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THE 2026

12-13 June, 2026
Independent University, Bangladesh (IUB)

PROCEEDINGS

Institutional Quality Assurance Cell

Institutional Quality Assurance Cell
Independent University, Bangladesh

International Conference on Innovation, Excellence and Quality for Transformation in Higher Education 2026 (THE 2026)

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Conference Proceedings

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Institutional Quality Assurance Cell (IQAC), Independent University, Bangladesh (IUB)

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Mr. Didar A Husain
Chairman, Board of Trustees
Independent University, Bangladesh

Message

It gives me immense pleasure to welcome you to the International Conference on Innovation, Excellence and Quality for Transformation in Higher Education 2026 (THE 2026), organized by the Institutional Quality Assurance Cell (IQAC) of Independent University, Bangladesh (IUB). This conference reflects IUB's unwavering commitment to academic excellence, innovation, and global engagement in higher education.

In an era marked by rapid technological advancement, evolving workforce demands, and changing educational paradigms, higher education institutions must continuously adapt to remain relevant and impactful. "THE 2026" provides a timely platform for scholars, educators, researchers, policymakers, and practitioners from around the world to exchange ideas, share best practices, and explore transformative approaches to teaching, learning, governance, quality assurance, and digital innovation.

IUB has always emphasized fostering a culture of intellectual inquiry, interdisciplinary collaboration, and socially responsible leadership. Through initiatives such as this conference, we seek to contribute meaningfully to national and global conversations on the future of higher education. I am confident that the deliberations and collaborations emerging from this conference will inspire innovative solutions and strengthen the pursuit of quality and excellence across institutions worldwide.

I extend my sincere appreciation to the organizing committee, keynote speakers, invited guests, authors, reviewers, and participants for their valuable contributions. I wish THE 2026 every success and hope that all participants will enjoy a productive and memorable experience at IUB.

Mr. Didar A Husain
Chairman, Board of Trustees, Independent University, Bangladesh
&
Chairman, Rahim Textiles Mills Limited



Prof. M. Tamim
Vice Chancellor
Independent University, Bangladesh

Message

On behalf of Independent University, Bangladesh (IUB), I am delighted to welcome all participants to the International Conference on Innovation, Excellence and Quality for Transformation in Higher Education 2026 (THE 2026). Organized by the Institutional Quality Assurance Cell (IQAC), this conference represents a significant initiative aimed at promoting dialogue and collaboration on the future of higher education.

Higher education worldwide is undergoing profound transformation driven by digital technologies, artificial intelligence, changing learner expectations, and increasing demands for accountability and employability. Institutions must therefore embrace innovation, strengthen quality assurance mechanisms, and cultivate inclusive and student-centered learning environments. The conference themes of THE 2026 thoughtfully address these pressing challenges and opportunities through discussions on curriculum innovation, teaching excellence, assessment, accreditation, leadership, digital transformation, and industry-academia collaboration.

At IUB, we strongly believe that quality education and impactful research are fundamental to sustainable national development and global progress. We are proud to host a platform that brings together distinguished academics, researchers, and professionals from diverse disciplines and regions to share insights and foster partnerships. I hope that the conference discussions will generate innovative ideas, practical strategies, and meaningful collaborations that will contribute to transforming higher education for future generations. I express my heartfelt gratitude to all contributors, reviewers, speakers, sponsors, and organizers for their dedication and hard work. I wish all participants a successful conference and a pleasant stay at IUB.

Prof. M. Tamim
Advisor, THE 2026



Prof. Md. Abdur Razzak
Director, IQAC
Independent University, Bangladesh

Message

It is my great pleasure to welcome you to the International Conference on Innovation, Excellence and Quality for Transformation in Higher Education 2026 (THE 2026), hosted by the Institutional Quality Assurance Cell (IQAC) of Independent University, Bangladesh (IUB).

THE 2026 has been designed as a multidisciplinary platform to encourage critical discussions on emerging trends, innovative practices, and transformative strategies in higher education. The conference aims to bring together scholars, educators, researchers, policymakers, and practitioners from around the world to exchange knowledge and experiences that can shape the future of higher education systems globally.

The conference covers a broad range of important themes, including curriculum innovation, outcome-based education, teaching and learning excellence, assessment and academic integrity, quality assurance and accreditation, digital transformation and artificial intelligence, leadership and governance, and industry-academia collaboration. We are encouraged by the enthusiastic response from participants and the high quality of submissions received from researchers across different countries and institutions.

I sincerely thank the keynote speakers, invited speakers, technical committee members, reviewers, session chairs, authors, sponsors, and volunteers for their invaluable support and contributions. I also extend my gratitude to the university leadership and IQAC for their continuous encouragement and guidance in organizing this conference.

I hope that THE 2026 will foster productive discussions, inspire innovative ideas, and create lasting collaborations among participants. I wish everyone a fruitful and enjoyable conference experience.

Prof. Md. Abdur Razzak
Conference General Chair, THE 2026



Prof. Shahriar Kabir
Additional Director (QA), IQAC
Independent University, Bangladesh

Message

It is my pleasure to welcome you to the International Conference on Innovation, Excellence and Quality for Transformation in Higher Education 2026 (THE 2026), organized by the Institutional Quality Assurance Cell (IQAC) of Independent University, Bangladesh (IUB).

Organizing an international conference of this scale requires the collective effort, commitment, and dedication of many individuals and teams. We are delighted to host scholars, researchers, educators, policymakers, and professionals from different parts of the world who have gathered to discuss innovative ideas and transformative practices in higher education.

The organizing committee has worked diligently to create an engaging and productive conference environment that facilitates academic exchange, professional networking, and collaborative learning. We have planned a comprehensive program that includes keynote addresses, invited talks, technical sessions, and interactive discussions covering a wide range of topics relevant to innovation, excellence, and quality in higher education.

A total of 21 abstracts, 57 full papers, 2 keynote papers and 4 invited papers are going to be presented in the conference. I extend my sincere gratitude to the university leadership, conference committees, volunteers, sponsors, reviewers, and participants for their invaluable support and cooperation. Their contributions have been instrumental in making THE 2026 possible.

We hope that your participation in this conference will be professionally enriching and personally enjoyable. We also hope you will take the opportunity to experience the vibrant academic environment and warm hospitality of IUB and Bangladesh.

I wish you a successful and memorable conference experience.

Prof. Shahriar Kabir
Technical Program Chair, THE 2026



Prof. Md. Abdul Awal Khan
Additional Director (ETL), IQAC
Independent University, Bangladesh

Message

Welcome to the International Conference on Innovation, Excellence and Quality for Transformation in Higher Education 2026 (THE 2026). It is an honor to serve as the Technical Program Chair of this important international conference organized by the Institutional Quality Assurance Cell (IQAC) of Independent University, Bangladesh (IUB).

The technical program of THE 2026 has been carefully designed to ensure a high-quality academic and professional exchange among participants from diverse backgrounds and disciplines. The conference received a significant number of submissions addressing contemporary issues and innovative practices in higher education. Each submission underwent a rigorous review process conducted by experienced reviewers and technical committee members to maintain academic integrity and scholarly excellence.

The selected papers and presentations reflect current developments and emerging challenges in higher education, including digital transformation, artificial intelligence in education, innovative pedagogies, quality assurance frameworks, assessment practices, governance, employability, and interdisciplinary collaboration. We believe that the technical sessions, keynote talks, and panel discussions will provide valuable opportunities for meaningful learning, networking, and future collaboration.

I would like to express my sincere appreciation to all reviewers, technical committee members, authors, and presenters for their dedication and contributions. Special thanks go to the organizing committee and university administration for their continuous support in ensuring the success of this conference.

I hope that all participants will find the conference intellectually stimulating and professionally rewarding.

Prof. Md. Abdul Awal Khan
Organizing Chair, THE 2026

KEYNOTE SPEAKER



Dr. Tengku Adeline Adura Tengku Hamzah

Director, Centre for Assessment and Capacity Building, Quality Management and Enhancement Department, University of Malaya, Malaysia

Topic: Quality Assurance and Academic Programme Accreditation: The Experience of Universiti Malaya, Malaysia

Biography: Tengku Adeline Adura Tengku Hamzah is an Associate Professor at the Department of Geography, Faculty of Arts and Social Sciences, Universiti Malaya, Malaysia. She obtained a Doctor of Philosophy Degree (PhD) in Environmental Governance from Durham University, United Kingdom; Master's Degree in Environmental Studies from Universiti Putra Malaysia, Malaysia; and a Bachelor's Degree in Science from Universiti Malaya, Malaysia. Her research interests revolve around the broad issues of environmental governance particularly related to waste governance, natural resource governance, climate risk and governance, and ESG. She was awarded with numerous research grants amounting to approximately RM 1.1 million in total, to date. She has produced numerous publications in academic journals, chapters in books, conference papers and book. She also served as supervisors and examiners to post graduate candidates in Universiti Malaya. Tengku Adeline is often invited to deliver keynote speeches at local and international institutions. Apart from that, she is also a teaching and learning strategy expert, and has conducted numerous workshops and sessions on Outcome-based Education (OBE) at higher learning institutions, and a Certified Lead Auditor for ISO 9001: 2015 (Quality Management System). She is also entrusted to hold several administrative posts at department, faculty and university levels. In the field of Quality Assurance, she currently serves as the Executive Director of the Quality Management and Enhancement Department at Universiti Malaya, Malaysia. Previously, she held several key leadership roles, including Director of the Centre for Accreditation and Recognition, Director of the Centre for Assessment and Capacity Building, and Deputy Director of Academic Quality Assurance within the same department.

KEYNOTE SPEAKER



Professor Daniel W. Lund

Pro Vice Chancellor, Independent University, Bangladesh

Topic: Higher Education Organizational Effectiveness in Developing Countries: Domains of Analysis

Biography: Daniel W. Lund is serving as the Pro Vice Chancellor at Independent University, Bangladesh as since April 2025. Prior to joining IUB, joining Independent University, Bangladesh, Daniel W. Lund served as the Founding Dean of Graduate Programs and Executive Education at British Management University. Over the course of his career, he has held several senior academic leadership positions across Asia, the Middle East, and the South Pacific, including Dean of the Faculty of Business Administration at Iqra University, Acting Dean of the College of Business at Alfaisal University, and Founding Dean of the School of Business and Management at Solomon Islands National University. He has also taught at internationally recognized institutions such as Fudan University, Tecnologico de Monterrey, and Nazarbayev University. Dr. Lund is currently completing an EdD at Johns Hopkins University with a focus on Entrepreneurial Leadership in Education. He earned his PhD from Griffith University in Higher Education Organizational Effectiveness and Diversity Management, an MBA from York University, and a BA in Philosophy and English Literature from University of Victoria. He also completed executive leadership programs at Duke University Fuqua School of Business and Harvard Business School. An expert in higher education's governance, strategic planning, and institutional effectiveness, Dr. Lund has served on academic boards, councils, and accreditation committees in multiple countries. He has contributed to accreditation and quality assurance initiatives aligned with AACSB and EQUIS standards and advised organizations such as the Solomon Islands Development Bank and China's Ministry of Commerce. His research interests include higher education leadership, cross-cultural management, expatriate adjustment, and strategic human resource management. In addition to publishing widely and delivering keynote speeches internationally, he is an International Faculty Fellow at the MIT Sloan School of Management and a member of the Academy of Management. Beyond academia, he has also worked internationally as a business consultant across diverse industries.

INVITED SPEAKER



Dr. Anisul Haque

Professor, Dept. of EEE, East West University

Topic: From Quality Assurance to Local Accreditation to Global Recognition: Evolution of Engineering Education in Bangladesh

Biography: Dr. Anisul Haque is working as a professor in the Department of Electrical and Electronic Engineering, East West University since 2006. He has served as the Chairperson of the Department of EEE and the Dean of the Faculty of Sciences and Engineering. Before joining East West University, he taught at the Electrical and Electronic Engineering Department, BUET for eighteen years. He has been a visiting faculty at Tokyo Institute of Technology, Japan, University of Connecticut, USA and Clarkson University, USA. Dr. Haque's research interests include the physics, modeling, simulation and characterization of photovoltaic devices and systems and nanoelectronic devices. He is also interested in engineering education. Dr. Haque is the recipient of the Bangladesh University Grants Commission Award in 2006 and the gold medal from the Bangladesh Academy of Science in 2010. Dr. Haque was an editor of IEEE Transactions on Electron Devices from 2010 to 2019. He also served as an associate editor of IEEE Access from 2013 to 2023. Currently he is an editor of IEEE Electron Devices Review. He has been serving as an IEEE Distinguished Lecturer since 2009. He was a Board member of the Board of Accreditation for Engineering and Technical Education (BAETE), Institute of Engineers, Bangladesh (IEB) from 2012 to 2025. Dr Haque has conducted many training and workshop sessions on Outcomes Based Education (OBE) for academic program leaders and on Outcomes Based Accreditation (OBA) for BAETE program evaluators.

INVITED SPEAKER



Dr. Salekul Islam

Professor, Department of Electrical and Computer Engineering, North South University

Topic: From Routine Compliance to Meaningful OBE: Transforming Teaching, Learning, and Quality in Higher Education

Biography: Salekul Islam has been Professor of the Electrical and Computer Engineering (ECE) Department of North South University since 2024. Earlier, he served as a Professor of the Computer Science and Engineering (CSE) Department of United International University (UIU) since 2018 and was also the Head of the CSE Department of UIU. He was also in the position of the Director of Institutional Quality Assurance Cell (IQAC) and the Director of Centre for AI and Robotics (CAIR) at UIU. He was a Visiting Faculty Member of Anglia Ruskin University, UK in 2015. Dr. Islam completed his PhD in Computer Science from Concordia University, Canada in 2008. He also worked as a Fonds de Recherche du Québec Nature et Technologies (FRQNT) Postdoctoral Fellow at Institut national de la recherche scientifique (INRS), Canada, from 2008 to 2011. He is actively involved with Bangladesh Board of Accreditation for Engineering and Technical Education (BAETE) in different capacities including as Co-Chair of the Quality Assurance Cell and master trainer. Previously he served as a Member of the Board and a member of the Task Force for Preparing the OBE Manual. His research areas mainly focus on Cybersecurity, Blockchain, NLP, Image Processing, Edge Cloud Computing, Robotics and Engineering Education. He has been serving as a Senior Editor of IEEE Access and an Associate Editor of Frontiers in High Performance Computing. As a PI/Co-PI, he successfully received more than 10 national and institutional grants. He served as the Organizing Chair of several international conferences. He is a Fellow of the Institute of Engineers, Bangladesh (IEB) and is also a Senior Member of IEEE.

INVITED SPEAKER



Prof. Dr. Kazi Shahadat Kabir

Pro Vice Chancellor, City University

Topic: Digital Transformation, Governance and Leadership in Universities

Biography: Kazi Shahadat Kabir is serving as the Pro Vice Chancellor of City University. completed his Bachelor of Human Science in Political Science, Masters, and PhD in Political Science and Public Policy from International Islamic University Malaysia. He later completed a postdoctoral fellowship in the Department of Public Administration at Incheon National University under the support of the National Research Foundation of Korea and the Ministry of Education of the Republic of Korea. With more than 24 years of academic and administrative experience, Dr. Kabir has taught at International Islamic University Chittagong, International Islamic University Malaysia as an adjunct faculty member, and has served for over 16 years at Northern University Bangladesh. Since 2007, he has been serving as the Head of the Department of Governance and Public Policy in collaboration with BCS Administration Academy, and also served as Registrar of the university. During his tenure, he introduced the "Masters of Governance Studies" and "Masters in Public Policy & Management" programs at the BCS Administration Academy. He also played an important role in establishing international collaborations with universities in Malaysia, China, the UK, the USA, and Australia through the NUB International Centre. Dr. Kabir teaches a wide range of subjects including Political Science, Public Administration, Public Policy, Bangladesh Studies, Sociology, Engineering Ethics, Business Ethics, and International Organizations. He has authored three books, published numerous articles and book reviews, and presented papers at national and international conferences. He is the Editor-in-Chief of the "NUB Journal of Social Sciences and Humanities" and has supervised more than 100 master's students in Governance Studies and Public Policy. Beyond academia, Dr. Kabir is the founder and Secretary General of the Golden Kids Welfare Foundation, a center for autistic and developmentally delayed children. He also completed specialized training on autism and dyslexia in India and Malaysia.

INVITED SPEAKER



Dr. Swakkhar Shatabda

Professor, Department of Computer Science and Engineering, and Deputy Director, IQAC
Brac University

Title: Designing for the Unknown: Teaching Students to Learn What We Can't Yet Teach

Biography: Swakkhar Shatabda is a Professor of Computer Science at BRAC University. He earned his Ph.D. from Griffith University, Australia, where he served as a Graduate Researcher at the Queensland Research Laboratory, NICTA. Prior to his doctoral studies, he completed his B.Sc. in Computer Science and Engineering from the Bangladesh University of Engineering and Technology (BUET) in 2007, and his international research experience includes work at the BioGeM Institute in Italy. His research interests span AI search, optimization, applied machine learning, algorithms, and computational biology, and his work has appeared in leading journals and top-tier conferences in these domains. He also serves as an Academic Editor for PLOS ONE and is a member of both ACM and IEEE. In addition to his academic roles, Professor Shatabda is the Director of Quality Assurance at the Board of Accreditation for Engineering and Technical Education (BAETE) under The Institution of Engineers, Bangladesh (IEB), a member of its Quality Assurance Cell, and the Deputy Director of the Institutional Quality Assurance Cell at BRAC University.

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Full Papers

Design and Implementation of a CAD-Integrated Outcome-Based Curriculum for Digital Fashion Education in Bangladesh

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Abstract
As Bangladesh prepares for graduation from Least Developed Country (LDC) status, its ready-made garment (RMG) sector is undergoing a structural transition from volume-based production towards value-added, design-led, and technology-driven manufacturing. This transformation demands a commensurate shift in higher education, particularly in fashion design, where digital capability, interdisciplinary integration, and industry alignment remain underdeveloped. This paper presents the design and implementation of a Bachelor of Science (BSc) programme in Fashion Design and Apparel Engineering at Prime University, Bangladesh, developed within an Outcome-Based Education (OBE) framework. The curriculum systematically integrates Computer-Aided Design (CAD) and digital workflows across four progressive academic stages, representing one of the most comprehensively CAD-integrated fashion programmes in Bangladesh. Drawing on OBE principles and constructive alignment theory, the paper details the programme's design philosophy, learning outcomes, curriculum architecture, and evidence from initial implementation with the inaugural cohort in 2026 — all seven students of whom, all female, progressed to the second semester with a 0% dropout rate. The study proposes this model as a scalable, replicable framework for digital fashion education reform in similar developing-economy contexts.

Keywords: Outcome-Based Education; CAD Integration; Digital Fashion; Curriculum Design; Apparel Engineering; Higher Education; Bangladesh

1. Introduction

Bangladesh's ready-made garment (RMG) sector is the world's second-largest apparel exporter, contributing approximately 84 percent of national export earnings and employing more than four million workers (Bangladesh Garment Manufacturers and Exporters Association, 2023). As the country approaches graduation from LDC status, the industry faces intensifying pressure to shift from low-margin, high-volume production towards value-added manufacturing, original design, and digitally mediated product development (World Bank, 2022). This transition is driven by global buyer expectations, fast fashion's compressed cycles, sustainability imperatives, and the widespread adoption of digital technologies—including 3D garment simulation, virtual prototyping, and CAD-based pattern engineering—across international supply chains (Nayak & Padhye, 2018; Sayem et al., 2023).

Despite the sector's scale, a persistent shortage of graduates with advanced design, engineering, and digital competencies continues to constrain its upgrading trajectory. The industry's documented reliance on foreign technical professionals from India and Sri Lanka for senior roles underscores a structural misalignment between existing higher education provision and emerging industry requirements. Government responses—through the expansion of textile engineering programmes at DUET, KUET, MBSTU, and JUST, and the development of Bangladesh University of Textiles (BUTEX)—have focused largely on manufacturing and production engineering. Fashion design education, by contrast, remains unstandardised, and no public university currently offers an undergraduate degree in the discipline.

The theoretical foundations of this study draw on two intersecting bodies of literature. First, Outcome-Based Education (OBE), conceptualised by Spady (Spady, 1994) and operationalised in higher education through Biggs and Tang's (Biggs & Tang, 2011) constructive alignment framework, provides the pedagogical architecture for curriculum design. OBE emphasises the backward mapping of course content and assessment from explicitly defined graduate competencies, ensuring coherence between learning outcomes, teaching strategies, and evaluation (Harden, 1999; Kennedy, 2007). It has been adopted as the standard quality assurance framework by the University Grants Commission (UGC) of Bangladesh for all approved undergraduate programmes.

Second, a substantial body of literature documents the digital transformation of the fashion and apparel industry and its implications for education. Sayem (Sayem et al., 2023) reports that 3D virtual prototyping reduces physical sample iterations by up to 80 percent, compressing product development lead times and enabling more sustainable

workflows. Nayak and Padhye (Nayak & Padhye, 2018) situate CAD within the broader continuum of garment manufacturing technology, arguing that digital pattern engineering is no longer a supplementary skill but a core professional competency. Students trained with integrated 3D CAD tools demonstrate superior spatial reasoning and design communication compared to those taught through conventional flat-pattern methods alone.

Internationally, leading fashion institutions—including Parsons School of Design, the Royal College of Art, and Politecnico di Milano—have progressively embedded CAD, CLO 3D, and Browzwear workflows across their curricula rather than treating them as elective add-ons. In developing-country contexts, however, this integration remains fragmented. Infrastructure constraints, faculty capability gaps, and a tendency to treat digital tools as terminal-year specialisations are the primary barriers. A structural divide persists between design-oriented programmes, which emphasise aesthetics and creativity, and engineering-based textile curricula, which focus on production systems—a bifurcation that limits the interdisciplinary competency development required by modern apparel enterprises.

Within this context, the present paper makes three contributions. First, it describes a curriculum architecture that bridges fashion design and apparel engineering within a single OBE programme, resolving the design–engineering divide identified in the literature. Second, it demonstrates a model of progressive, vertical, and horizontal CAD integration that operationalises the call for systematic digital embedding rather than piecemeal module addition. Third, it provides early implementation evidence from Bangladesh's formally approved, CAD-integrated fashion design degree, offering a replicable model for analogous developing-economy contexts.

2. Methodology

The BSc programme in Fashion Design and Apparel Engineering was designed collaboratively by academic faculty, industry practitioners, and UGC academic advisors over an eighteen-month development period. The design process followed a backward mapping approach consistent with OBE principles: graduate competencies were defined first, and course content, CAD integration points, and assessment strategies were subsequently mapped to achieve those outcomes (Biggs & Tang, 2011; Harden, 1999). The programme was formally approved by UGC Bangladesh in December 2025 and commenced with its inaugural cohort in January 2026, following the university's concurrent transition from a bi-semester to a trimester academic calendar.

2.1 Design Philosophy and Programme Learning Outcomes

The curriculum is governed by three intersecting principles—integration of design and engineering knowledge, progressive digital orientation, and alignment with contemporary industry workflows—each operationalised through the course architecture, assessment design, and studio practice described in subsequent sub-sections.

The Programme Learning Outcomes (PLOs) are formally defined in the UGC-approved curriculum and reflect the full range of academic and professional competencies expected of graduates of the B.Sc. in Fashion Design and Apparel Engineering. The ten approved PLOs are as follows:

- PLO 1 – Fundamental Knowledge: Understanding theories and principles behind Fabric Construction, Textile Science, History of Art, Textile, Costumes, Fashion theories, Styles, Draping, Pattern Cutting, Marketing and Merchandising.
- PLO 2 – Programme Analysis: To apply the knowledge of elements and principles of design to create futuristic designs on various domains and develop prototypes using draping, flat pattern making and stitching.
- PLO 3 – Design Development: To understand the applicability of new technologies related to design development, material choices, manufacturing and distribution of fashion in the global market.
- PLO 4 – Visual Communication: To visually communicate ideas in the form of artistic fashion illustrations, graphic illustration, styling, fashion photography and visual display of merchandise.
- PLO 5 – Event Management and Team Leadership: To demonstrate understanding to successfully conduct a fashion event or run an organisation, handle its finance, HR and business functions.
- PLO 6 – Creation: To communicate ideas and creative inputs to the global fashion industry by creating fashion images using multimedia and digital technologies, and to explore illustration potential in branding.
- PLO 7 – Problem Solutions: To focus on a creative approach to developing designs and innovative solutions through learned traditional and contemporary technologies.
- PLO 8 – Ethics: Develop an understanding of ethical and sustainable principles in fashion design, considering environmental, social, economic, and political impacts of climate change.

- PLO 9 – Modern Tool Usage: Graduates will be able to use techniques and modern tools applied in fashion execution.
- PLO 10 – Lifelong Learning: To demonstrate knowledge and understanding of basic skills, transfer of education, personal development, continuous professional development, and dedication to lifelong learning.

These ten PLOs were mapped against the National Qualifications Framework Level 6 descriptors and aligned with competency profiles identified through industry consultation, validated against graduate attribute frameworks reported in the literature (Kennedy, 2007; Spady, 1994). Collectively, they address the full spectrum of graduate competencies expected in the discipline, spanning foundational knowledge, creative practice, technical application, digital proficiency, professional conduct, and ethical awareness.

The Washington Accord — the premier international accreditation agreement for engineering and technology degree programmes — prescribes twelve graduate attributes as the benchmark for accredited programmes. These encompass: engineering knowledge, problem analysis, design and development of solutions, investigation, modern tool usage, the engineer and society, environment and sustainability, ethics, individual and teamwork, communication, project management, and lifelong learning. Programmes seeking accreditation under frameworks that are signatories to, or aligned with, the Washington Accord — including the Bangladesh Accreditation Council (BAC) criteria for engineering and technology programmes — are expected to demonstrate explicit coverage of all twelve attributes through their PLO set, either directly or through traceable PLO-to-attribute mapping.

The present programme, as approved by UGC, articulates ten PLOs. Mapping against the twelve Washington Accord attributes reveals strong coverage: PLO 8 (Ethics) corresponds directly to the Ethics attribute; PLO 9 (Modern Tool Usage) aligns with Modern Tool Usage; PLO 10 (Lifelong Learning) maps to the Lifelong Learning attribute; and PLOs 1–3 collectively address Engineering Knowledge, Problem Analysis, and Design and Development of Solutions. However, two attributes — "the engineer and society" and "environment and sustainability" as explicitly standalone outcomes — and a dedicated "project management" outcome are not yet independently articulated. Scholarly debate within the OBE literature reflects a substantive tension here: a larger PLO set provides more precise assessment anchors and enables finer-grained attainment evidence, yet risks administrative fragmentation and dilution of curricular coherence if outcomes are not sufficiently differentiated from one another (Harden, 1999; Kennedy, 2007). Biggs and Tang (Biggs & Tang, 2011) caution that constructive alignment is most effective when PLOs are genuinely distinct and independently assessable — a standard that becomes progressively harder to maintain as PLO count increases. Conversely, Spady's (Spady, 1994) original OBE framework prioritises comprehensive coverage of exit competencies over parsimony, arguing that every significant domain of professional practice warrants explicit outcome specification.

As the programme progresses towards future BAC accreditation, expanding the PLO set from ten to twelve — in full alignment with the Washington Accord graduate attributes — will be undertaken through the programme's formal curriculum review process, in consultation with the UGC. This expansion will ensure that "environment and sustainability," "the engineer and society," and "project management" are articulated as independent PLOs, while preserving the internal coherence of the existing ten. The current ten PLOs therefore represent the approved foundational structure of the programme, with systematic augmentation planned as part of its accreditation pathway.

2.2 Curriculum Architecture: A Four-Stage Progressive Model

The curriculum is structured across eight semesters (four academic years) in four progressive stages, as approved by UGC in December 2025, adapting the staged digital integration model and extended through the vertical–horizontal integration framework described by Biggs and Tang (Biggs & Tang, 2011). Each stage builds cumulatively on prior competencies, ensuring that digital skills are developed as embedded professional capacities rather than isolated technical proficiencies. It should be noted that while the UGC-approved syllabus specifies a bi-semester course distribution, Prime University transitioned from a bi-semester to a trimester academic calendar in January 2026, concurrent with the programme's commencement. The course distribution across Years 1–4 remains unchanged; the trimester structure affects scheduling and pacing within each year but does not alter the programme's content architecture or credit structure.

- Foundation Stage (Year 1): Foundational fashion design principles, technical drawing, textile science, and garment manufacturing. Digital literacy is initiated through the Application of Computer in Fashion and Apparel course, in which students are introduced to Adobe Photoshop as the primary tool for digital image creation and manipulation, alongside foundational skills in Adobe Illustrator for vector-based

design work. These industry-standard applications provide an early entry point into digital design practice, while emphasis on spatial reasoning, proportion, and graphical communication establishes the conceptual foundations required for advanced CAD application in subsequent stages.

- Core Stage (Year 2): Introduction of 2D CAD for pattern development and technical documentation. Students learn Adobe Illustrator for technical flat drawing and fashion illustration via CAD I, before advancing to Lectra Modaris — the industry-standard parametric pattern-making platform — in CAD II, where they link manual pattern-making skills to professional digital workflows and develop proficiency with grading and marker planning.
- Advanced Stage (Year 3): Expansion to 3D garment simulation, virtual prototyping, and digital visualisation through E-Fashion I and E-Fashion II courses. Students work with CLO 3D to conduct fit analysis in virtual environments, simulate fabric behaviour, and integrate 3D digital workflows across product development briefs, building directly on the 2D pattern competencies established in Year 2.
- Integration Stage (Year 4): Consolidation of all competencies through industry-standard capstone projects, a Final Dress Collection, and a Portfolio Development. Students execute end-to-end design-to-production workflows using CAD tools, demonstrating professional readiness.

Table 1 maps CAD integration components, key skills, and industry relevance across the four stages.

TABLE 1 MAPPING OF CAD INTEGRATION AND LEARNING OUTCOMES ACROSS ACADEMIC STAGES

Year	Academic Stage	CAD / Digital Components	Key Skills Developed	Industry Relevance
Year 1	Foundation	Adobe Photoshop (primary) and Adobe Illustrator (fundamentals) via Application of Computer in Fashion and Apparel; technical drawing and visualisation	Spatial reasoning, graphical communication, Adobe Photoshop and Illustrator proficiency	Early Adobe Creative Suite adoption; foundation for advanced digital workflows
Year 2	Core	Adobe Illustrator (CAD I) for technical flats; Lectra Modaris (CAD II) for parametric pattern making and grading	Technical flat drawing (Adobe Illustrator), digital pattern making and grading (Lectra Modaris), technical documentation	Pattern design CAD application
Year 3	Advanced	CLO 3D for garment simulation and virtual prototyping (E-Fashion I & II)	3D garment simulation and fit analysis, virtual prototyping, digital workflow integration (CLO 3D)	Fashion design CAD application; Product development
Year 4	Integration	Full CAD workflow in Capstone Project, Portfolio Development, Final Dress Collection	End-to-end digital product development	Industry readiness across design and development roles

2.3 Vertical and Horizontal Integration

The model's structural strength lies in its dual axis of integration, a design principle supported by Taba's (Taba, 1971) curriculum development theory and more recently by Harden's (Harden, 1999) integration ladder for medical education, adapted here for fashion and engineering.

Vertical integration refers to the cumulative development of digital competencies across the four academic years, where each stage explicitly builds on the preceding one. This ensures that 3D simulation in Year 3 is experienced as an extension of 2D pattern logic acquired in Year 2, not as a disconnected technical module.

Horizontal integration embeds CAD tools across multiple concurrent courses at each stage rather than confining them to designated 'digital' modules. Courses including *Application of Computer in Fashion and Apparel*, *CAD I & II*, *E-Fashion I & II*, *Creative Design Analysis and Collection*, and *Portfolio Development* collectively ensure that digital tools are encountered as instruments of design thinking and engineering practice rather than as terminal-year specialisations. Across these courses, a deliberate software progression is maintained: Adobe Photoshop and Illustrator in Year 1, Adobe Illustrator for technical illustration and Lectra Modaris for parametric pattern engineering in Year 2, and CLO 3D for 3D garment simulation and virtual prototyping in Year 3 — each platform representing the industry-standard tool for its respective workflow domain. This approach is consistent with Kolb's (Kolb, 2015) experiential learning cycle, wherein repeated, contextually varied encounters with a skill domain deepen both procedural fluency and conceptual understanding.

2.4 Assessment Design and OBE Alignment

Assessment strategies were designed using constructive alignment (Biggs & Tang, 2011): each assessment task is directly mapped to one or more PLOs and to the specific CAD competencies targeted at that academic stage.

Studio critiques, technical portfolios, CAD-generated pattern submissions, and the Final Dress Collection constitute the primary assessment instruments, supplemented by written examinations for theory-based courses. This multi-modal assessment design is consistent with recommendations in the OBE literature for fashion and design programmes, where both process and product evidence are necessary to demonstrate competency attainment (Kennedy, 2007).

2.5 Industry Alignment and Graduate Employability

A central design objective was to align graduate competencies with the evolving professional roles demanded by Bangladesh's transitioning apparel sector. Industry consultation identified four emerging role clusters for which no adequate domestic graduate supply currently exists: Fashion Designer, Apparel Merchandiser, Product Developer, and CAD Specialist. The curriculum's PLO-to-industry-role mapping is presented in Table 2.

TABLE 2 GRADUATE ROLE–PLO ALIGNMENT MATRIX.

Graduate Role	Core Competencies Required	Programme Learning Outcomes Addressed
Fashion Designer	Design ideation, trend interpretation, visual communication	PLO 1, PLO 2, PLO 4, PLO 6
Apparel Merchandiser	Product planning, buyer liaison, order management	PLO 1, PLO 5, PLO 6, PLO 8
Product Developer	Design-to-technical spec translation, sampling, costing	PLO 2, PLO 3, PLO 7, PLO 9
CAD Specialist	Digital pattern making, grading, 3D virtual prototyping	PLO 3, PLO 4, PLO 6, PLO 9

Industry-oriented pedagogical components—including project-based learning, capstone projects, supervised internships, and portfolio development—were incorporated to bridge theoretical knowledge and professional practice. The Final Dress Collection, in particular, functions as an integrative capstone requiring students to apply design, engineering, and digital competencies within a single, industry-standard production workflow, providing examinable evidence of holistic competency attainment.

3. Results and Discussion

The programme received formal UGC approval following an institutional review process, confirming its compliance with Bangladesh's National Qualifications Framework and OBE standards. The inaugural cohort commenced studies in January 2026, marking the transition of the curriculum from design documentation to live delivery, simultaneously with the university's shift from a bi-semester to a trimester academic calendar. The cohort comprises seven students, all female — a gender composition consistent with the predominant female enrolment patterns observed in fashion and design programmes internationally. Of particular significance, all seven students progressed to the second semester, representing a 0% dropout rate. This outcome is noteworthy on two counts: attrition rates are typically elevated in inaugural cohorts due to the uncertainties associated with newly established programmes, and dropout rates among female students in technical and engineering-adjacent disciplines in Bangladesh remain disproportionately high relative to male peers (BANBEIS, 2023). While the cohort size is modest and longitudinal conclusions must be drawn with appropriate caution, this early retention data constitutes encouraging preliminary evidence of student engagement and programme viability. The following results and observations are drawn from the first semester of implementation.

3.1 Initial Implementation Evidence

The structured academic induction programme, which introduced students to studio-based learning norms, interdisciplinary engagement expectations, and the programme's digital learning pathway, facilitated faster familiarisation with the curriculum's integrated design–engineering orientation than anticipated.

The deployment of 2D CAD tools in Year 2 Core Stage courses — specifically Adobe Illustrator for technical flat drawing in CAD I and Lectra Modaris for parametric pattern engineering and grading in CAD II — confirmed the pedagogical validity of the delayed introduction model: students who had completed the Foundation Stage's manual pattern-making modules demonstrated qualitatively stronger conceptual mapping between physical and digital pattern making than cohorts in institutions where CAD is introduced from Year 1 without prior manual grounding, consistent with Nayak and Padhye's (2018) recommendation for sequenced skill development in apparel engineering education.

3.2 Institutional and Systemic Implications

The programme's development and approval also surfaces a structural feature of Bangladesh's private higher education sector with broader policy implications. Leading Category A private universities have historically avoided textile and apparel engineering programmes, perceiving them as narrowly applied and less adaptable to shifting graduate labour market demands. This institutional risk-aversion has reinforced the public–private provision gap in fashion and textile education. The present programme challenges this perception by repositioning apparel engineering competencies within a design-led and digitally oriented academic framework—an approach consistent with the *academic drift* literature (Codling & Meek, 2006), which shows that applied disciplines gain institutional legitimacy when reframed through interdisciplinary and professional-graduate positioning.

Furthermore, the programme's approval establishes a precedent within the UGC framework for fashion design as a formally recognised engineering-adjacent discipline, creating a regulatory pathway for other private and public institutions to develop analogous programmes. This is consistent with the policy trajectory observed in comparable LDC-graduation contexts, including Vietnam and Cambodia, where state-led curriculum reform in technical education preceded sustained improvements in the value-added composition of garment exports (World Bank, 2022). A notable implementation nuance concerns the university's concurrent transition from a bi-semester to a trimester academic calendar in January 2026. The UGC-approved syllabus was designed around a bi-semester structure, yet delivery has proceeded under the trimester system. Since the course distribution across Years 1–4 remains unchanged, this transition introduces no changes to content sequencing or credit allocation, but it does require ongoing administrative adaptation in pacing and scheduling. This experience points to a broader design consideration for curriculum developers in similar contexts: building structural flexibility into course distribution frameworks to accommodate institutional calendar variation, particularly given Bangladesh's diverse private university scheduling practices.

3.3 Limitations and Future Research

This paper reports findings from a single institution and a single inaugural semester. The absence of longitudinal graduate performance data, employer satisfaction metrics, and learning outcome attainment evidence across all four stages is acknowledged as a significant limitation. The authors intend to publish a follow-up study assessing PLO attainment rates, CAD competency benchmarking against international standards, and employer feedback following the graduation of the first cohort. Comparative studies across institutions adopting analogous models in other South and South-East Asian LDC-graduation contexts would also advance external validity.

4. Conclusion

This paper has presented the design rationale, curriculum architecture, and initial implementation evidence of a CAD-integrated, Outcome-Based BSc programme in Fashion Design and Apparel Engineering at Prime University, Bangladesh. The programme addresses a well-documented structural gap in the country's higher education provision by integrating fashion design, apparel engineering, and digital competencies within a single, coherent academic framework.

Three contributions are advanced. First, the programme operationalises OBE through constructive alignment between PLOs, progressive CAD integration, and multi-modal assessment, providing a replicable design methodology for fashion education in developing-economy contexts. Second, the four-stage vertical–horizontal integration model demonstrates how digital technologies can be embedded systematically across a curriculum—as instruments of both design creativity and engineering rigour—rather than appended as standalone modules. Third, the programme's UGC approval and initial implementation provide feasibility evidence for a new category of interdisciplinary, digitally oriented technical degree within Bangladesh's private university sector.

As the programme matures through successive cohorts, rigorous assessment of learning outcomes, graduate employability, and industry impact will be essential. The present study nevertheless establishes a foundation for curriculum innovation in digital fashion education and contributes to the wider international discourse on higher education's role in enabling industrial transformation in developing economies.

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Fostering Lifelong Learning through Outcome-Based Education: Prospects and Challenges in Higher Education Institutions of Bangladesh

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Abstract
Outcome-Based Education (OBE) is a teaching approach that emphasizes clearly defining the goals of what students should achieve or be able to do upon completing a course, program, or degree. In Bangladesh, this method has been implemented at the higher education level since 2022, following the directive of the University Grants Commission (UGC), to improve the quality of higher education. On the other hand, lifelong learning has emerged as a significant model in the 21st-century education system and industrial sectors, placing emphasis on continuous skill development and adaptive learning. In this context, OBE offers a structured and systematic learning framework that aligns higher education with the evolving demands of students, society, and the job market. Lifelong learning principles have been included in the Bangladesh National Qualifications Framework (BNQF). BNQF is a benchmark instrument for the development, classification and recognition of skills, knowledge and competencies from primary to higher education, including technical and vocational training. This study analyzes the various prospects and challenges of integrating lifelong learning principles within the implementation of OBE in higher education institutions of Bangladesh. It explores how OBE can contribute to the development of critical thinking, self-directed learning, and employability skills important elements for building a strong foundation for lifelong learning.

***Keywords**:* OBE, Lifelong Learning, and Learning Outcome.

1. Introduction

Outcome-Based Education (OBE) was first introduced by William G. Spady[1] In the late 1980s and later, a revised and comprehensive version was conceptualised in the early 1990s for redesigning higher education systems with clearly defined learning outcomes. OBE ensures that all learners achieve learning outcomes at the end of their study (Spady, 1994). In the traditional system, learning outcomes from the learners were not systematically defined and incorporated into the curriculum of higher education. Therefore, OBE brought significant improvement and development in the existing higher education curriculum in Bangladesh.

OBE has been introduced in higher education in Bangladesh by the University Grants Commission (UGC) of Bangladesh and the Ministry of Education as part of the country's quality assurance mandate. OBE also represents Bangladesh's international commitment to improving educational quality, in line with international benchmarks and Sustainable Development Goal 4 (SDG 4) on quality education. The establishment of the Institutional Quality Assurance Cell (IQAC) in all public and private universities in Bangladesh under the Higher Education Quality Enhancement Project (HEQEP) in 2015 is considered the initial significant step towards integrating OBE principles into the curriculum of all universities (University Grants Commission (UGC, 2018). OBE has been implemented at the higher education level since 2022, following the directive of the UGC, to improve the quality of higher education. OBE also aligns with the Bangladesh National Qualifications Framework (BNQF), which provides a structured system for clearly defining learning outcomes, graduate attributes, and levels of competence (Ministry of Education, BNQF, 2021). BNQF is an "internationally benchmarked instrument for the development, classification and recognition of skills, knowledge and competencies along a continuum of agreed levels. This Framework describes the learning outcomes and volume of learning of students corresponding to each qualification", from primary to higher education, including technical and vocational training. (Ministry of

[1] William G. Spady (1942–2023) was an American sociologist and educationalist. He is often referred to as the father of OBE.

Education, BNQF, 2021). Bangladesh Accreditation Council (BAC)[2] and Board of Accreditation for Engineering and Technical Education (BAETE)[3] has made OBE mandatory for program accreditation.

On the other hand, lifelong learning (LLL) has emerged as a significant model in the 21st-century education system and industrial sectors, placing emphasis on continuous skill development and adaptive learning. LLL principles have been included in the Bangladesh BNQF. In this context, OBE offers a structured and systematic learning framework that aligns higher education with the evolving demands of students, society, and the job market. Therefore, fostering LLL through OBE becomes obvious in higher education in Bangladesh for quality education and skilled graduates. Despite all those policy developments, there are significant challenges to implementing OBE and ensuring LLL principles.

2. Theoretical Perspective

This study will follow a qualitative research methodology to get an in-depth understanding of how OBE fosters lifelong learning in higher education institutions of Bangladesh. A qualitative approach is suitable because it allows exploration of participants' experiences, perceptions, and institutional practices in a systematic and organized way. Primary data will be collected from structured and semi-structured questionnaire surveys, including close-ended questions categorized into sections addressing various aspects of OBE practices to achieve LLL.

LLL Lifelong refers to BNQF as "all learning activities undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic, social and/or employment-related perspective." (Ministry of Education, BNQF, 2021). The higher education of Bangladesh faces significant challenges in adopting and implementing OBE frameworks systematically and effectively. Among many challenges, there are a few common challenges, such as limited faculty capacity, inadequate institutional readiness, and a lack of comprehensive OBE-based assessment systems. IQAC of each university is primarily responsible for facilitating and providing guidelines for designing OBE-based curriculum, and respective departments/programs are responsible for implementing OBE. Moreover, transitioning from teacher-centred instruction to a student-centred or OBE-based learning approach required comprehensive training for the faculty members, which requires significant time for their readiness. Again, the formulation of preparing curricula of engineering programs, assessment and evaluation for Program Educational Objectives (PEOs) as well as the Program Learning outcomes (POs) are also one of the big challenges, especially for the engineering programs. (Hassan, 2012).

BNQF creates LLL pathways where anyone with relevant requirements can enter any qualification at any level in the framework and uphold LLL and increase the employability of graduates through open and flexible qualification pathways, recognition of prior learning. (Ministry of Education, BNQF, 2021). BNQF also describes other benefits and opportunities of LLL, such as, LLL provides a means of validating learning that is achieved outside formal instructions, and through life's experience, recognizing both formal and informal learning opportunities to foster continuous development and improvement of knowledge and skills needed for employment and personal fulfilment, development of new ideas, solutions and systems, encourage self-directed lifelong learning effectively.

3. Results

The study is still ongoing. Data collection is yet to be completed. Based on the collected data and information, the results of the survey will be prepared.

4. Discussion

There are a few hypotheses regarding various challenges in ensuring LLL through OBE which hinder the full realization of OBE's potential to foster LLL and continuous learning among graduates. Those hypotheses are to be tested through a systematic and organised methodology as proposed in the study.

Such as, limited emphasis on LLL by the Higher Educational Entities due to a variety of reasons. Those reasons are to be identified through the proposed methodology. Poorly implemented assessment mechanisms are also

[2] BAC is established under the Bangladesh Accreditation Council Act, 2017.

[3] The Board of Accreditation for Engineering and Technical Education (BAETE) was established under the Institution of Engineers, Bangladesh (IEB) as a national accreditation body to ensure and enhance the quality of engineering education in Bangladesh in 2001.

responsible for eroding OBE's credibility and effectiveness. There are also challenges in adapting to OBE due to limited training and unfamiliarity with its principles. Many higher educational institutions in Bangladesh struggle with inadequate infrastructure and resources, which can hinder the implementation of OBE as well as LLL. The study will further explore how OBE can contribute to the development of critical thinking, self-directed learning, and employability skills, which are important elements for building a strong foundation for lifelong learning.

5. Conclusion

To be developed after completing the study.

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Integrating the Sustainability Concept in the Higher Education Curriculum in Bangladesh: A Comparative Case Study of University of Dhaka and North South University

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Abstract
Sustainability education entails the incorporation of sustainability principles and practices into all facets of the educational system, encompassing governmental policies, curriculum, pedagogical methods, and research. The existing studies in sustainability education have mostly focused on the secondary and higher secondary level of education, virtually ignoring the higher education level of Bangladesh. This study attempts to examine the level of incorporation of sustainability concepts in the social science curricula of the University of Dhaka and North South University, focusing on course titles, content, and disciplinary variation as well as in the existing education policy and legislation. Using a systematic content analysis of undergraduate and graduate courses, the research identifies the level of prevalence and reflection of sustainability, as well as patterns of integration across departments using the 42 words related to sustainability. This study evaluates the 16 departments from faculty of Social Science in University of Dhaka and 4 departments from North South University. Findings reveal that the University of Dhaka demonstrates broader and more diversified integration of sustainability, with moderate reflection in departments such as Sociology, Anthropology, and Development Studies, while North South University exhibits a more limited and concentrated approach, primarily at the basic level. Sustainability is often incorporated in a fragmented, discipline-specific manner, with limited interdisciplinary engagement. The study highlights gaps in depth, scope, and pedagogical integration, suggesting that sustainability education remains uneven and evolving. This study also found that at the University of Dhaka, sustainability was incorporated at a minimal level in five courses, at a basic level in four courses, and at a moderate level in three courses. In contrast, at North South University, sustainability appeared at a minimal level in two courses and at a basic level in one course. The study recommends that universities incorporate dedicated and interdisciplinary sustainability-focused courses, either as mandatory or elective components, to ensure a more structured and comprehensive integration of sustainability within the curriculum.

Keywords*:* Sustainability, Sustainability Education, Curriculum Integration, Social Sciences, Bangladesh.

1. Introduction

The concept of sustainability has gained popularity in recent decades, as individuals and organizations seek to minimize their environmental impact and advocate for a more sustainable future for all. The prevalent notion of sustainability is often defined as meeting present needs without jeopardizing future generations' needs; however, it encompasses numerous complex layers of meaning (Antúnez et al., 2015; Fernández-González, 2016). Sustainability encompasses a wide array of topics, including environmental conservation, social fairness, and economic stability. As humanity delves into the complexities of sustainability, we gain a clearer comprehension of the issues we face (Builes-Vélez et al., 2024).

The concept of sustainability has existed for many years, but it began to receive global prominence in the 20th century. In the early 1900s, conservationists like John Muir and Theodore Roosevelt championed the safeguarding of natural resources and the establishment of protected areas and parks (Maldonado, 2015). The increasing awareness of environmental concerns, including pollution and deforestation, during the 1960s and 1970s culminated in the establishment of the contemporary environmental movement. This movement focused its efforts on mitigating air and water pollution, habitat degradation, and the depletion of natural resources. In the 1980s, the notion of sustainable development evolved as a means to reconcile economic growth with environmental conservation and social equity. The Brundtland Commission's report, titled Brundtland (1987), popularized the concept of sustainable development and laid the groundwork for the Rio Earth Summit in 1992, during which global leaders endorsed the United Nations Framework Convention on Climate Change and the Convention on Biological Diversity. Since that time, the notion and implementation of sustainability have emerged as a paramount concern for governments, various institutions, and individuals globally. Consequently, several

sustainability programs currently aim to mitigate the greenhouse impact, conserve natural resources, and advance social justice, equity, and economic stability (Spindler, 2013).

Sustainability in education is a framework for imparting knowledge about the interdependence of economic, social, cultural, and environmental systems (Builes-Vélez et al., 2024). The United Nations, through the 2030 Agenda for Sustainable Development particularly SDG 4.7 emphasizes the integration of education for sustainable development into all levels of education, including higher education, to equip learners with the knowledge and skills needed to address global sustainability challenges. Although not legally binding, this global commitment is further supported by UNESCO frameworks and initiatives that encourage universities to embed sustainability principles across curricula, teaching, and learning processes. In this context, sustainability seeks to foster responsible behaviors and actions that safeguard the wellbeing of current and future generations (Antúnez et al., 2015). It entails the incorporation of sustainability principles and practices into all facets of the educational system, encompassing governmental policies, curriculum, pedagogical methods, and research. Sustainability education seeks to provide the academic community with appropriate values, competencies, skills, and knowledge relevant to contemporary concerns (Antúnez et al., 2015). Consequently, it underscores critical thinking, problem-solving, and interdisciplinary methodologies that integrate many subjects and viewpoints. Sustainability education underscores the significance of experiential and place-based learning, which entails involving students, educators, and administrators in practical activities and real-world problem-solving within their local communities and ecosystems (Bastardas-Boada, 2019), enabling them to act responsibly in accordance with available resources and to advocate for a more sustainable future. In this regard it is imperative that how the education system incorporated the sustainability into the curriculum.

While, in the global perspective a number of studies has been conducted on how the sustainability concept incorporated in the curriculum of education system from different layer (Argento et al., 2020; Bataeineh & Aga, 2022; Builes-Vélez et al., 2024; Chhokar, 2010), in the Bangladesh perspective very few studies (Chowdhury, 2014; Haque et al., 2023; Rahman & Akter, 2025; Ropum, 2019), are available which basically focus on primary and secondary level, virtually ignoring the how sustainability concept is incorporated at the tertiary level of education's curriculum. Against this backdrop, this study attempts to address this knowledge gap by exploring how the sustainability concept is incorporated in the curriculum of tertiary level education system in Bangladesh with focus on course titles, content, and disciplinary variation of the various departments and reviewing the educational policy and legislation. The study was carried out in the faculty of Social sciences of the University of Dhaka and North South University.

2. Literature review and Theoretical Framework

Although sustainability is a familiar concept, some scholars agree that its interpretation, understanding and definitions are ambiguous (Lozano, 2008). This has resulted in different and often contradictory applications of the concept in Higher Education Institutions (HEIs). Filho, (2011) recognizes that the lack of initiatives driven by HEIs is a result of misinterpretations, the lack of coherence and objective and concrete comprehension of the concept and its practices. A number of studies conducted on how the sustainability concept integrated in the curriculum of the tertiary level education.

Argento et al., (2020) carried out a study on how sustainability is integrated into the courses/programmes of higher education institutions. The results of this study showed that academics engage with sustainability by integrating, to a greater or lesser extent, some topics into their courses and by conducting research projects dealing with, for example, sustainability reporting, smart and sustainable city strategies, well-being and gender issues. The most relevant goals are SDG 8 decent work and economic growth, SDG 12 responsible consumption and production and SDG 17 partnerships for the goals.

Gosselin et al., (2013) conducted a study of how the sustainability incorporated into three universities. All three programs from the three department provide opportunities for students to explore technologies, systems of economic production, cultural systems, laws and politics, and ideas and ideologies they currently employ for living with the rest of nature. Each program also provides opportunities for students to reflect and act on viable alternatives and to ask the critical questions to acquire the necessary knowledge, skills, and professional training to make a real difference in the world.

Bataeineh & Aga, (2022) conducted a study on integrating sustainability into higher education curricula. They developed forty indicators to assess the sustainability into to curriculum. These indicators are emission, footprint, biodegradable, biomass, byproduct, carbon, circular, closed loop, compositing, deforestation, econ-conscious,

eco-friendly, global warming, greenhouse, landfill, life cycle, reclaim, recycle, reduce, biodiversity, green, renewable, solid waste, treatment, environmental impact, marine, air pollution, reuse, waste, climate, conservation, desertification, sustainable, resources, natural, ecology, sustainability, water, energy, environment. The results indicate that no dedicated elective or mandatory courses specifically focused on sustainable development education are included in the university curriculum, reflecting a low level of integration. Although some courses address environmental issues, the coverage remains limited in scope.

Builes-Vélez et al., (2024) carried as study on the significance of sustainability in higher education. This study examined the sustainability using the multiple word related to sustainability and sustainable development in the curriculum. Regarding the sustainability concepts, most of the PEPs declare as principals for their educational guidelines: social responsibility, the understanding of social problems, sustainable development, urban and rural transformation, innovation and sustainability. As a Catholic University, UPB has a strong focus on social responsibility and working with communities, especially for equality, peace and social justice. This study found that most faculties at the university do not conceptualize the sustainability concept; courses are designed neither for promoting sustainability nor sustainable education. Besides this, almost no level of integration was identified among faculties on this topic.

Drawing insights from the existing literature, e, this study developed a theoretical framework covering the 42 words related to sustainable development and sustainability shown in the **table-1** to assess the level of reflection of sustainability concepts in the curriculum of the tertiary level in Bangladesh. These are;

TABLE 1 LIST OF WORDS TO ASSESS THE SUSTAINABILITY IN THE CURRICULUM

Carbon emission	Composting	Reclaim	Environmental impact	Sustainable
Footprint	Deforestation	Recycle	Marine	Natural resources
Biodegradable	Eco-consensus	Reduce	Air pollution	Ecology
Biomass	Eco-friendly	Biodiversity	Reuse	Sustainability
Byproduct	Global warming	Green	Waste	Water
Circular	Greenhouse	Renewable	Climate	Energy
Closed loop	Landfill	Solid waste	Conservation	Environment
	Life cycle	Treatment	Desertification	Environmental
Social justice	SDGs	Economic development		

3. Methodology

3.1 Research Approach

This research followed a qualitative comparative case study approach where the University of Dhaka (from the public university category) and North South University (from the private university category) were selected as cases to examine the level of reflection of sustainability in the curriculum of tertiary level education of Bangladesh. Besides this, we reviewed education policies and legislation to examine what is stated in these policies and laws about how sustainability is to be incorporated into the curriculum.

3.2 Description of Cases

3.2.1 University of Dhaka

The University of Dhaka is a public research university located in Dhaka, Bangladesh. Established in 1921, it is the oldest active university in the country. The university comprises 13 faculties, among which the Faculty of Social Sciences is one of the most prominent and diverse. Established on October 2, 1970, this faculty covers a wide range of disciplines related to human society, culture, and politics, integrating both theoretical and empirical research approaches. Currently, the faculty consists of 16 departments, including Economics, Political Science, International Relations, Sociology, Mass Communication and Journalism, Public Administration, Anthropology, Population Sciences, Peace and Conflict Studies, Women and Gender Studies, Development Studies, Television, Film and Photography, Criminology, Communication Disorders, Printing and Publication Studies, and Japanese Studies.

3.2.2 North South University

North South University (NSU), established in 1992, is the first private university in Bangladesh. The university consists of four faculties, among which the School of Humanities and Social Sciences (SHSS) plays a key role in delivering social science education. The SHSS offers a broad range of courses across undergraduate programs, focusing on the study of individuals, society, and global issues. Its curriculum emphasizes areas such as human behavior, social institutions, law, policy, ethics, and governance to equip students with a comprehensive understanding of contemporary societal challenges.

3.3 Sample size

The primary objective of this study is to examine how sustainability is integrated into undergraduate and postgraduate programs within the Faculty of Social Sciences at University of Dhaka as well as the North South University. To achieve this, the study includes the curricula of 20 academic departments under these faculties of the two universities (16 from University of Dhaka and 4 from North South University). These two universities were selected to enable a meaningful comparison between a leading public institution, University of Dhaka, and a prominent private institution, North South University, representing two major higher education streams in Bangladesh. Their strong academic reputation and influence on curriculum development make them appropriate cases for assessing how sustainability is integrated into social science education.

For comparative purposes, North South University is selected as a representative private university. Unlike the University of Dhaka, North South University does not have a distinct Faculty of Social Sciences. Therefore, to ensure comparability, departments at North South University that correspond to those departments available at the University of Dhaka irrespective of the faculty were purposively selected. This approach allows us for maintaining structural and disciplinary consistency between the two institutions. As a result, the sample consists of matched departments from both universities, enabling a balanced comparative analysis of how sustainability concepts are incorporated across similar academic contexts.

3.4 Data Extraction Procedure

The data extraction process was conducted in a systematic and structured manner to ensure consistency and transparency following some steps. These includes: First, all available course titles from the relevant departments of the selected universities were reviewed. During this stage, courses were screened based on the presence of specific keywords, namely *"sustainability"* and *"sustainable development."* This initial filtering helped to identify courses that explicitly indicate a connection to sustainability-related concepts.

Second, following the identification of relevant courses, a more in-depth examination of the course contents was undertaken. Course descriptions, outlines, and, where available, detailed syllabi were analyzed to understand how the selected terms are incorporated into the course contents. This step goes beyond keyword identification and focuses on the substantive integration of sustainability concepts.

To ensure analytical rigor, each selected course was assessed based on predefined criteria, such as the depth of coverage, thematic relevance (e.g., environmental, social, economic dimensions), and the extent to which sustainability principles are embedded in learning objectives, topics, and assessment methods. This approach allowed differentiation between courses that either merely mention sustainability or those that meaningfully engage with the concept.

Finally, all extracted information was systematically recorded in a data extraction matrix, including course title, department, level of study, presence of keywords, and qualitative assessment of content. This structured dataset served as the basis for subsequent analysis and comparison across institutions.

3.5 Data Analysis

All extracted data were compiled and organized in a structured Microsoft Excel database to facilitate systematic analysis. Initially, the full course content, including course descriptions and outlines, from both University of Dhaka and North South University were carefully reviewed.

Subsequently, a keyword-based content analysis was conducted by identifying and counting terms related to sustainability within each course's detailed content. These keywords were then aggregated at the departmental level to capture the overall presence of sustainability-related discourse within each department.

First, we counted the number of sustainability-related words (from the list of 42 words) present in each course individually. Then, we aggregated all the identified words at the departmental level to determine the total number of sustainability-related words within each department. During this process, repeated words were counted only once to ensure uniqueness. Finally, based on the total word count, the departments were categorized into four levels according to a predefined scale: minimal reflection, basic reflection, medium reflection, and high reflection.

TABLE 2 CATEGORIZATION THE LEVEL OF PRESENCE OF SUSTAINABILITY INTO CURRICULUM

Number of words	Category
1-10	Minimal Reflection
11-20	Basic Reflection
21-30	Moderate reflection
31 and above	Highly reflection

4. Findings

4.1. Prevalence of sustainability in the course titles of the selected departments of two universities

TABLE 3 PREVALENCE OF SUSTAINABILITY IN THE COURSE TITLE OF TWO CASES

University and faculty name	Department name	Course name
Faculty of Social Sciences, University of Dhaka	Department of Economics	Development Economics
		Environmental Economics
		Natural Resource and Energy Economics
		Development Economics I
		Development Economics II
		Environmental and Natural Resource Economics
	Department of Political Science	No
		Global Environmental Politics
		Political Economy of Global Development
	Department of International Relations	Energy and Environment
		Environment, Resources, and Security
		Energy, Economy and Ecology
	Department of Sociology	Gender, Society and Development
		Sociology of Built Environment
		Water, Politics and Development
		Sociology of Sustainable Development
		Sociology of Development and Underdevelopment
		Population, Politics and Development
	Department of Mass Communication & Journalism	Climate and Environment Journalism
	Department of Public Administration	Gender, Administration and Development
		Environment and Disaster Management
		Urban Governance and Development
	Department of Anthropology	Ecological Anthropology
		Anthropology and Climate Change
		Forest and Forest Dependent People
		Disaster Anthropology
	Department of Population Sciences	Population, Environment, and Sustainable Development
		Population and Development

		Climate Change, Population Vulnerability and Adaptation
	Department of Peace and Conflict Studies	Environment and conflict
		Gender and Development: Conceptual Issues
	Department of Women and Gender Studies	Gender, Environment and Natural Resource Management
		Gender, Sustainable Development and Globalization: Issues and Debates
		Development Economics
		Environment and Sustainable Development
	Department of Development Studies	Environmental Economics
		Natural Resource Management: Approaches, Models and Practice
		Sustainable Resource Management: Models and Methods
	Department of Television, Film and Photography	No
		Environmental Crime (Elective)
	Department of Criminology	Issues of Development and Crime (Elective)
		Environmental Crime
	Department of Communication Disorders	No
	Department of Printing and Publication Studies	No
	Department of Japanese Studies	Environmental Issues and Concern in Japan
	Department of Political Science & Sociology	Gender and Development
	Department of media communication and journal	Introduction to Environmental Science
		Gender and Development
Faculty of Social Sciences and Humanities, North South University	Department of Economics	Environmental and Natural Resource Economics
		Economic Development
		Development Economics
		Economics of Natural Resources
		Environmental Economics
	Department of Development Studies	Issues in Sustainable Development
		Environmental Management

The table-3 shows that sustainability-related course titles are widely but unevenly distributed across departments of social science faculty in University of Dhaka and the North South University, with a noticeably higher frequency at the University of Dhaka compared to North South University. At the University of Dhaka, a total of 38 courses explicitly reflect sustainability-related themes in their titles, with the highest concentration in the Department of Economics (6 courses) and the Department of Development Studies (5 courses). Other departments such as International Relations and Sociology each offer 5 and 6 courses respectively, while Anthropology (4 courses), Population Sciences (3 courses), Women and Gender Studies (3 courses), Public Administration (3 courses), and Criminology (3 courses) also demonstrate substantial inclusion. In contrast, four departments show no presence of sustainability-related courses in their titles.

On the other hand, at the North South University, the overall frequency is comparatively lower, with **10 courses** identified across four departments. The Department of Economics accounts for the highest share (5 courses), followed by Development Studies (2 courses), Department of Media, Communication and Journalism (2 courses) and Political Science & Sociology (1 course).

4.2. Reflection of sustainability in the course contents of two universities

TABLE 4 REFLECTION OF SUSTAINABILITY IN THE COURSE CONTENT OF THE DHAKA UNIVERSITY

Department name	Program	Course name	Sustainability related word in the details course content
Department of Economics	BSS	Development Economics	Economic development, Development, Environment, deforestation, natural resources, climate change

Department of International Relations	MSS	Environmental Economics	Environment, natural resources, ecology, eco-dynamics, energy, sustainable development, sustainability, pollution, solid waste, waste and recycling, economic development
		Natural Resource and Energy Economics	Natural resource, energy, environment, renewable, water
		Development Economics I	Economic development
		Development Economics II	Economic development, environment, sustainable development
		Environmental and Natural Resource Economics	Environment, natural resource, depletion, sustainable
	BSS	Global Environmental Politics	Development, sustainable development
	MSS	Political Economy of Global Development	Development, sustainable development, environment, energy
		Energy and Environment	Energy, sustainable development, environment, economic development
		Environment, Resources, and Security	Environment, environmental impact, climate change, sustainable development
		Energy, Economy and Ecology*	
Department of Sociology		Gender, Society and Development	Development, environment
		Sociology of Built Environment	Environment, development
	BSS	Water, Politics and Development	Water, environment, sustainability, development, sustainable development, SDGs, climate change, natural disaster
	MSS	Sociology of Sustainable Development	Development, sustainable development, ecology, footprints, green, sustainability, environment, resources, energy, environmental impact, reclaiming, SDG, Conservation, climate, social justice, water
		Sociology of Development and Underdevelopment	Development, resource, environment
		Population, Politics and Development	Environment, development
Department of Mass Communication & Journalism	MSS	Climate and Environment Journalism	climate, environment, global warming, energy, renewable, recycling, biodiversity, conservation, waste, greenhouse, climate change
Department of Public Administration	BSS	Gender, Administration and Development	development, environment, environmental degradation
		Environment and Disaster Management	Environment, sustainable development, biodiversity, natural disaster, climate change, conservation, environmental impact
		Urban Governance and Development	Development, environment, sustainable
Department of Anthropology	BSS	Ecological Anthropology	Ecology, ecosystem, environment, pollution, development, conservation, sustainability, resources, climate change, social justice, biodiversity, sustainable development, green
		Anthropology and Climate Change	Climate change, climate, environment, ecology, footprints, carbon emission, sustainability, development, ecosystem, conservation, carbon
		Forest and Forest Dependent People	Ecology, forest, environment, climate change, global warming, natural disaster, resource, conservation
	MSS	Disaster Anthropology	Natural disaster, environment
Department of Population Sciences	BSS	Population, Environment, and Sustainable Development	environment, sustainable development, ecology, ecological footprint, ecosystem, resources, pollution, biodiversity, climate change, environmental impact
		Population and Development	Development, environment, economic development, sustainable development, climate change
Department of Peace and Conflict Studies	BSS	Climate Change, Population Vulnerability and Adaptation	Climate change, climate, environment
		Environment and conflict	Climate change, environment, green, pollution, natural resource, climate
Department of Women and Gender Studies	BSS	Gender and Development: Conceptual Issues	Development, environment
		Gender, Environment and Natural Resource Management	Environment, biosphere, ecosystem, natural resources, sustainable, conservation, forest, water, climate change, pollution
	MSS	Gender, Sustainable Development and Globalization: Issues and Debates	Sustainable development, development, environment, SDGs, sustainable, Economic development

Department of Development Studies	BSS	Development Economics	Economic development, Development
		Environment and Sustainable Development	Environment, sustainable development, SDGs, development, biodiversity, water, energy
		Environmental Economics	Environment, natural resource, sustainability, ecology, renewable, conservation, pollution, emission, energy, economic development, sustainable development, waste, biodiversity, development
	MSS	Natural Resource Management: Approaches, Models and Practice	environment, natural resources, renewable, biosphere, biodiversity, sustainability, energy, climate change, water, waste, pollution, eco-friendly, recycling, green, ecology, ecosystem
		Sustainable Resource Management: Models and Methods	Sustainable development, natural resources, development, environmental impact, renewable, energy, green, carbon
Department of Criminology	BSS	Environmental Crime (Elective)	environment, ecology, ecosystem, biodiversity, global warming, climate change, water, green, justice, deforestation, pollution, waste,
		Issues of Development and Crime (Elective)	SDGs, Development
	MSS	Environmental Crime	environment, pollution, air pollution, eco-system, waste, development
Department of Japanese Studies	MSS	Environmental Issues and Concern in Japan	Environment, conservation, consensus, waste, global warming, air pollution, marine, environmental impact

*The details course content is not available.

The table-4 illustrates that sustainability-related terms are extensively reflected in the course contents across multiple departments at the University of Dhaka, though the degree of reflection varies by discipline and program level. Overall, a high concentration of sustainability-related words is observed in departments such as Development Studies, Anthropology, Sociology, and Environmental Economics-related courses within the Department of Economics, where course contents include a wide range of terms covering environmental, social, and economic dimensions of sustainability. Courses in these departments frequently incorporate keywords related to climate change, biodiversity, natural resources, pollution, energy, and sustainable development, indicating a broad and multidimensional representation of sustainability.

Moderate levels of reflection are evident in departments such as International Relations, Public Administration, Population Sciences, and Women and Gender Studies, where sustainability-related terms are present but comparatively fewer in number and scope. These courses primarily emphasize themes such as development, environment, climate change, and policy-related aspects of sustainability.

In contrast, lower levels of reflection are observed in some courses within the Department of Economics and Criminology, where sustainability-related terms appear in a more limited and focused manner, often restricted to core concepts such as development, environment, or pollution.

TABLE 5 REFLECTION OF SUSTAINABILITY IN THE COURSE CONTENT OF THE NORTH SOUTH UNIVERSITY

Department name	Program	Course name	Sustainability related word in the course content
Department of Political Science & Sociology	BA	Gender and Development	Development, economic development
		Environment and Mass Communication	No
	MA	No	
Department of Economics	BA	Environmental and Natural Resource Economics	Environment, Natural resources, pollution, renewable, recycle, water, mineral
		Economic Development	Economic development, environmental degradation, development
		Development Economics	Development, economic development
	MA	Economics of Natural Resources	Ecology, environment, resources, natural resources
		Environmental Economics	Pollution, emission, environment
Department of Development Studies	BA	No	
	MA	Issues in Sustainable Development	Sustainable development, sustainability, environmental degradation, resources, economic development, environment

	Environmental Management	Environment, development, sustainable development, environmental impact, waste

The table-5 indicates that sustainability-related terms are present but relatively limited in scope and frequency within the course contents at North South University. The Department of Economics shows the highest representation, with multiple courses incorporating keywords such as environment, natural resources, pollution, renewable resources, and economic development, reflecting a moderate level of sustainability integration primarily from an economic and environmental perspective. The Department of Development Studies also demonstrates a notable inclusion of sustainability concepts, particularly in courses explicitly focused on sustainable development and environmental management, where terms related to sustainability, environmental degradation, resources, and impact are evident.

In contrast, the Department of Political Science & Sociology exhibits a minimal level of reflection, with sustainability-related terms appearing only in a limited form, mainly centered on development concepts. Across programs, both undergraduate (BA) and graduate (MA) levels include sustainability-related content, though the diversity and depth of terms remain comparatively narrow.

4.3 Description of how the sustainability incorporated into curriculum
4.3.1 University of Dhaka
4.3.1.1 Department of Economics
At the undergraduate level, the Department of Economics demonstrates an integration of sustainability concepts across three core courses namely Development Economics, Environmental Economics, and Natural Resource and Energy Economics. In *Development Economics*, sustainability is incorporated through the linkage between economic growth and environmental challenges, particularly in topics addressing deforestation, climate change, natural resource degradation, reflecting an understanding of the environment–development nexus. This integration becomes more comprehensive in *Environmental Economics*, where sustainability is treated as a central analytical framework, encompassing ecological principles, intergenerational equity, sustainability measurement, environmental ethics, and policy instruments such as pollution control and climate governance, thereby reflecting both theoretical and applied dimensions of sustainable development. Similarly, *Natural Resource and Energy Economics* extends this integration by focusing on the sustainable use and management of both renewable and non-renewable resources, energy policy, biodiversity conservation, and optimal resource allocation, highlighting the economic and environmental trade-offs involved in sustainability transitions.

At the graduate (MSS) level, sustainability is incorporated into the Economics curriculum in three courses. The integration is most visible through the explicit inclusion of the environment–development nexus and sustainable development debates, particularly in advanced discussions on environmental challenges, resource scarcity, and long-term growth trajectories. Courses collectively address sustainability through key economic lenses such as externalities, environmental policy design, valuation of natural resources, and optimal resource use (e.g., exhaustible and renewable resources). However, the broader development courses remain primarily focused on structural transformation, industrialization, and growth theories, with sustainability integrated only in specific segments rather than as a cross-cutting principle.

4.3.1.2 Department of International Relations
Within the Department of International Relations, sustainability is incorporated into the curriculum of five courses but the course content is missing for the one course. The integration is evident through courses that explicitly engage with sustainable development concepts, particularly in relation to human development, and the roles of international institutions, non-state actors, and governance structures. Sustainability is further embedded through thematic linkages with energy politics, environmental movements, and policy debates. Notably, the curriculum extends beyond traditional environmental perspectives by incorporating human security, climate-induced conflict, migration, and peacebuilding, thereby situating sustainability within complex socio-political and security frameworks. Additionally, the inclusion of gender, inclusive development, and transboundary cooperation highlights a recognition of the social and equity dimensions of sustainability.

4.3.1.3 Department of Sociology
At the undergraduate and graduate level, the Sociology curriculum demonstrates a comprehensive and multidimensional integration of sustainability into the six courses, where the concept is treated as both a social and environmental phenomenon intertwined with development, equity, and governance. Courses such as *Gender, Society and Development* highlight the intersection of gender, environment, and development, emphasizing

women's roles and gendered dimensions in sustainable development. *Water, Politics and Development* and *Sociology of Sustainable Development* extend sustainability analysis to natural resources, climate change, and the fulfillment of SDGs, integrating ecological, social, and economic perspectives. Core concepts such as ecological footprints, environmental justice, climate vulnerability, and green economy strategies are examined critically, reflecting both theoretical understanding and societal implications. Moreover, courses like *Sociology of Built Environment*, *Sociology of Development and Underdevelopment*, and *Population, Politics and Development* situate sustainability within urbanization, globalization, resource management, population dynamics, and social inequality, highlighting systemic linkages and social determinants. Overall, the curriculum treats sustainability as a cross-cutting principle, embedding environmental, social, and economic dimensions across theoretical, policy, and applied contexts, with a strong emphasis on equity, social justice, and transformative change.

4.3.1.4 Department of Mass Communication & Journalism

In the Department of Mass Communication & Journalism, sustainability is integrated through a practical, skills-based approach into one course on graduate level. The *Climate and Environment Journalism* course equips students to critically engage with sustainability by teaching them to identify, research, and communicate complex environmental topics such as climate change, renewable energy, biodiversity, pollution, and environmental policy. It emphasizes translating scientific information into accessible narratives, covering both local and global sustainability issues including the global warming, renewable energy and waste, environmental policy and laws as well as environmental issues like greenhouse effect and climate changes and highlighting human and societal dimensions, including activism, green living, and conservation efforts.

4.3.1.5 Department of Public Administration

In the Department of Public Administration, sustainability is incorporated into the curriculum of these courses in a policy-oriented and governance-centric manner, where it is closely linked with gender, environment, disaster management, and urban development. The integration is evident through the inclusion of sustainable development as a guiding concept in environmental governance, climate change mitigation and adaptation, and disaster risk reduction frameworks, reflecting both global and national policy contexts. Courses address sustainability through institutional mechanisms, legal frameworks, and practical tools such as environmental and social impact assessments, indicating a strong emphasis on implementation and administrative capacity. Additionally, the curriculum connects sustainability with gender equity and empowerment, as well as with urbanization challenges through the concept of sustainable cities and rural-urban linkages.

4.3.1.6 Department of Anthropology

In the Department of Anthropology, sustainability is incorporated into the four courses curriculum in both undergraduate and graduate level in a highly integrated, critical, and context-sensitive manner, where it is examined through the complex interactions between culture, environment, and development processes. Across courses, sustainability is not treated as a standalone concept but is embedded within broader anthropological frameworks such as ecological anthropology, political ecology, and human ecology, enabling students to understand environmental issues through social, cultural, and power-related dynamics. The curriculum engages extensively with themes like climate change, biodiversity, resource management, and environmental degradation, while simultaneously emphasizing indigenous knowledge, local adaptation strategies, and community-based resilienc**e**, particularly in the context of Bangladesh. It further expands sustainability discourse by incorporating issues of vulnerability, migration, inequality, and climate justice, linking local experiences with global policy frameworks and negotiations. Courses on disaster and forest-dependent communities deepen this integration by focusing on risk, resilience, participatory resource management, and human–environment relationships, highlighting both the causes and responses to environmental challenges. Overall, the curriculum reflects a holistic and interdisciplinary approach to sustainability, combining theoretical depth with empirical and community-level insights, and strongly emphasizing equity, adaptation, and sustainable livelihoods.

4.3.1.7 Department of Population Sciences

In the Department of Population Sciences, sustainability is incorporated into the curriculum of three courses in the undergraduate level. In these courses the sustainability concept is closely linked with demographic dynamics, environmental change, and development processes. The integration is evident through the explicit focus on the population-environment-development nexus, highlighting how population growth, distribution, and structure interact with ecological stress, resource use, and environmental health outcomes. Sustainability is further embedded through the inclusion of core ecological concepts, global environmental challenges, and environmental governance tools such as impact assessment and policy frameworks. The curriculum also advances this integration

by addressing climate change through a vulnerability and adaptation lens, emphasizing population-specific risks, health impacts, migration, and food security, particularly in the context of Bangladesh. Overall, the curriculum demonstrates a coherent with the demographic analysis, environmental considerations, and development planning.

4.3.1.8 Department of Peace and Conflict Studies

In the Department of Peace and Conflict Studies, sustainability is incorporated into the curriculum through a security and conflict-oriented lens, where environmental issues are framed as critical drivers of instability, migration, and global governance challenges. The integration is evident in the emphasis on climate change, pollution, and natural resource scarcity as sources of conflict and violence, reflecting the growing importance of environmental security within non-traditional security paradigms. Sustainability is further embedded through the analysis of climate-induced displacement and migration, highlighting the human consequences of environmental degradation. Additionally, the curriculum addresses sustainability at the global governance level by engaging with environmental diplomacy, international negotiations, and peacebuilding strategies, including climate agreements and transnational environmental movements.

4.1.9 Department of Women and Gender Studies

In the Department of Women and Gender Studies, sustainability is incorporated into the curriculum of three courses in bachelor and master's degree, where it is examined through the intersections of gender, development, environment, and globalization. The integration is evident in the extensive use of feminist development frameworks such as WID, WAD, GAD, and WED, which critically analyze how development processes and environmental changes differentially affect women and men. Sustainability is not only introduced conceptually but is also explored through natural resource management, environmental ethics, and gendered access to resources, highlighting power relations and inequalities in environmental governance. The curriculum further strengthens this integration by addressing gendered vulnerability to climate change, disasters, and environmental degradation, alongside women's coping strategies and adaptive capacities. Additionally, sustainability is framed within broader global and policy contexts, including SDGs, development agendas, and globalization debates, emphasizing the role of institutions, governance, and feminist critiques in shaping sustainable development pathways.

4.3.1.10 Department of Development Studies

In the Department of Development Studies, sustainability is incorporated into the curriculum in multiple courses in undergrad and graduate level, where it serves as a central organizing framework linking environment, economy, and society. The curriculum explicitly positions sustainable development as a reconciliation between environmental constraints and development goals, engaging with core issues such as resource inequality, environmental limits, poverty, and global challenges. This integration is further deepened through advanced economic and ecological analyses, including environmental valuation, externalities, and the trade-offs between efficiency and sustainability. Moreover, sustainability is operationalized through natural resource management approaches, case-based learning, and analytical tools such as impact assessments, life-cycle analysis, and dynamic optimization models, reflecting a strong emphasis on practical implementation and decision-making. The inclusion of Bangladesh-specific environmental sectors, policy regimes, and institutional frameworks ensures contextual relevance, while global perspectives such as SDGs and international cooperation broaden the analytical scope. Overall, the curriculum demonstrates a holistic and advanced integration of sustainability, combining conceptual depth, methodological rigor, and real-world applicability, with a strong focus on governance, resource management, and sustainable development transitions.

4.3.1.11 Department of Criminology

In the Department of Criminology, sustainability is integrated into the curriculum primarily through the lens of environmental crime, justice, and governance, linking ecological concerns with social, legal, and developmental outcomes. Students explore sustainability by analyzing the ecological and socio-environmental impacts of human behavior, including biodiversity loss, deforestation, pollution, climate change, and water management. The curriculum emphasizes green criminology, highlighting environmental harm, eco-justice, and the victims of environmental crime, connecting ecological protection directly to human rights and sustainable development goals (SDGs).

Sustainability is further embedded through case-based and policy-oriented studies, particularly in the Bangladesh context, examining issues like illegal wildlife trade, industrial pollution (ship-breaking, tanneries), land grabbing, and GMO-related food crime. The courses also introduce spatial and theoretical criminology approaches-such as

Routine Activity Theory, Crime Pattern Theory, and CPTED-linking crime prevention to environmental stewardship. International and national legal frameworks are analyzed to understand enforcement, compliance, and the role of law in protecting environmental resources.

4.3.1.12 Department of Japanese Studies

In the Department of Japanese Studies, sustainability is incorporated into the curriculum with a strong focus on Japan's environmental experience. The integration is evident through the comprehensive examination of environmental issues across historical, political, and economic dimensions, particularly the tension between rapid industrial growth and environmental protection. Sustainability is embedded through detailed analysis of environmental policies, legal frameworks, governance structures, and management systems, highlighting how institutional arrangements and technological innovation contribute to sustainable development. The curriculum further strengthens this integration by addressing contemporary environmental challenges such as waste management, pollution, nuclear energy, and climate change, alongside Japan's role in international environmental agreements and global sustainability efforts. Additionally, the inclusion of environmental movements, public participation, and policy change reflects the socio-political dynamics of sustainability transitions.

4.3.2 North South University

4.3.2.1 Department of Political Science & Sociology

In the Department of Political Science & Sociology department, the sustainability concept is incorporated into curriculum of two course in undegraded level. But the details course content was found for one course namely Gender and Development. The course content was not found for the Environment and Mass communication. The sustainability concept is mainly focused on the gender and development courses are gender issue such as gender relations, rural and industrial development.

4.3.2.2 Department of Media, Communication, and Journalism (DMCJ)

In the Department of Media, Communication, and Journalism (DMCJ), the sustainability concept is incorporated the title of two courses namely Introduction to Environmental Science, Gender and Development. But the Details course content is missing for these two courses.

4.3.2.3 Department of Economics

In the Department of Economics, sustainability is incorporated into the curriculum of two courses, primarily through the integration of environmental and resource considerations within economic frameworks. The curriculum reflects sustainability through core topics such as resource scarcity, optimal use of renewable and non-renewable resources, and the limits to growth, emphasizing the long-term management of natural capital. Concepts like market failure, externalities, and pollution control policies further highlight the economic mechanisms underlying environmental degradation and sustainability challenges. Additionally, sustainability is linked with development processes in courses addressing environmental degradation, public policy, and the balance between growth, equity, and governance. Overall, the integration remains economics-centric, focusing on efficiency, resource allocation, and policy analysis, with sustainability embedded as a critical dimension of development rather than as a fully interdisciplinary or transformative framework.

At the graduate level, the Department of Economics incorporates sustainability into the curriculum in a highly analytical and model-driven manner, where it is embedded within advanced economic theory, resource allocation, and policy analysis. Sustainability is primarily reflected through the study of natural resource economics and environmental economics, focusing on issues such as optimal depletion of exhaustible resources, intertemporal decision-making, externalities, and pollution control mechanisms. The use of formal economic models covering taxation, emission trading, and equilibrium analysis demonstrates a strong emphasis on efficiency, regulation, and long-term resource management. While the core development economics course remains centered on growth theories, sustainability appears indirectly through its relevance to development dynamics and applied economic issues.

4.3.2.4 Department of Development Studies

At the graduate level, the Department of Development Studies incorporates sustainability into the curriculum of three courses, where it is treated as a central paradigm of development rather than a peripheral concern. Sustainability is directly conceptualized through the integration of economic, social, and environmental dimensions, emphasizing intergenerational equity, poverty reduction, income distribution, and global cooperation frameworks such as SDGs and climate agreements. The curriculum further strengthens this integration by linking

sustainability with institutional and governance structures, including the roles of state, market, and community-based organizations in achieving development outcomes. In addition, sustainability is operationalized through environmental management tools and practices, such as impact assessments, life-cycle analysis, and environmental auditing, reflecting a strong focus on implementation and decision-making. Overall, the curriculum demonstrates a comprehensive and applied integration of sustainability, combining theoretical depth, policy relevance, and practical tools, with a clear emphasis on achieving synergies between efficiency, equity, and long-term sustainability.

4.4 Comparison between the University of Dhaka and North South University in terms of incorporation of sustainability

The comparison reveals that the level of sustainability reflection varies across departments between the University of Dhaka and North South University, with the former demonstrating a broader and relatively higher level of integration. At the University of Dhaka, most departments fall within the basic to moderate reflection categories, with three departments Sociology, Anthropology, and Development Studies showing moderate reflection (21–30 keywords), indicating a more substantial incorporation of sustainability-related concepts. Several departments, including Economics, Population Sciences, Women and Gender Studies, and Criminology, exhibit basic reflection (11–20 keywords), while others such as Mass Communication & Journalism, International Relations, Public Administration, Peace and Conflict Studies, and Japanese Studies remain at a minimal reflection level (1–10 keywords).

In contrast, North South University shows a more limited and concentrated pattern, with departments primarily falling within the minimal to basic reflection levels. The Department of Economics and Development Studies demonstrate basic reflection (11–20 keywords), while the combined Department of Political Science & Sociology reflects a minimal level (1–10 keywords) of sustainability integration.

Overall, the findings indicate that while both universities incorporate sustainability into their curricula, the University of Dhaka exhibits greater disciplinary diversity and higher frequency of moderate-level reflection, whereas North South University's integration remains more restricted, with no departments reaching the moderate reflection category.

TABLE 6 COMPARISON BETWEEN DHAKA UNIVERSITY AND NORTH SOUTH UNIVERSITY

Department name	Level of reflection	
	University of Dhaka	North South University
Department of Economics	Basic reflection	Basic reflection
Department of Sociology	Moderate reflection	Minimal reflection*
Department of Development Studies	Moderate reflection	Basic reflection
Department of Mass Communication & Journalism	Minimal reflection	
Department of International Relations	Minimal reflection	
Department of Public Administration	Minimal reflection	
Department of Anthropology	Moderate reflection	
Department of Population Sciences	Basic reflection	
Department of Peace and Conflict Studies	Minimal reflection	
Department of Women and Gender Studies	Basic reflection	
Department of Criminology	Basic reflection	
Department of Japanese Studies	Minimal reflection	

*In the North South University, the political science and sociology is a combined program

4.5 Incorporation of sustainability in Policy and Regulatory Framework

4.5.1 BNQF

The Bangladesh National Qualifications Framework (BNQF) part-B for higher education is an internationally benchmarked instrument for the development, classification and recognition of skills, knowledge and competences along a continuum of agreed levels. The BNQF aims to unify qualifications across various educational and training levels, ensuring comparability, quality assurance, and conformity with national development objectives. Sustainability is integrated indirectly within this paradigm through competency-based

learning outcomes that highlight environmental awareness, responsible resource utilization, social responsibility, and ethical decision-making in the background, implementing the framework objective of the framework, qualification level section. Sustainability is predominantly incorporated in an embedded manner throughout several qualification descriptions, especially in the development of applied knowledge and skills. This encompasses components pertaining to environmental conservation, sustainable resource management, and socially responsible professional practices, anticipated to be cultivated across several educational tiers.

4.5.2 Accreditation Rules, 2022 and Bangladesh Accreditation Council Act, 2017
The Accreditation Rules, 2022, in alignment with the Bangladesh Accreditation Council Act, 2017, require that academic curricula and related activities comply with a national framework formulated under Section 15 of the Act. This section outlines a structured and consultative process for curriculum development, implementation, and periodic revision through coordination between the Commission, Council, and expert committees. Through this linkage, the Rules operationalize the Act by ensuring that curriculum design follows a standardized and adaptable framework.

In terms of sustainability, the policies provide an indirect pathway for integration through curriculum revision and quality assurance mechanisms.

4.5.3 Strategic plan for Higher education in Bangladesh 2018-2030
The review of the *Strategic Plan for Higher Education in Bangladesh (2018–2030)* indicates that sustainability is only indirectly incorporated in relation to curriculum development. In Chapter 3: Pursuit of Excellence and Quality Enhancement (B.11), the policy emphasizes curriculum revision in line with international developments, suggesting scope for integrating global themes, including sustainability. In Chapter 7: Achieving ICT Parity (Unified Curriculum Development), the focus is on standardized, outcome-based, and market-oriented curricula, particularly in IT-related fields, highlighting skills development and alignment with international accreditation standards. Additionally, in Section F.4: Academic Network and Fast Global Connectivity – Sustainability, the concept of sustainability is reflected mainly in terms of institutional continuity, digital infrastructure, and long-term operational viability, particularly through initiatives like BdREN.

4.5.4 National Education Policy, 2010
The analysis of the National Education Policy, 2010 shows that curriculum development is addressed across multiple chapters with an emphasis on quality, modernization, and alignment with societal needs. In Chapter 8: Higher Education, the policy stresses maintaining standardized curricula and academic quality across public and private universities. In Chapter 13: Business Studies, it highlights collaborative curriculum design through engagement between universities and industry, aiming to ensure relevance and practical applicability. In Chapter 24: Teachers' Training, the focus is on modernizing curriculum and syllabus, while Chapter 26: Curriculum, Syllabus and Textbooks emphasizes embedding social, human, and moral values, as well as fostering creativity, critical thinking, and research orientation at higher levels.

5. Discussion
The findings of this study reveal that sustainability has entered the curricula of both the University of Dhaka and North South University, but the nature and depth of this integration differ substantially across the two institutions. These differences reflect broader global patterns in Sustainability Education, where sustainability is increasingly recognized as a priority but remains unevenly embedded across institutions and disciplines.

A key insight from this study is that the University of Dhaka exhibits a comparatively higher level of sustainability integration, both in terms of the number of courses and the diversity of departments involved. This suggests a stronger institutional orientation toward sustainability-related discourse. However, the variation across departments from minimal to moderate reflection indicates that this integration is not systematic but rather fragmented and discipline-driven. Such fragmentation is consistent with previous research, which argues that sustainability in higher education often emerges through isolated initiatives rather than coordinated institutional strategies (Lozano et al., 2013)(Barth & Rieckmann, 2012). In contrast, North South University demonstrates a more limited and concentrated pattern of integration, with sustainability largely confined to Economics and Development Studies. This narrower scope suggests that sustainability has not yet diffused across the broader academic structure, reinforcing the argument that institutional commitment plays a critical role in mainstreaming sustainability across curricula.

The disciplinary distribution of sustainability-related content further highlights important epistemological differences. At the University of Dhaka, departments such as Sociology, Anthropology, and Development Studies demonstrate a more holistic and multidimensional engagement, integrating environmental, social, and economic dimensions of Sustainable Development. This aligns with the widely accepted three-pillar framework and reflects an interdisciplinary understanding of sustainability challenges. These findings are consistent with studies suggesting that social science disciplines are particularly well-positioned to address the complex and interconnected nature of sustainability issues, especially in relation to inequality, governance, and social justice (Sterling, 2011; Wals, 2015).

In contrast, the integration of sustainability at North South University appears to be more technocratic and economics-centered, focusing on resource allocation, environmental degradation, and policy instruments. While this approach provides valuable analytical tools, it tends to emphasize efficiency and management over critical or transformative perspectives. This supports the argument that sustainability education can sometimes be reduced to a managerial or instrumental framework, limiting its potential to foster critical thinking and systemic change (Tilbury, 2011). The dominance of economic perspectives may therefore constrain the broader transformative goals of sustainability education, particularly in developing country contexts where social and environmental challenges are deeply interconnected.

Another important finding is the distinction between symbolic inclusion and substantive integration. The presence of sustainability-related keywords in course titles and content does not necessarily indicate deep engagement with sustainability principles. In several departments, particularly those categorized under minimal or basic reflection, sustainability appears in a limited and peripheral manner. This suggests that sustainability may, in some cases, be incorporated to align with global policy narratives, including those promoted by the United Nations and the Sustainable Development Goals (SDGs), rather than being fully embedded into teaching and learning processes. This observation is consistent with previous research highlighting the risk of "cosmetic" integration, where sustainability is referenced without fundamentally transforming curricula or pedagogical approaches (Lozano et al., 2015).
At the same time, the study identifies areas of more advanced integration, particularly within the University of Dhaka. Departments such as Development Studies and Anthropology demonstrate a transformative approach, where sustainability is treated as a core analytical framework and linked with real-world applications, including policy analysis, environmental management, and community-based practices. These findings support the notion that effective sustainability education requires not only content integration but also contextual relevance and applied learning, especially in countries like Bangladesh where sustainability challenges are closely tied to climate vulnerability, population dynamics, and resource constraints (Bataeineh & Aga, 2022)(Barth & Rieckmann, 2012).

Despite these strengths, the overall findings suggest that sustainability education in both universities lacks institutional coherence and interdisciplinary integration. The absence of sustainability-related content in several departments and the limited depth of integration in others indicate that sustainability has not yet been mainstreamed across the curriculum. This raises important concerns regarding the capacity of higher education institutions to equip students with the knowledge and skills needed to address complex sustainability challenges. As argued in the literature, achieving meaningful integration requires a shift from discipline-specific approaches toward whole-institution strategies, including curriculum reform, faculty development, and cross-disciplinary collaboration (Bataeineh & Aga, 2022; Builes-Vélez et al., 2024; Chhokar, 2010).

With regard to integration of sustainability in the existing policy and regulatory framework, the study finds that although the BNQF indirectly calls for integrating the sustainability in the higher education curriculum, however, it does not explicitly and consistently emphasized it to be integrated as a separate learning domain. The integration is fragmented and context-dependent, potentially resulting in inconsistent emphasis across disciplines and restricting the depth of sustainability-oriented learning outcomes. Similarly, the Accreditation Rules, 2022 and Bangladesh Accreditation Council Act, 2017 do not explicitly mentioned sustainability or sustainable development as a curricular requirement, nor are there defined standards or indicators for its inclusion. As a result, the incorporation of sustainability remains implicit and dependent on how the framework is interpreted and implemented, rather than being a clearly mandated component of higher education curricula. Furthermore, Sustainability is not explicitly defined as a curricular priority, nor are there specific guidelines or indicators for integrating sustainable development into teaching and learning in the **Strate**gic Plan for Higher education in Bangladesh. The focus remains largely technical and skills-oriented, with limited attention to environmental, social, and interdisciplinary dimensions of sustainability within the curriculum. Likewise, the National Education

Policy, 2010 policy implicitly incorporates term of sustainability. The inclusion of social, human, and moral values, along with the emphasis on research, innovation, and societal relevance, provides an indirect foundation for sustainability-related education. However, there is no explicit reference to sustainability or sustainable development, and no specific guidelines for integrating environmental, economic, or interdisciplinary sustainability dimensions into the curriculum. As a result, sustainability remains broadly implied rather than systematically embedded within the policy framework

6. Conclusion and recommendation

This study set out to examine how sustainability is incorporated into the social science curricula of the University of Dhaka and North South University, focusing on course titles, content, and disciplinary variation. The findings reveal that while both institutions have made progress in integrating sustainability-related concepts, the overall pattern remains uneven in terms of depth, scope, and distribution across departments. The University of Dhaka demonstrates a comparatively broader and more diversified integration, with several departments achieving moderate levels of reflection. In contrast, North South University shows a more limited and concentrated approach, with sustainability primarily embedded within a few disciplines and largely confined to basic levels of reflection.

Importantly, the study highlights that sustainability is often incorporated in a fragmented and discipline-specific manner, rather than as a coherent, cross-cutting framework. While some departments, particularly Development Studies, Sociology, and Anthropology demonstrate a more holistic and multidimensional engagement aligned with the principles of Sustainable Development, many others reflect only minimal or symbolic inclusion. This suggests that sustainability education in both universities is still evolving and has not yet reached a stage of full institutional mainstreaming. Based on the findings, a number of recommendations can be proposed for improving sustainability integration in higher education of Bangladesh: First, universities should develop clear institutional strategies to mainstream sustainability across all departments, rather than relying on isolated initiatives. Second, introduce cross-cutting courses or modules that integrate environmental, social, and economic dimensions of sustainability. Third, provide training and support for academic staff to incorporate sustainability concepts and innovative pedagogical approaches into their teaching. Fourth, establish guidelines or benchmarks for assessing sustainability integration in curricula to ensure consistency and quality. Fifth, incorporate local sustainability challenges, particularly those relevant to Bangladesh, into course content and case studies. Six, ensure that detailed course outlines are publicly available to facilitate curriculum assessment and academic accountability. Seventh, it is recommended that sustainability be more explicitly integrated into educational policies and legislation, as it is currently underemphasized. Strengthening this policy foundation should be prioritized to support the development of a sustainable curriculum.

The findings of this study carry important implications for higher education policy and curriculum development. First, they highlight the need for universities to move beyond symbolic inclusion toward more substantive and integrated approaches to sustainability education. Simply including sustainability-related terms in course titles or content is insufficient without deeper conceptual and pedagogical engagement. Second, the study underscores the importance of interdisciplinary integration. Sustainability challenges are inherently complex and cannot be addressed within the boundaries of a single discipline. Therefore, universities should foster collaboration across departments to promote a more holistic understanding of sustainability. Finally, the findings are particularly relevant in the context of Bangladesh, where sustainability challenges such as climate change, population pressure, and resource management are closely linked to development processes. Strengthening sustainability education can play a crucial role in preparing graduates to address these challenges effectively.

Despite its contributions, this study has several limitations that should be acknowledged. First, the analysis is primarily based on the presence and frequency of sustainability-related keywords in course titles and content. While this approach provides a systematic way to assess integration, it may not fully capture the depth of pedagogical engagement, teaching methods, or student learning outcomes. Second, the study relies on publicly available course content, and in some cases, detailed course outlines were missing. This limitation may have led to an underestimation or incomplete assessment of sustainability integration in certain departments or courses. Third, the study focuses on only two universities, which limits the generalizability of the findings to the broader higher education system in Bangladesh or other contexts. Institutional differences such as governance structure, resource availability, and academic priorities may influence the level of sustainability integration. Finally, the study does not incorporate perspectives from faculty members or students, which could provide deeper insights into how sustainability is actually taught, interpreted, and experienced within the classroom.

Future studies should expand the scope of analysis to include a larger number of universities, both public and private, to provide a more comprehensive understanding of sustainability integration in higher education in Bangladesh. There is also a need for mixed-method research, combining content analysis with qualitative approaches such as interviews, focus group discussions, and classroom observations. This would help capture the depth of teaching practices, student engagement, and learning outcomes, which are not reflected in keyword-based analysis. Additionally, future research could explore the impact of sustainability education on students' knowledge, attitudes, and behaviors, particularly in relation to real-world problem-solving and policy engagement. Comparative studies across countries or regions could further enrich understanding of how institutional and cultural contexts shape sustainability education.

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Independent Thinking and Real-Life Problem Solving: Philosophy, Pedagogy, Curriculum

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Abstract
Education is more than the transmission of information or preparation for examinations. It is a transformative process that nurtures independent thinking, creativity, moral awareness, and the capacity to solve real-life problems (Biesta, 2015; Freire, 1970). This paper examines the philosophy of education and shows how curriculum design and teaching methods can foster reflective, analytical, and socially responsible citizens. Drawing on the ideas of Aristotle, Socrates, Rabindranath Tagore, Swami Vivekananda, and other modern educational thinkers, it argues that true education must promote curiosity, questioning, creativity, and intellectual freedom (Tagore, 1917; Vivekananda, 1999). The paper also reviews educational practices in Finland, Japan, and Singapore to identify evidence on teacher quality, student-centered learning, mother-tongue instruction, innovation-oriented curricula, and reduced reliance on rote memorization. It pays particular attention to the role of education in national development and social transformation. The study concludes that an education system capable of producing independent thinkers and humane citizens must rest on strong philosophical foundations, well-trained teachers, context-sensitive curricula, and a learning environment that values inquiry over memorization.

***Keywords**:* Education Philosophy, Independent Thinking, Curriculum Reform, Pedagogy, Finland Education System, Student-Centered Learning, Human Capital, Critical Thinking

1. Introduction

Education is one of the most powerful instruments of human development. The quality of a nation's education system shapes its economic growth, scientific progress, civic culture, and social harmony (World Bank, 2022). In the twenty-first century, when knowledge and innovation define global competitiveness, educational institutions can no longer depend mainly on rote memorization or examination-centered teaching. Instead, they must foster critical thinking, creativity, analytical ability, and moral consciousness (UNESCO, 2021).

Today's societies need citizens who can solve real-life problems, adapt to change, challenge prejudice, and contribute constructively to their communities. For that reason, excellence in teaching and learning should not be judged only by grades or standardized test scores. It should also be measured by the extent to which education helps students become independent thinkers and socially responsible human beings (Dewey, 1916).

This paper examines the philosophical foundations of education and explores how curriculum design and teaching methods can promote intellectual independence and practical problem-solving. It also reviews the education systems of Finland, Japan, and Singapore to identify the institutional and pedagogical factors that contribute to their success.

2. Philosophy of Education

The philosophy of education defines both the purpose of learning and the direction of curriculum and pedagogy. From this perspective, education is more than the simple accumulation of information. As Albert Einstein famously observed, education is "what remains after one has forgotten what one has learned in school" (Einstein, 1954). His insight underscores a central principle of the philosophy of education: genuine education is measured not by memorized facts alone, but by the development of intellect, character, and sound judgment.

2.1 Education and Human Development

A primary purpose of education is to cultivate humane, ethical, and well-rounded individuals. In Aristotle's view, human beings are distinguished by their capacity for rationality, ethical judgment, and culture (Aristotle, trans. 2004). Education should therefore do more than transmit knowledge; it should also nurture empathy, social awareness, and balanced values that guide responsible living.

Rabindranath Tagore argued that education should liberate the mind rather than confine it within rigid structures (Tagore, 1917). His work at Visva-Bharati emphasized creativity, freedom, nature, and holistic growth. In a similar spirit, Swami Vivekananda described education as "the manifestation of the perfection already in man" (Vivekananda, 1999). Together, these perspectives place human potential, inner development, and intellectual freedom at the heart of the educational process.

2.2 Independent Thinking and Questioning

Independent thinking is one of the central aims of education. In this view, the teacher's role is not simply to transmit information but to help students discover, examine, and construct knowledge for themselves. The Socratic method illustrates this approach clearly: through questioning and dialogue, Socrates encouraged learners to reflect critically rather than accept ideas passively (Dewey, 1916). His well-known statement, "The unexamined life is not worth living," captures the enduring value of critical inquiry in education.

Students should therefore be encouraged to question assumptions, examine inherited beliefs, and assess ideas through reasoned judgment. An education system that relies too heavily on rote memorization restricts creativity and weakens innovation. By contrast, inquiry-based learning strengthens analytical ability, intellectual confidence, and the habit of thoughtful reflection, all of which are essential for lifelong learning and responsible citizenship (Freire, 1970).

2.3 Education and Social Responsibility

Education should also cultivate social responsibility and patriotism. When education becomes excessively individualistic, it may produce technically competent graduates who lack empathy, public-mindedness, and civic awareness. For that reason, students should engage directly with society through community projects, field research, internships, and other forms of experiential learning. In the social sciences especially, society itself should serve as a living laboratory for observation, analysis, and meaningful learning.

3. Curriculum and Excellence in Learning

A curriculum reflects a society's educational philosophy and broader developmental priorities, which why, effective curriculum design must balance theoretical knowledge with practical application, while also promoting creativity, ethics, and cultural understanding (Biesta, 2015).

3.1 Beyond Memorization

Although memorization has a limited place in learning, excessive reliance on rote methods undermines critical thinking, creativity, and innovation (Freire, 1970). A modern curriculum should therefore place greater emphasis on the following areas:

- Problem-solving skills
- Analytical reasoning
- Creativity and innovation
- Interdisciplinary learning
- Research and experimentation
- Ethical and civic education

Students should learn not only 'what to think' but also 'how to think'.

3.2 Real-Life and Experiential Learning

Education becomes most meaningful when it is connected to real-life experience. Approaches such as project-based learning, internships, laboratory work, field visits, simulations, and community engagement enable students to apply theoretical knowledge in practical settings. These methods also strengthen communication, leadership, teamwork, and other skills essential for effective participation in professional and social life.

Many successful education systems now integrate experiential learning into everyday classroom practice. Instead of treating students as passive recipients of information, they engage them as active participants in inquiry, application, and reflection. This shift helps make learning more relevant, deepens understanding, and better prepares students to address real-world challenges.

3.3 Curriculum Updating and Global Knowledge
In an era of rapid scientific and technological advancement, curricula must be reviewed and updated continuously. Teachers and educational researchers should stay informed about global developments through academic journals, professional conferences, and collaborative research. Without regular curriculum renewal, students risk becoming disconnected from international knowledge, innovation, and competition.

4. Teaching Methods for Independent Thinking

Teaching methods are central to educational excellence. Even a well-designed curriculum can fall short if classroom practice remains authoritarian, examination-driven, and unimaginative. Effective pedagogy is therefore essential for transforming curricular goals into meaningful learning experiences that foster curiosity, participation, and independent thought (Dewey, 1916).

4.1 Student-Centered Learning
Student-centered learning places learners at the core of the educational process. Rather than relying on one-way lectures, it transforms the classroom into a space for dialogue, collaboration, and inquiry (Biesta, 2015). Effective methods include:

- Group discussions
- Debates
- Case studies
- Problem-based learning
- Research assignments
- Reflective writing
- Peer teaching

These methods encourage students to formulate arguments, defend positions, and evaluate evidence critically.

4.2 Teachers as Facilitators
In progressive education systems, teachers are viewed less as authoritarian figures and more as facilitators of learning. Their role is to stimulate curiosity, support inquiry, and guide students through the process of exploration and understanding. This approach depends on professional autonomy, creativity, and strong pedagogical preparation, all of which enable teachers to respond effectively to diverse learning needs.

4.3 Importance of Mother-Tongue Education
Research in psychology and linguistics strongly supports the use of the mother tongue in early education. Children think most naturally in the language they first acquire through communication with their parents and immediate environment. As a result, mother-tongue instruction strengthens cognitive development, deepens conceptual understanding, and builds emotional confidence (UNESCO, 2021).

Japan offers a strong example of how native-language instruction can support modernization. By translating global scientific and technological knowledge into Japanese and teaching it through the national language, the country advanced rapidly without sacrificing its linguistic identity. This experience shows that educational and technological progress does not require abandoning one's mother tongue (Ministry of Education, Culture, Sports, Science and Technology of Japan, 2023).

5. Empirical Evidence from Successful Education Systems

5.1 Finland: Creativity and Equality
Finland is widely recognized as one of the world's most effective education systems. Its success is rooted in a coherent set of principles that emphasize quality, equity, trust, and student well-being.

Highly Qualified Teachers
Teachers in Finland are required to possess master's degrees and undergo rigorous selection processes. Teaching is considered a prestigious profession.

Minimal Standardized Testing
Finland places limited emphasis on high-stakes standardized testing. Instead, it relies more heavily on continuous assessment, teacher judgment, and constructive feedback to support student growth and monitor learning progress.

Student Well-Being
Student well-being is a core feature of the Finnish model. Free school meals, healthcare, counseling, and academic support help create stable learning conditions and allow students to concentrate more fully on their education.

Teacher Autonomy
Finnish teachers are trusted to design lessons, select appropriate teaching methods, and adapt classroom activities to student needs. This professional autonomy supports responsive instruction and reinforces the high status of teaching.

Equality in Education
Finland promotes equality by ensuring that most students attend public schools of consistently high quality. This reduces disparities between schools and helps make educational opportunity less dependent on family background or place of residence.

These features are reflected in Finland's strong performance in international assessments such as PISA, particularly in literacy, problem-solving, and scientific reasoning. Together, they illustrate how quality, equity, trust, and student support can reinforce one another within a successful education system.

5.2 Japan: Discipline, Mother-Tongue Learning, and Collective Responsibility
Japan's transformation from a feudal society into a major industrial power was driven in large part by educational reform during the Meiji Restoration (1868–1912). Its experience highlights several features of education that supported modernization, social cohesion, and long-term national development.

Mother-Tongue Instruction
Japan advanced science and technology through Japanese-language instruction and the extensive translation of Western knowledge into the national language. This approach enabled modernization while preserving linguistic and cultural continuity.

Moral and Civic Formation
Japanese schools place strong emphasis on discipline, cooperation, cleanliness, and collective responsibility, helping students develop habits that support both personal character and social cohesion.

Collaborative Teacher Development
Japan's lesson study model promotes collaborative professional learning among teachers and supports continuous improvement in classroom practice and pedagogy.

Strong Foundational Learning
Students build deep conceptual understanding through structured, carefully sequenced instruction that strengthens core knowledge and skills over time.

Together, these educational features have contributed significantly to Japan's technological innovation, industrial growth, and broader national development.

5.3 Singapore: Innovation and Future-Oriented Learning
Singapore has built one of the world's most competitive education systems through a deliberate emphasis on innovation, adaptability, teacher development, and future-oriented learning (Singapore Ministry of Education, 2024). Its experience offers several important lessons for education systems seeking to combine academic rigor with responsiveness to changing social and economic demands.

A National Vision for Lifelong Learning
Through the philosophy of "Thinking Schools, Learning Nation," Singapore has promoted creativity, adaptability, and lifelong learning as central aims of education. This vision encourages schools to prepare students not only for examinations, but also for continuous learning in a rapidly changing world.

Emphasis on STEM and Innovation

Singapore's curriculum gives strong priority to science, technology, engineering, and mathematics while also encouraging research, innovation, and the practical application of knowledge. This orientation helps prepare students for participation in a knowledge-based and technology-driven economy.

Continuous Teacher Development
Teachers in Singapore receive sustained professional development, particularly through the National Institute of Education. This ongoing investment helps maintain high teaching standards and supports continuous improvement in classroom practice.

A More Balanced Approach to Assessment
Although examinations remain important, Singapore has increasingly broadened its educational approach to include creativity, collaborative learning, and applied problem-solving. This shift reflects an effort to balance academic rigor with the wider competencies needed for contemporary life and work.

Singapore's sustained performance in international assessments illustrates the effectiveness of combining academic rigor with innovation-oriented and future-focused learning.

6. Education and National Development

Education is closely linked to economic growth and social progress. Human capital theory suggests that investment in education strengthens productivity, supports innovation, and raises national income (World Bank, 2022). As a result, educational quality should be understood not only as a social concern, but also as a central component of national development.

Countries with strong education systems generally experience several interconnected benefits:

- Higher economic growth
- Lower poverty rates
- Greater technological innovation
- Improved governance
- Reduced corruption
- Stronger social cohesion

As Peter Ojiambo (2009) argues, education is a foundational driver of national development. Quality education does more than transmit information; it equips citizens to think critically, address social problems, and contribute productively to public life.

Educational quality also shapes democratic culture and civic responsibility. An informed, rational, and ethically grounded citizenry is better prepared to resist extremism, misinformation, and manipulation, and to participate constructively in public life.

For developing countries such as Bangladesh, improving educational quality is therefore not optional; it is essential for sustainable development, social stability, and long-term national progress.

7. Challenges in Bangladesh

Despite notable progress in enrollment and literacy, Bangladesh still faces a set of structural and pedagogical challenges that limit the overall quality and effectiveness of its education system.

- Insufficient public investment in education
- High student-teacher ratios and overstretched classroom conditions
- Weak teacher preparation and limited professional development
- Political influence in educational governance and administration
- Excessive dependence on examinations and rote-based assessment
- Persistent inequality between urban and rural schools
- A limited culture of research, inquiry, and innovation

Taken together, these challenges reveal a gap between the country's educational outcomes and its broader developmental ambitions. Addressing that gap will require sustained investment in teacher education, curriculum reform, assessment practices, and educational infrastructure.

At the same time, reform should preserve education as an inclusive, secular, rational, and open-minded public good. A curriculum that discourages critical inquiry or neglects diverse intellectual traditions risks weakening creativity, social harmony, and democratic culture.

8. Recommendations

To strengthen teaching and learning in a meaningful and sustainable way, the following reforms are recommended:

1. Promote critical thinking and inquiry-based learning in place of excessive rote memorization.
2. Strengthen teacher education and professional autonomy to improve instructional quality and responsiveness.
3. Increase public investment in education to support quality improvement at all levels.
4. Regularly update curricula in response to scientific, technological, and social change.
5. Expand experiential and project-based learning to connect classroom knowledge with real-life application.
6. Support mother-tongue instruction in foundational education while also promoting multilingual competence.
7. Reduce excessive examination pressure and broaden assessment methods to reflect a wider range of student abilities.
8. Integrate ethics, civic education, and social responsibility into the curriculum to strengthen democratic and humane values.
9. Strengthen research culture among teachers and students to encourage inquiry, innovation, and evidence-based learning.
10. Ensure equitable educational opportunities regardless of socioeconomic background or place of residence.

9. Conclusion

Excellence in teaching and learning requires far more than examination success or technical training alone. Genuine education cultivates independent thinkers, creative problem-solvers, morally grounded citizens, and socially responsible human beings. Across philosophical traditions and educational reform movements, freedom of thought, intellectual curiosity, and holistic human development have remained central aims of education.

The experiences of Finland, Japan, and Singapore show that successful education systems consistently invest in teacher quality, student well-being, creativity, and critical inquiry. Although these countries differ in history and context, each demonstrates that educational excellence emerges when learning is meaningful, humane, and oriented toward the future.

For developing nations, educational reform must therefore focus not only on access, but also on quality, philosophy, and pedagogy. An education system that inspires thought, innovation, ethical responsibility, and human dignity can become one of the strongest foundations for national development and social transformation.

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Strategies to Improve Outcome-Based Education in Private Universities of Bangladesh

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Abstract
Outcome-Based Education (OBE) has been mandated by the University Grants Commis-sion (UGC) of Bangladesh to align higher education with global standards and improve graduate employability. However, private universities face unique challenges in imple-mentation, including faculty readiness, assessment alignment, industry disconnect, and resource constraints. This paper examines the current state of OBE in Bangladeshi pri-vate universities, identifies key barriers, and proposes a 4-pillar strategic framework: 1) Faculty Capacity Building, 2) Curriculum-Assessment Alignment, 3) Industry-Academia Integration, and 4) Data-Driven Continuous Quality Improvement. Case insights from three leading private universities illustrate practical interventions. The findings suggest that contextualized training, authentic assessment, and structured stakeholder feedback can significantly improve OBE outcomes without requiring major financial investment.

***Keywords**:* Outcome-Based Education, Private Universities, Bangladesh, Curriculum Design, Graduate Attributes, Quality Assurance

1. Introduction

Bangladesh has 115+ private universities serving over 60% of tertiary students. To enhance global competitiveness and address the skills gap, the UGC introduced OBE through the Bangladesh Accreditation Council Act 2017 and the OBE Template 2020. OBE shifts focus from teach-ing inputs to measurable student outcomes defined as Program Educational Objectives (PEOs), Program Learning Outcomes (PLOs), and Course Learning Outcomes (CLOs).

While public universities have state support, private universities must implement OBE under market pressures, tuition dependence, and heterogeneous faculty quality. A 2023 UGC audit found that 68% of private universities had documented OBE files, but only 22% demonstrated full alignment between CLO-PLO assessment and closing-the-loop actions. This gap motivates the central question: How can private universities in Bangladesh improve OBE implementation effectively & sustainably?

This paper contributes: 1) A diagnosis of implementation barriers specific to private HEIs, 2) A low-cost, scalable improvement framework, 3) Evidence from pilot practices in three Dhaka-based private universities.

2. Current Status and Challenges in Private Universities

2.1 Policy vs Practice Gap

Most private universities have adopted OBE documentation to meet BAC accreditation. How-ever, implementation often remains “paper compliance.” Common issues include:

TABLE 1 KEY OBE IMPLEMENTATION CHALLENGES IN PRIVATE UNIVERSITIES

Challenge Area	Observed Issue	Impact on OBE
Faculty Readiness	70% faculty lack formal OBE/assessment training	CLOs written as topics, not measurable outcomes
Assessment Design	Overreliance on midterms/finals testing recall	PLO attainment not captured through direct measures
Industry Linkage	PEOs drafted without employer consultation	Graduates miss 21st-century skills demanded by job market
CQI Mechanism	Data collected but not analyzed for action	"Closing the loop" step absent
Student Buy-in	Students unaware of CLOs/PLOs	Low engagement in project-based learning

3. Proposed 4-Pillar Framework for OBE Improvement

Pillar 1: Contextualized Faculty Capacity Building

Training must move beyond one-off UGC workshops to continuous, discipline-specific mentoring.

- Action 1.1: OBE Learning Communities – Form departmental CoPs where senior faculty peer-review CLOs and rubrics monthly.
- Action 1.2: Micro-credentialing – Offer 15-hour certificate on "Constructive Alignment" with credit toward promotion. Brac University's pilot increased faculty CLO approval rate from 41% to 84% in 2 semesters.
- Action 1.3: Adjunct Integration – Mandate 3-hour OBE orientation + provide pre-mapped CLO question banks for part-timers.

Pillar 2: Curriculum & Assessment Alignment

Use Biggs' Constructive Alignment to ensure Teaching-Learning Activities (TLAs) and assessments directly measure CLOs.

- Action 2.1: Bloom's Heat Map – Audit all course outlines to ensure 50% assessments at Bloom Level 3+ for years 3-4.
- Action 2.2: Authentic Assessment – Replace 1 summative exam/semester with portfolio, industry case, or capstone. North South University's CSE dept. saw PLO attainment jump 19% after introducing GitHub-based project portfolios.
- Action 2.3: Student CLO Dashboard – Use LMS plugins to show students which CLO each activity addresses, improving metacognition.

Pillar 3: Industry-Academia Integration for Relevant PEOs

PEOs must reflect employer needs, not just academic intent.

- Action 3.1: Sectoral Advisory Panels – Each program maintains 5-member panel meeting biannually to revise PEOs and skill weights.
- Action 3.2: Co-op & WIL – Mandate 3-credit Work-Integrated Learning. AIUB's BBA internship mapping to PLOs improved employer satisfaction from 3.1 to 4.2/5.
- Action 3.3: Alumni Outcome Tracking – Use LinkedIn + tracer studies at 1-year and 3-year marks to validate PEO achievement.

Pillar 4: Data-Driven Continuous Quality Improvement (CQI)

OBE fails without closing the loop.

- Action 4.1: Lightweight OBE Software – Use Excel macro or open-source tools like OBE-soft to auto-calculate CLO-PLO attainment from gradebooks. Avoid costly ERP modules initially.
- Action 4.2: "One Metric, One Action" Rule – If PLO attainment 60%, department must document one specific intervention in next semester's course plan.
- Action 4.3: External Moderation – Cross-university peer moderation of 5% final scripts/projects each semester to benchmark standards.

4. Implementation Roadmap for Resource-Constrained Universities

TABLE 2 PHASED OBE IMPLEMENTATION ROADMAP

Phase	Timeline	Key Milestone	Resource Needed
Phase 0: Baseline	Month 1-2	OBE readiness audit + PLO attainment baseline	IQAC team

Phase 1: Quick Wins	Month 3-6	Revise 100-level CLOs, train 30% faculty, launch 1 authentic assessment/course	Existing LMS, workshop budget
Phase 2: Scale	Month 7-18	All programs map CLO-PLO, industry panel formed, CQI report published	1 OBE coordinator/dept
Phase 3: Mature	Year 2+	External accreditation, alumni PEO survey, research on OBE impact	BAC liaison

5. Conclusion and Policy Implications

OBE in Bangladeshi private universities will not improve through documentation alone. The 4-pillar model emphasizes faculty ownership, assessment authenticity, market relevance, and data-informed action. UGC and BAC should: 1) Recognize incremental CQI evidence instead of perfect compliance at first audit, 2) Fund discipline-specific OBE training hubs, 3) Create a national PLO benchmarking database for private universities.

Future research should measure longitudinal impact of these interventions on graduate employment and employer satisfaction. With targeted, low-cost strategies, private universities can turn OBE from a compliance burden into a competitive advantage.

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English for Legal Practitioners: A Needs Analysis and Curriculum Redesign for the Legal Sector in Bangladesh

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Abstract
English for Specific Purposes (ESP) has increasingly gained prominence across professional domains, and the legal sector in Bangladesh is no exception. This study investigates the English language needs of legal practitioners in Bangladeshi courts, drawing on a mixed-methods design comprising surveys, semi-structured interviews, and Focus Group Discussions (FGDs). Findings reveal that legal vocabulary constitutes the primary barrier to effective English communication, while writing and speaking skills are identified as the most critical competence for professional performance, particularly at the High Court level. Practitioners rated their overall English proficiency as working-level, with accuracy and vocabulary acknowledged as key weaknesses. Dissatisfaction with prior English for Legal Purposes (ELP) courses is evident, followed by inadequate focus on practical legal language. The study concludes with a proposed revised ELP syllabus and recommendations for course developers, teacher trainers, and institutional policymakers.

***Keywords**:* English for Specific Purposes (ESP), English for Legal Purposes (ELP), Needs Analysis, Legal Practitioners, ESP Curriculum, Language Skills

1. Introduction

English Language Teaching has undergone a significant transformation, driven by the global demand for English as the dominant language of international communication. Within this evolving landscape, English for Specific Purposes (ESP) has emerged as a highly relevant sub-discipline, catering to the distinct communicative needs of professionals across sectors. Law is one such field where English proficiency is not merely advantageous—it is professionally indispensable. Legal proceedings at the supreme court level are conducted predominantly in English, yet the legal education system has not historically prioritized a rigorous, profession-specific English curriculum. Consequently, many practitioners enter the field with significant linguistic deficiencies, particularly in vocabulary, accuracy, and the drafting of legal documents. This study addresses that gap by conducting a comprehensive needs analysis of legal practitioners in Bangladeshi courts, guided by the theoretical frameworks of Hutchinson and Waters (1987), Dudley-Evans and St. John (1998), and Richards (2001).

Statement of the Problem

While ESP has gained recognition globally, its implementation in the Bangladeshi legal education system remains superficial. English is used as the medium of instruction (MOI) and litigation at the higher judicial tiers; however, most legal practitioners—particularly those trained at public universities—lack the vocabulary, grammatical precision, and genre-specific writing skills required for effective courtroom performance. The absence of a systematic needs analysis before curriculum design has resulted in ELP courses that fail to meet practitioners' actual professional requirements.

Research Questions

The study is guided by the following research questions:

- What are the English language requirements of legal practitioners in Bangladesh?
- How crucial are English language abilities for lawyers practicing in Bangladesh?
- Which specific English language skills do legal professionals identify as deficient?
- What are the English language wants and preferences of law practitioners for a revised ELP course?

Significance of the Study

This study provides an empirically grounded foundation for revising ELP syllabi in Bangladeshi institutions. By centering the voices of practicing lawyers, it bridges the gap between generic English instruction and profession-specific communicative competence. Furthermore, it stimulates scholarly inquiry into ESP needs analysis within South Asian legal contexts.

2. Needs Analysis Framework

Needs analysis constitutes the cornerstone of ESP curriculum design. According to Hutchinson and Waters (1987), it is the awareness of learner needs that fundamentally distinguishes ESP from general English instruction. Richards (2001) further posits that needs analysis assists in identifying the gap between current learner competencies and target professional performance— what Dudley-Evans and St. John (1998) characterize as the learner's 'lacks.' The present study operationalizes needs analysis across three interrelated dimensions: necessities (what learners must know to function in the target situation), lacks (the gap between current and required competencies), and wants (the learners' subjective preferences). Data were triangulated across three instruments—a structured survey, semi-structured interviews, and Focus Group Discussions—ensuring both quantitative breadth and qualitative depth.

3. Methodology

This study adopted a mixed methods design to capture both the breadth of practitioner perceptions and the contextual relevance of individual legal experience.

- *Participants*

Forty legal practitioners participated in the survey, representing a cross-section of seniority levels: 60% were advocates at the Supreme Court of Bangladesh, 30% were apprentice lawyers (fewer than five years' experience), and 10% were senior legal officers with over 60 years' experience. The majority (85%) held an LLM degree. Five individual specialist informants were interviewed in depth, and two Focus Group Discussions were conducted.

- *Instruments and Procedures*

Three instruments were employed. A 30-item structured survey questionnaire gathered quantitative data on language use, perceived proficiency, materials used, and course preferences. Semi-structured interviews (five participants) elicited professional narratives about English use and ELP course experience. Two FGDs provided group-level insight into expectations, challenges, and course design suggestions.

4. Findings and Discussion

- *Survey Findings*

Table 1 presents a synthesis of the key language skills identified through the survey, mapped against practitioners' self-reported proficiency and their perceived priority for a revised ELP syllabus.

TABLE 1 LEGAL PRACTITIONERS' SKILL NEEDS AND PROFICIENCY ASSESSMENT

Skill Area	Key Needs Identified	Proficiency Level	Priority in New ELP Syllabus
Vocabulary	Legal jargon, Latin maxims, courtroom terms	Below average	Highest
Writing	Drafting petitions, memos, and legal documents	Average	Very high
Speaking	Oral arguments, client interaction, and court delivery	Average	High
Reading	Case studies, statutory texts, foreign law	Average	High
Listening	Judicial hearings, collegial discussions	Average	Moderate
Grammar	Tense accuracy, sentence structure in petitions	Average	High

The data reveal that vocabulary is considered the most critical deficiency and the highest priority for curriculum development. This aligns with the FGD findings, where practitioners explicitly noted that the absence of Latin maxims, courtroom registers, and updated legal terminology in prior ELP courses was a significant shortcoming. Writing and speaking were identified as the most frequently used skills in professional practice: writing for the drafting of petitions and legal documents, and speaking for oral arguments before judges.

The majority of the participants indicated that they were dissatisfied with their previous ELP course, a finding of considerable significance for curriculum developers. Furthermore, 80% stated a preference for a revised course

with a strong emphasis on vocabulary and grammar, followed by accuracy and coherence (40%) and fluency (20%). Participants indicated willingness to invest one hour per day in an ELP course of four to six months' duration, with a preferred class size not exceeding 30 students.
Regarding language use, 70% of participants reported using English in court, with the remaining 30% using English for reading and analyzing case studies while communicating in Bengali with clients. Textbooks and scholarly articles were the most frequently used materials (60%), while audiovisual resources remained underutilized (20%).

- *Interview Findings*

Table 2 summarizes the key contributions of the five specialist informants interviewed in the study.

TABLE 2 SPECIALIST INFORMANT PROFILES AND KEY FINDINGS

Court Level	Experience	Key Finding
Supreme Court	25 years	Both Bangla & English are essential; communicative bilingualism is needed
Supreme Court	Senior	No prior ELP course; learns on the job
Supreme Court	Senior	Supports vocabulary-focused training
District Court	Mid-career	Vocabulary gaps; difficulty with updated legal terms
Lower/High Court	Mid-career	Writing and speaking are most critical at the High Court level

The interview data highlight a consistent theme: the professional primacy of English at the High Court level, and the inadequacy of current ELP provision. Mr. Rahim, a senior advocate with 25 years' experience, articulated the bilingual imperative by emphasizing that legal practitioners must be equally competent in both Bangla and English— the former for client communication, the latter for petitions, case studies, and interactions with foreign clients. Mr. Jamal's account was particularly instructive: he noted that poor grammar and inadequate writing skills directly impair a practitioner's ability to secure favorable judicial outcomes, observing that judges at the High Court are highly attentive to linguistic accuracy in submitted petitions.

A recurring observation across interviews was that university-level ELP courses suffer from a 'pass-and-forget' culture—students acquire sufficient knowledge to pass examinations but do not develop transferable professional language skills. Jamal's suggestion of direct translation support for Bangla legal terms into English, alongside tense instruction and legal terminology training, represents a practical, learner-driven recommendation for syllabus revision.

- *Focus Group Discussion Findings*

The two FGDs corroborated the survey and interview data. Participants reported that their primary expectation from ELP courses—explanation of Latin legal terminologies and maxims—had consistently gone unmet. Practical skills such as document analysis, summary writing, and courtroom vocabulary were identified as the most useful competencies for daily professional practice. The FGDs also underscored the motivational dimension: practitioners expressed genuine interest in receiving ELP training, indicating that institutional investment in such programs is substantial.

Proposed Revised ELP Syllabus

On the basis of the needs analysis findings, the authors propose a revised 15-unit ELP syllabus that integrates reading, writing, and speaking skills around authentic legal topics. Each unit follows a consistent three-strand structure—Let's Read, Let's Write, Let's Speak—ensuring that all macro-skills are developed in tandem with legal content knowledge.

TABLE 3 PROPOSED REVISED ELP SYLLABUS OVERVIEW (15 UNITS)

Unit	Reading Topic	Writing Focus	Speaking Focus
1	Legislation	Descriptive text	Describing a place/context

2	Types of Crimes	Announcements	Delivering an announcement
3	International Trade Law	Suggestions	Giving suggestions
4	Police Officer Roles in Law	Chart writing	Presenting a chart
5	Capital Punishment	Memo writing	Making a phone call
6–9	Family Law / Marriage Law / Insurance / Labour Law	Letters, reports, compare–contrast	Storytelling, reporting, presentations
10–15	Consumer Protection / Attorney / Citizenship / Drugs / Property / Environmental Law	Greeting cards, tips, motivation & application letters	Congratulations, giving tips, and job interview

The syllabus prioritizes legal vocabulary development in every unit through the reading strand, while the writing strand builds genre-specific competencies (petitions, memos, reports, application letters) progressively across units. The speaking strand incorporates simulation-based activities—presentations, announcements, storytelling, and job interviews—that mirror real professional contexts. Latin maxims, courtroom registers, and case-study analysis are developed throughout the reading materials to address the vocabulary deficit identified as the primary barrier to professional English communication.

5. Conclusion

This study has demonstrated that English language proficiency is a professional prerequisite for legal practitioners in Bangladesh, particularly at the Supreme Court level. The needs analysis reveals that vocabulary depth, writing accuracy for petition drafting, and speaking fluency for oral court proceedings are the most critical competencies, while current ELP provision falls substantially short of meeting these needs.

The proposed 15-unit syllabus, grounded in authentic legal topics and a tripartite skill-development model, offers a theoretically informed and empirically validated response to these identified gaps. As the legal and corporate sectors in Bangladesh has become increasingly internationalized, equipping legal practitioners with context-specific English competencies is not merely an educational imperative— it is the most substantial solution to this problem.

6. Recommendations

- ELP course designers must conduct systematic needs analyses before curriculum development, centering on the lacks, wants, and necessities of the target learners.
- A strong emphasis on legal vocabulary—including Latin maxims, courtroom registers, and updated legal terminology—should be integrated across all units of the ELP syllabus.
- Writing for professional legal purposes (petitions, memos, reports) should receive dedicated instructional time, as it is the skill most directly affecting courtroom outcomes.
- Teacher training workshops should equip ELP instructors with genre-specific pedagogical approaches and contextual awareness of legal professional culture.
- Legal practitioners should have access to a structured ELP course before entering professional practice, with a recommended duration of four to six months and a class size not exceeding 40 students.
- Audiovisual and digital resources, including authentic courtroom recordings, legal documentaries, and online legal databases, should be incorporated into ELP classrooms to develop listening comprehension and digital legal literacy.

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Outcome-Based Education and Employability in Civil Engineering: Evidence from a Private University of Bangladesh Using PLS-SEM

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Abstract
The study was aimed to investigate the "employability gap" in the construction industry of Bangladesh with special reference to the relationship between Outcome Based Education (OBE) competencies and employability of Civil Engineering graduates in the job market. Drawing on Human Capital Theory and Self-Efficacy Theory, this study analyzes a dual-stakeholder dataset (N = 180) consisting of alumni and industry employers using Partial Least Squares Structural Equation Modeling (PLS-SEM). The structural model investigates This suggests that Career Readiness is a significant psychological process that links academic and experiential inputs to professional efficacy. The influence of Technical Skills (TS), Soft Skills (SS) and Practical Exposure (PE) on Employability (EMP) with special reference to mediating role of Career Readiness (CR). The findings show that Career Readiness fully mediates the effect of Practical Exposure and Soft Skills on employability. However, Technical Skills has significant direct effect on employability. This suggests that Career Readiness is a significant psychological process that links academic and experiential inputs to professional efficacy. The model has moderate predictive power, explaining 40.2% of the variance in Career Readiness and 30.1% in Employability. These results provide actionable insights to Institutional Quality Assurance Cells (IQAC) and curriculum designers to move from the theoretical mastery towards industry aligned engineering outcomes that foster graduate self-efficacy.

***Keywords**:* Outcome-Based Education, Employability, Career Readiness, Civil Engineering Education, PLS-SEM, Technical Skills, Soft Skills, Practical Exposure

1. Introduction

Engineering graduates from private universities in Bangladesh discover that the trip from the lecture hall to the real job field is filled with unforeseen barriers. A bachelor degree in Civil Engineering does not always guarantee an easy passage into the professional world. The building industry is one of the important economic sectors. But the gap between the best academic graduates and the capacity to get the positions in the civil engineering professions still persists because of the lack of the practical competence and psychological adaptability. The main reason for this gap is the traditional emphasis on mastery of theory rather than the holistic development of "employability capital", which is responsible for the alarming rise of unemployed civil engineers who have knowledge but no ability to apply it. Outcome-Based Education has thus become a strategic format that emphasizes measurable outcomes that reflect not only technical skills but also the 'soft' attributes such as communication and problem-solving that are most sought after by local companies. But transitioning to the workforce is about more than just having the skills. It is also a strong feeling of job preparedness that psychologically connects between knowing and acting [11]. OBE-driven programs can prepare the graduates for the field's rigor through hands-on practical experience and internship opportunities to improve professional self-efficacy [5] and prepare them to internalize their training. The actual effect of academic preparation is only witnessed when students are not only technically prepared but also psychologically prepared and adaptable to the challenges of a modern job market [13]. This integrated approach means that education is not just about covering a syllabus but about developing self-assured individuals who can turn their academic capabilities into practical results. In this background, there is a pressing need to thoroughly investigate the effect of OBE practices on the employability of civil engineering graduates of Private Universities in Bangladeshi setting. The present research proposes to investigate the association of OBE driven teaching methods with the development of technical and soft skills needed in the job market. This research is planned to give the main educational factors leading to career preparation as perceived by graduates and employers using Partial Least Squares Structural Equation Modeling (PLS-SEM). The study intends to provide curriculum designers and legislators with realistic recommendations to align academic outcomes with professional expectations in civil engineering education.

2. Theory and Hypotheses

The research is grounded in two theoretical frameworks. The Human Capital Theory and Self-Efficacy Theory are combined to map out the process through which academic competencies translate into effective employment of civil engineering graduates.

2.1 Human Capital Theory

According to Human Capital Theory (HCT), investments in education and training increase the economic value and productivity of the individual [12, 18]. In the specific context of civil engineering, this "capital" is composed of the knowledge of a graduate, his practical experience and his personal qualities [12]. HCT notes that access to the job market is mediated through quality education, but more recent scholarship has added to this 'employability capital' and the need for graduates to actively negotiate their skills in the workplace [4, 16]. According to the Outcome-Based Education, the graduates should have the required resources such as Technical Skills, Soft Skills, and Practical Exposure to meet the industry needs [5]. However, owning such resources is only half of the battle, as employability also depends on one's ability to signal and leverage these resources [17].

2.2. Theory of Self-efficacy

HCT provides the structural basis for professional success and the psychological mechanism is provided by Self-Efficacy Theory. Self-efficacy is a cognitive judgement of the capacity of oneself to design and implement the actions to achieve certain objectives [15]. Self-efficacy for engineering graduates is a "cognitive mechanism" that influences the magnitude of effort and persistence to confront problems in the field [1]. It is not just a matter of technical skills but also about the belief in the ability to use these qualities in a professional context [15]. Studies have shown that career-related self-efficacy is an important aspect of career adaptability and a determinant of proactive job search behaviors [7, 13].

2.3 Career readiness as a mediating variable

The study links these beliefs to Career Readiness as a central link. Career readiness is the general preparedness of a graduate which comprises self-confidence, technical competency and social agility [10, 14]. The model conceptualizes CR as a full mediator rather than abilities directly predicting employment. This means that the first transformation of academic competencies to employability must be internalized as "readiness" which is a state of professionally prepared and confident being [6, 15].

2.4 Generating Hypotheses

The combination of human capital and psychological readiness results in the following assumptions:

- H1: Practical exposures have a positive impact on Career Readiness of engineering graduates. Direct exposure of students to the industry through internships or industrial training helps them bridge the gap between theoretical knowledge and professional application leading to an increase in perceived readiness [5].
- H2: Soft Skills have positive effect on Career Readiness of engineering graduates. Interpersonal skills like communication, leadership and team building are crucial for a successful integration into the workplace [3]. This is due to the fact that technical knowledge alone may not be enough to ensure a smooth transition to professional employment [3].
- H3: Technical Skills positively impact the Career Readiness of engineering graduates. Graduates with fundamental knowledge of the primary engineering disciplines have the cognitive tool kit required to provide the psychological confidence to confront the challenges of entry level engineering careers [5]
- H4: Career readiness of engineering graduates has positive impact on employability of engineering graduates. Highly 'work-ready' graduates with job certainty are viewed to be more capable and better prepared for the demands of the modern job market [14].
- H5: Technical Skills have a positive effect on Employability of engineering graduates. Discipline-specific competencies are still a major criterion in recruiting by engineering organizations as it ensures the candidate can perform the vital professional responsibilities efficiently [9].
- H6: Practical Exposure has positive impact on Employability of engineering graduates. Practical experience links academic training with business expectations, making graduates more attractive to employers who value less onboarding time [5].
- • H7: Soft Skills have positive impact on Engineering Students Employability. Today's engineering industry needs graduates who have social and communication skills to work in a team and manage projects successfully [2].
- H8a: Career Readiness moderates the relationship between Practical Exposures and Employment. This hypothesis states that exposure to the industry has an indirect effect on hiring outcomes, through the improvement of the graduate's self-perceived competence and readiness to perform professional duties [13].

- H8b: Soft Skills and Employability – Mediating Role of Career Readiness Soft skills affect professional performance through the mediating factor of psychological readiness to handle complex organizational problems in graduates [7].
- H8c: Career Readiness mediates between Technical Skills and Employability. The technical skills are important but the impact on employability is increased when the graduates are psychologically prepared to use that knowledge effectively in a labor setting [13].

3. SmartPLS Model Development, Results and Discussion

3.1. Demographic Profile of the Respondents and Measurement Instrument

In the current study, a dual-stakeholder survey design was adopted with a total sample of N = 180 (One Hundred and eighty) respondents comprising alumni and employers. The integration of the two groups allows for a comprehensive assessment of graduate competencies by capturing supply-side perspectives (graduates) and demand-side expectations (industry employers) to strengthen the external validity of the findings.

All constructs were measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Five latent constructs, Technical Skills (TS), Soft Skills (SS), Practical Exposure (PE), Career Readiness (CR) and Employability (EMP) were created based on the principles of Outcome-Based Education (OBE) and employability literature and these were the measurement instrument.

Technical Skills (TS): Technical Skills describe how well graduates know the fundamental engineering principles and analytical capabilities, and the technical skills they need for professional work.
TS1: University education prepares graduates for solving real-world engineering problems in professional environments.
TS2: Academic software engineering education has direct applicability to industry.
TS3: Graduates are able to apply BNBC/ACI codes in design work.
TS4: Graduates interpret technical drawings and engineering specifications correctly.
TS5: The degree has taught the engineering fundamentals that meet the professional job requirements.

Soft Skills (SS): Soft Skills are interpersonal effectiveness, communication skills, teamwork and professional conduct.
SS1: Graduates can describe technical concepts to non-technical stakeholders.
SS2: Graduates are effective members of multi-disciplinary teams.
SS3: Graduates are able to coordinate tasks and responsibilities of graduates.
SS4: Graduates effectively organizes workloads to meet project deadlines.
SS5: Graduates produce high quality professional technical documentation.

Practical Exposure (PE): Practical Exposure is the importance of hands-on learning in preparing graduates to practice engineering in the real world.
PE1: The internship experience helps the transition from academic study to professional practice.
PE2: Field visits in academic study help students to better understand field operations.
PE3: Experience in the laboratory is a good basis for working with materials and field conditions.
PE4: Collaborate with industry professionals to learn about professional ethics.
PE5: Academic projects are meeting the real needs of the job market.

Career Readiness (CR): Career Readiness is the ability, confidence and flexibility to succeed in a professional role.
CR1: Graduates will be able to perform the functions of entry level engineers.
CR2: Academic preparation is the key to success in technical interviews and the recruiting process.
CR3: Graduates are adaptable to high pressure working environment
CR4: The academic training supports a transparent and sustainable career path.
CR5: Graduates are employable and can work across the construction industry.

Employability (EMP): Employability is a measure of early career outcomes, employer satisfaction and job fit.
EMP1: Employment of graduates within a reasonable time frame after graduation.
EMP2: The employment of graduates is in line with their academic training in Civil Engineering.
EMP3: Graduates are satisfied with their pay and conditions of employment.
EMP4: The employers are satisfied with the technical skills of the graduates.

EMP5: Higher education credentials are linked to job security and career advancement.

Table 1 provides the demographic structure of the data, which provides a strong empirical foundation for the subsequent Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis. The male respondents (87.2%) dominated the respondents which is consistent with the gender composition of the civil engineering profession in Bangladesh and also with previous studies on engineering education and workforce analysis (Table 1). From a methodological point of view, this distribution does not affect the validity of the model, as PLS-SEM is robust to non-normal and unbalanced data structures. The inclusion of both alumni (66.1%) and employers (33.9%) increases the external validity of the structural model through the use of both the supply-side (graduate competency development) and demand-side (industry expectations) perspectives. This dual stakeholder approach is particularly relevant to the assessment of the relationship between Outcome-Based Education (OBE) competencies and employability outcomes as it enables triangulation of perceived skill effectiveness.

TABLE 1 DEMOGRAPHIC PROFILE OF RESPONDENTS (N = 180)

Category	Sub-Category	Frequency (n)	Percentage (%)
Total Respondents	—	180	100.0
Gender	Male	157	87.2
	Female	23	12.8
Stakeholder Role	Alumni	119	66.1
	Employer	61	33.9
Age Range	20–29 years	49	27.2
	30–39 years	90	50.0
	40 years and above	41	22.8
Highest Qualification (Alumni)	B.Sc. in Civil Engineering	97	81.5
	Postgraduate	22	18.5
	Private Organization	87	72.5
Current Job Sector (Alumni)	Government/Semi-Gov	16	13.3
	Autonomous/Others	17	14.2
	Junior (0–3 years)	61	50.8
Experience Level (Alumni)	Mid-level (3–10 years)	46	38.4
	Senior (10+ years)	13	10.8

The distribution of age and experience shows that the majority of the respondents are early to mid-career professionals (77.2% are between 20 and 39 years old and 89.2% have up to 10 years of experience). This is particularly true for the SmartPLS modeling, because employability constructs and self-efficacy perceptions are most dynamic in the early career stage in the transition from academic learning to professional practice. In addition, the high percentage of bachelor degree holders (81.5%) ensures the measurement model to reflect the effectiveness of undergraduate OBE implementation largely, which is the main focus of this study. The dominance of private sector employment (72.5%) also fits with industry-driven competency assessment, raising the relevance of structural pathways linking technical skills, soft skills and employability outcomes.

3.2 Measurement Model Evaluation

Indicator reliability, internal consistency reliability, convergent validity, and discriminant validity [8] were used to assess the measurement model (Fig. 1).

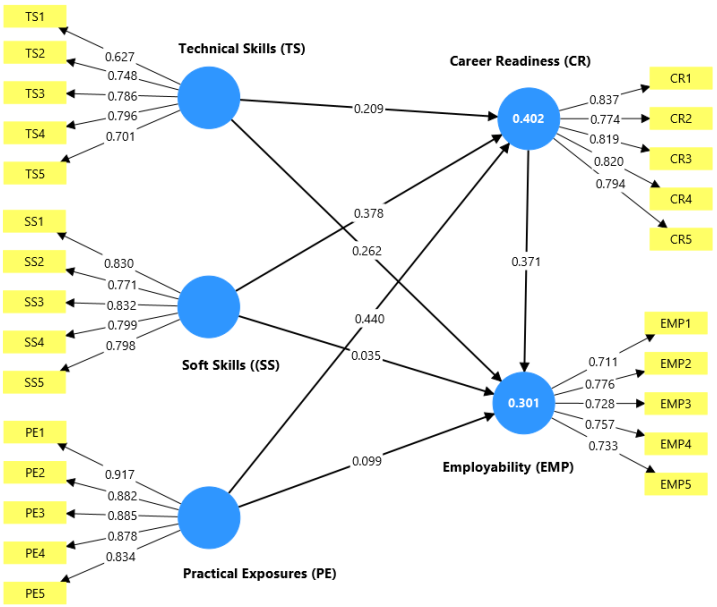


Fig.1 Measurement Model

Table 2 shows that indicator reliability was confirmed with most of the outer loadings higher than the threshold of 0.708. However, TS1 (0.627) and TS5 (0.701) were slightly below this mark, but they were retained to preserve content validity as the Average Variance Extracted (AVE) and composite reliability (rho_c) for the "Technical Skills" construct were well above the recommended cut-offs (Hair et al., 2019).

Internal consistency was tested using Cronbach's alpha, rho_a and rho_c scores for all constructs were above the 0.70 cut-off point. Convergent validity was also confirmed with all the Average Variance extracted AVE values above the threshold of 0.50, which indicates that latent constructs explain a large part of the variance of their respective indicators.

TABLE 2 CONSTRUCT RELIABILITY AND CONVERGENT VALIDITY

Construct	Items	Loadings	Cronbach's α	rho_a	rho_c	Average variance extracted (AVE)
Career Readiness (CR)	CR1–CR5	0.774–0.837	0.868	0.869	0.905	0.655
Employability (EMP)	EMP1–EMP5	0.711–0.776	0.796	0.800	0.859	0.550
Practical Exposures (PE)	PE1–PE5	0.834–0.917	0.927	0.934	0.945	0.774
Soft Skills (SS)	SS1–SS5	0.771–0.832	0.866	0.877	0.903	0.650
Technical Skills (TS)	TS1–TS5	0.627–0.796	0.787	0.808	0.853	0.539

Discriminant validity was evaluated by the Heterotrait-Monotrait (HTMT) ratio (Table 3). All values were below the conservative threshold of 0.85 confirming the constructs are conceptually distinct and reflect unique latent phenomena.

TABLE 3 DISCRIMINANT VALIDITY (HTMT CRITERION)

Construct	CR	EMP	PE	SS	TS
Career Readiness (CR)					
Employability (EMP)	0.576				
Practical Exposures (PE)	0.525	0.327			
Soft Skills (SS)	0.452	0.201	0.089		
Technical Skills (TS)	0.230	0.406	0.109	0.113	

3.3 Structural Model and Hypothesis Testing

The structural model analyses the relationships among the constructs and the predictive power of the model. Path analysis results are summarized in Table 4.

TABLE 4 PATH COEFFICIENTS AND HYPOTHESIS TESTING

Hypothesis	Relationship	Beta (β)	T-statistic	P-value	Decision
H1	PE → CR	0.440	8.501	0.000***	Supported
H2	SS → CR	0.378	7.315	0.000***	Supported
H3	TS → CR	0.209	3.619	0.000***	Supported
H4	CR → EMP	0.371	4.738	0.000***	Supported
H5	TS → EMP	0.262	3.984	0.000***	Supported
H6	PE → EMP	0.099	1.302	0.096	Not Supported
H7	SS → EMP	0.035	0.452	0.326	Not Supported

(*Note: *** $p < 0.001$*)

The analysis revealed that Practical Exposures (Beta (β) = 0.440), Soft Skills (Beta (β) = 0.378) and Technical Skills (Beta (β) = 0.209) significantly contribute to Career Readiness. In Employability, Career Readiness (Beta (β) = 0.371) and Technical Skills (Beta (β) = 0.262) were found to be significant predictors. Interestingly, the direct paths from Practical Exposures and Soft Skills to Employability were non-significant indicating a potential mediation mechanism. To further investigate these relationships, a specific indirect effects analysis was conducted (see Table 5). Career Readiness was found to significantly mediate the relationship between each of the three exogenous variables and Employability. This indicates that skills and exposures are important but their effect on perceived employability is largely mediated through the development of a student's sense of career readiness.

TABLE 5 MEDIATION ANALYSIS (SPECIFIC INDIRECT EFFECTS)

Relationship	Indirect Effect	T-statistic	P-value	Result
PE → CR → EMP	0.163	3.827	0.00007	Mediation
SS → CR → EMP	0.140	3.906	0.00005	Mediation
TS → CR → EMP	0.078	2.776	0.003	Mediation

The model was a moderate predictor, accounting for 40.2% of the variance in Career Readiness (R^2=0.402) and 30.1% of the variance in Employability (R^2=0.301). Practical Exposures (f^2 = 0.322) and Soft Skills (f^2 = 0.236) had large to medium effects on Career Readiness. Results show the importance of experiential learning and soft skills to fill the gap between academic preparedness and employability.

4. Conclusion

In conclusion, these findings are of real importance from the point of view of a civil engineering graduate entering the professional world. The SmartPLS results show that the skills acquired during university are valuable, but do not automatically lead to employment. Practical Exposure and Soft Skills matter, but only when they are translated into a real sense of Career Readiness (PE → CR → EMP, β = 0.163, SS → CR → EMP, β = 0.140). Experiences such as internships, site visits, group work, and communication training only become meaningful when they inform the graduate's sense of preparedness and confidence in handling real engineering responsibilities [13, 5]. In practice, this is simply a reflection of a common reality: exposure is not enough, unless it builds the ability to perform. At the same time, technical skills are still at the core of employability. Not only do they enhance Career Readiness (β = 0.209) but they also have a direct impact on Employability (β = 0.262), meaning they are doubly important. This is in line with the industry's standard for a graduate – high technical competence not only builds confidence but also signals value to the employer [9]. The model explained 40.2% of Career Readiness and 30.1% of Employability, which highlights the significance of merging a strong technical foundation with pertinent hands-on experience for achieving success [11]. In this sense Career Readiness is the bridge connecting what is learned in university and what is needed on site.

And there remains a lot more to discover about what influences the path of a graduate once they leave university. Future research should track civil engineering graduates into their early careers to understand how this initial feeling of readiness translates into actual work environments. It is always helpful to think outside the classroom, about things like professional networks, industry demand, and hiring practices that often play a big role in shaping

opportunities. More effective collaboration between higher education and employers could result in a better match between the skills being taught and the skills needed in practice. Furthermore, various branches of civil engineering such as structural, geotechnical or transportation may have slightly different strength requirements. The study of these differences could help to make education more targeted and effective. More studies at different institutions and countries would improve the understanding, especially in the developing context. The study offers a general useful but important insight to Civil Engineering graduates. Employability is not just about what is learned or experienced, but about how well these experiences are translated into confident and competent performance in the real world of engineering practice.

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Investigating Systemic Challenges of OBE Implementation and Proposing Remedies

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Abstract
Education has been a powerful tool from the beginning of human civilization for transforming the society from good to better. Outcome-Based Education (OBE) approach in higher education is a paradigm shift from traditional education although both of which have specific sets of learning outcomes. Traditional approach facilitates learning through dissemination of knowledge while the OBE suggests teaching-learning activities according to pre-planned intended learning outcomes. The student-centred OBE has some systemic challenges as per its philosophy and definition. This paper, through an explorative study, critically analysed some relevant documents and research articles for identifying the systemic challenges of OBE implementation by the two categories: Unavoidable and Preventable. Four challenges in each of these two categories explained in necessary details. All these challenges then lead to formulating some remedial proposals that believed to help reduce the intensity or sometimes avoid the occurrence of the challenges. The remedial proposals expected to be beneficiary to the senior academics, practising faculty members, institutional authorities and departmental heads, to ensure the expected level of attainments of the intended learning outcomes in higher education academic programs.

***Keywords**:* Challenges of OBE, Higher Education, OBE Implementation, Outcome-Based Education, Remedial Proposals.

1. Introduction

The greatest disciple Aristotle of the great teacher Plato wrote in Part XIV of Book Seven of 'Politics':

> "... For men must be able to engage in business and go to war, but leisure and peace are better; they must do what is necessary and indeed what is useful, but what is honourable is better. On such principles children and persons of every age which requires education should be trained." (Jowette, 1885)

There has been always a purpose of education; so, there is outcome of education. In that reality, education is traditionally outcome-based. However, it was never called an Outcome-Based Education (OBE) before. The main philosophy of OBE is that education must be helpful for the betterment and sustainability of the human race in the world. OBE has to have clearly defined learning outcomes to be taught by pre-planned and well-informed methods so that the students' attainments will ultimately be measured with a proper assessment tool (Spady, 1994). Thus, OBE is not an alien idea. Instead, it aligns with many reports and expectations regarding the usefulness of education, which can ultimately be identified as beneficial to societies. According to a report prepared by UNESCO, there has been a dual challenge of making good on the unfulfilled promise to ensure the right to quality education for every citizen and fully realizing the transformational potential of education as a route for sustainable collective futures. As a matter of fact, a new sort of social contract for education is essential that can repair injustices while transforming the future. Education is supposed to build skills needed in 21st century labour market, taking into account the changing nature of work and the different ways. Education has long played a foundational role in the transformation of human societies. Now, education itself must be transformed to shape peaceful, just and sustainable futures (UNESCO, 2021). OBE is one approach to reshape our education.

World Economic Forum publishes Future Jobs Report every year that reflects the changes in the trends and demands of jobs in various disciplines across societies. Some key findings of the report of 2023 show:

- Economic, health and geopolitical trends have created divergent outcomes for labour markets globally.
- The largest job creation and destruction effects come from environmental, technology and economic trends.
- Large-scale job growth is expected in education, agriculture and digital commerce and trade.
- The largest losses are expected in administrative roles and in traditional security, factory and commerce roles.
- Six in 10 workers will require training before 2027 though the availability of training opportunities is not sufficient.
- Analytical thinking and creative thinking remain the most important skills for workers (WEF, 2023).

These findings require appropriate outcomes of education to be ensured. Assurance of outcomes is not enough. It has to be appropriate according to demand of time, which eventually indicates probable challenges to identify the right outcomes of education in every level.

The authors of this article tried to find the answer to the question "what are the potential challenges in the OBE system and how can these be mitigated to implement OBE successfully?". In an explorative research approach, block diagram of the initiative is shown in Figure 1.



Fig.1 Block diagram of the research approach of this study

The following sections of this article sequentially describe the characteristics Outcome-Based Education (OBE) from the theoretical viewpoint, challenges of OBE that are built-in within its system, and a proposed set of recommendations to face the challenges for a successful OBE implementation. Finally, a concluding remark has been made.

2. What is OBE and what is not

Every student can learn. The time needed and the way for individual learning differ among students. Every student achieves an expected level of outcome after getting the education and eventually contributes to society through professional work. These thoughts of OBE were formulated by the academic and educational psychologist William Spady who has been given credit as the father of OBE. In 1989, Spady defined OBE as "a comprehensive approach to organizing and operating an education system that is focused on and defined by the successful demonstrations of learning sought from each student", which was published in the glossary of a book later (Spady, 1994). Later, Spady explicitly described OBE saying if education is not based on four pillars, and the four principles aren't followed consistently, systematically, creatively and simultaneously, then it isn't OBE (Spady, 2020). Four pillars of OBE are:

(1) One paradigm priority: What and whether students learn successfully is more important than when and how schools schedule and provide instruction and assessments.
(2) Two empowering purposes: Educators are to- i) maximize the 'Conditions of Success' for all learners and ii) send fully equipped and empowered graduates into the world.
(3) Three underlying premises: i) All students can learn and succeed, ii) Success breeds success, and iii) Schools control the 'Conditions of Success'.
(4) Four operational principles: i) Clarity of focus on outcomes of significance, ii) Expanded opportunity for all to succeed, iii) High expectations for all to succeed, and iv) Designing the curriculum down.

Operational principles of OBE are elaborated as:

(a) A clear set of learning outcomes is established by the educators, which forms the basis for all systems of instruction design and assessment method.
(b) Educators believe in and live the OBE's 'Success for All Learners' Philosophy and Pillars of Power working together.
(c) Educators match and combine these two elements with the content-referenced, criterion-referenced Foundation of learning and performance Standards of OBE.
(d) Educators dramatically change their Paradigm thinking, Priorities, and how they operate from time-centred to outcomes-centred.

Educators' role is clearly visible in Spady's OBE principles with the highest significance. Here, the educators are primarily the teachers. Curriculum design and assessment practices also significantly influence whether higher-

order learning is promoted. Many curricula and assessments remain heavily focused on lower-order learning, with higher-order learning often underrepresented. It also promotes a more learner- cantered approach to learning in which teachers prepare students by teaching them skills of critical thinking, problem solving, and applying knowledge (Biggs & Tang, 2011). Additionally, OBE is an internationally popular approach in higher education institutions because it improves employability and preparation for careers.

In order for OBE to be effectively adopted, firstly, there must be a well-accepted set of students' learning outcomes at both program and course levels. Secondly, educators must ensure effective teaching-learning activities towards achieving the targets of learning outcomes. Thirdly, students' performance evaluation has to be properly designed along with appropriate assessment tools keeping constructive alignment of learning outcomes across the phases of OBE. Mixture of formative and summative assessment tolls is a key. Also, as feedback is a tool of OBE, "there is an opportunity for ongoing refinement of the curriculum as teachers begin to receive evidence on how well students are achieving" (Killen, 2007). It has been found that OBE also heightens student engagement and motivation because students become invested in a goal-based education that is relevant to their chosen careers (Malan, 2000). In the next section, the authors tried to identify the systemic challenges throughout the three major phases of OBE implementation.

3. Identifying challenges of OBE

OBE challenges are primarily categorized as "Unavoidable" and "Preventable". Each category includes several types of challenges that are identified as Systemic, Academic, Procedural, etc. In this article, the authors are putting light only on the Systemic challenges for details.

3.1 Unavoidable systemic challenges

By "unavoidable", it has been meant that some challenges are obvious to appear. There is no way to avoid the challenges that are in-built in the system of OBE. These obvious unavoidable systemic challenges are: (i) Identifying Program Learning Outcomes (PEO), (ii) Total Minimum Program Credit, (iii) Program Time-bound, and (iv) Cultural Shock at Program level.

3.2 Preventable systemic challenges

By "preventable", it has been meant that some challenges are possible to avoid or weaken. Yet, these challenges are built-in to the OBE system. With a proper preparation, these challenges can be evaded from appearance or faced at a less intensity. These preventable systemic challenges are: (i) Aligning with HEI Mission, (ii) Identifying Program learning Outcomes (PLO), (iii) Course Learning Outcome (CLO)-PLO Mapping, and (iv) Cultural Shock at Course level.

These challenges are identified investigating the theoretical characteristics of OBE in general. One may find more, or less, number of challenges from a varied perspective. Table 1 shows the descriptions of the challenges identified above by the two categories.

TABLE 1 UNAVOIDABLE AND PREVENTABLE SYSTEMIC CHALLENGES OF OBE IMPLEMENTATION

Category	Systemic Challenge	Challenge Description
Unavoidable	Identifying PEOs	Program Educational Objectives (PEOs) are set based on the expected professional positions of the graduates after 3-to-5 years of their program completion. This is always a challenge to predict the future. Various reports with labour market trends may help. But this challenge is obvious to face.
	Total Minimum Program Credit	There is always a required total minimum credit to be completed by the students to achieve a diploma. For example, 130 credit is the minimal for bachelor programs in Bangladesh irrespective of subject area. OBE suggests the courses are to be brought in only for reaching the targets of achieving PLOs in a program. Thus, matching with credit limit is a challenge.
	Program Time-bound	Duration of every program is also fixed by years, which is same for all students in a cohort. Everyone can learn. But students learn different paces. Facilitating the students' learning accommodating every one of them in a same timeline is a challenge.
	Cultural Shock at Program level	Implementing OBE in the phase of designing a program curriculum is a paradigm shift. Senior academics – usually assigned for preparing

		curriculum – are rigid to changes in general. They are especially reluctant to change from teacher-centred to student-centred approach in education.
Preventable	Aligning with HEI Mission	PEOs must be mapped with the missions of the institution. In many universities, vision and mission are hardly found and/or outdated. In the case of an available institutional mission, it is rarely taken into consideration for necessary modifications in the course of time. The outdated mission is not possible to match with the PEOs of a degree offered in a current context. PEOs in the respective OBE curriculum are supposed to be formulated based on the immediate future context.
	Identifying PLOs	Program Learning Outcomes (PLOs) are prepared aligning with the PEOs. Courses (including the course contents) are to be chosen according to achieving the PLOs. Direction-wise, designing the learning outcomes has to be PLO-to-CLO. This is frequently a challenge as academics are traditionally inclined to design CLO-to-PLO.
	CLO-PLO Mapping	To achieve PLO, CLOs are to be planned. To achieve CLOs, certain course and/or course contents are fixed. This has to be the mapping. Many-a-times, after choosing a course, CLOs are remoulded for the sake of expected mapping with the list of PLOs.
	Cultural Shock at Course level	Implementing OBE in the phase of designing a course plan/outline is a paradigm shift. Many academics are rigid to course contents in general. They are reluctant to adapt teaching-learning for achieving the learning outcomes. Rather, they are comfortable stick to the course content by compromising intended learning outcomes.

Identified challenges lead to thinking of probable remedies. The next section describes the list of remedies proposed.

4. Proposing remedies for effective implementation

Remedial actions may reduce the intensity, or sometimes avoid the appearance, of a systemic challenge. Authors of this article have formulated some thoughtful proposals shown in Table 2 by the two categories.

TABLE 2 REMEDIAL PROPOSALS TO SYSTEMIC CHALLENGES OF OBE IMPLEMENTATION

Category	Systemic Challenge	Remedial Proposal
Unavoidable	Identifying PEOs	Assigned senior faculties – who will be formulating the PEOs – are expected to have adequate insights on OBE and the labour market trend in the discipline. They are additionally to be well-informed about the institutional vision and mission.
	Total Minimum Program Credit	No specific remedy has been proposed on this. In case of hardship of reaching the target of minimum credit, alternative level program (diploma, graduate diploma, etc.) may be chosen.
	Program Time-bound	Maintaining the suggested program time duration and semester/trimester time duration, time for teaching-learning can be adjusted according to achieving the intended learning outcomes. Training and experience of the faculty members may help the situation to overcome.
	Cultural Shock at Program level	An updated mindset is expected in the program head and curriculum designers regarding the reality of OBE implementation as a paradigm shift. PLOs are supposed to be formulated according to the PEOs set earlier keeping the students at the centre of thoughts. Traditionally, students were not in the centre.
Preventable	Aligning with HEI Mission	It is frequent that the missions of the institutions are not revised for a long time. This ignites this challenge. Revising the missions in every 4 to 5 years, perhaps along with the preparation of strategic plan of the HEI, can manage this challenge.
	Identifying PLOs	Formulating the set of PLOs has to be an automatic consequence of the OBE curriculum of a program. Correct set of PEOs identified from a rigorous need-based assessment should lead to formulating the appropriate set of PLOs. Identifying the PLOs must not be a stand-alone procedure only thinking of the contents to be taught.

	CLO-PLO Mapping	To achieve certain PLO(s), CLOs are to be planned after which the course must be designed. Keeping a course in mind, making out the list of CLOs from it and then mapping with certain PLOs is a complete disaster. A bursting awareness of the designer faculties on this matter will help get out of this.
	Cultural Shock at Course level	Traditionally, teachers are intended to teach their subjects for disseminating knowledge to students. Adapting with the realities of OBE education has been proposed by changing mindset of the course teachers. Gaining sufficient knowledge on this matter may improve the situation extensively.

The proposed remedial plans are catalytic to ensure the education quality confirming 'real' OBE implementation in the program. Sustainable Development Goals (SDGs) include goal # 4 of ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. Seven targets from 4.1 through 4.7 are to reach by 2030 all based on educational issues including gender parity, expected learning outcome, early childhood development, affordable quality education at every level, technical and vocation skills for employment and availing decent jobs, equal opportunities for vulnerable, disable and indigenous children, and promotion of peace and non-violence for sustainable development. The other three targets, numbered as 4.a, 4.b and 4.c, are supportive and complementary to achievement of the equitable quality education for all (United Nations, 2015).

Implementing OBE at an expected standard may ensure education quality in practice that has been suggested to the nations around the globe (UNESCO, 2021). According to this report, a new social contract must be grounded in human rights and based on principles of non-discrimination, social justice, respect for life, human dignity and cultural diversity that will strengthen education as a public endeavour and a common good.

Another UNESCO report – a background paper of initiative for future education – shows that uneven education approaches adversely affect expected learning outcomes (Face & Selwyn, 2021). The authors accept this evidence to compare with the situation of challenging realities of OBE implementation. Remedies are essential to mitigate the challenges and ultimately improve the success rate of intended learning outcomes.

For instance, courses from various disciplines properly designed by their learning outcomes and implemented with planned approaches of teaching-learning-assessment methods ensures better learning outcomes of students (Das *et. al*., 2025). This article showed the course level challenge mitigations by the course teachers and eventually reaching out to the expected target of learning outcomes.

5. Conclusion

OBE is a collective effort that involves philosophy, infra-structure, human resources, time, commitment and mindset of stakeholders. Successful implementation of OBE primarily depends on the internally engaged stakeholders in the process. A clear understanding of these implementing stakeholders help ensure the correct identification of its challenges and making action plans with remedial suggestions. As a result, the attainment of learning outcomes at both course and program levels can be successful. This paper put light on the whole matter systematically. The remedial proposals are expected to be directly helpful to –

- the senior academics and departmental heads who are responsible for preparing and reviewing the program curriculum,
- the practicing faculty members who design the course and take part in teaching, learning and assessment activities,
- the institutional authorities who provide resources and are involved in policy making for academic practices at an expected standard of quality.

The authors have identified at least two specific limitations of this study: (i) insufficient document review on OBE philosophy and implementation, and (ii) insufficient perspectives of OBE implementation to identify the challenges and subsequent remedial proposals. These limitations are trivial because of the novelty of the idea in the context of higher education in Bangladesh. Other researchers are expected to conduct further study on the topic in future for gaining more remarkable insights on successful implementation of OBE at higher education setting.

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Implementation of Outcome-Based Education (OBE) in Higher Education in Bangladesh: The Role of Institutional Support and Teachers' Competence

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Abstract
The implementation of Outcome-Based Education (OBE) has become an important educational reform initiative in higher education institutions in Bangladesh. This study investigates the effectiveness of OBE implementation with special focus on institutional support and teachers' competence. Using a mixed-methods research design, the study combines quantitative data collected from university teachers and qualitative insights from IQAC directors. The findings indicate that although many universities have formally adopted OBE frameworks, practical implementation remains inconsistent due to inadequate training, heavy workload, limited resources, and insufficient institutional guidance. The study further reveals that teachers' understanding and competency significantly influence the successful alignment of teaching, learning outcomes, and assessment practices. Institutional support through training programs, monitoring systems, and workload management was also identified as a key factor in improving OBE practices. The study highlights the need for stronger faculty development initiatives and sustained institutional commitment for effective OBE implementation in Bangladesh.

Keywords: Outcome-Based Education, Higher Education, Institutional Support, Teacher Competence, Bangladesh, IQAC

1. Introduction

Outcome-Based Education (OBE) is a learner-centered educational approach that focuses on clearly defined learning outcomes and measurable student achievement. Unlike traditional education systems that emphasize content delivery, OBE prioritizes what students are able to know, understand, and perform after completing a course or program. In recent years, the University Grants Commission (UGC) of Bangladesh has encouraged higher education institutions to adopt OBE as part of curriculum reform and quality assurance practices.

However, despite its growing importance, the practical implementation of OBE remains challenging in many universities. Major obstacles include inadequate institutional preparedness, limited teacher training, and insufficient technological and administrative support. Many institutions have adopted OBE within short timelines, often four to six months without ensuring that faculty members possess the necessary pedagogical competence or that curricula and assessments are properly aligned with learning outcomes. These gaps have led to a policy–practice mismatch, where OBE is formally introduced but not effectively integrated into classroom teaching.

To explore these issues, this study employs a mixed-methods approach combining quantitative surveys of university teachers and qualitative interviews with IQAC directors and quality assurance officials. The aim is to identify the key barriers to OBE implementation in Bangladesh and to examine how institutional support and teacher competence influence the success of this educational reform.

2. Program Outcomes, Bloom's Domains, Assessment Tools, and Implementation Challenges in Bangladesh

To better understand the barriers to OBE implementation, this study maps selected Program Outcomes (POs) against Bloom's domains and the assessment tools typically used in Bangladeshi universities. The table also highlights the key challenges faced by institutions and teachers in aligning assessments with intended learning outcomes.

TABLE 1 PROGRAM OUTCOMES, BLOOM'S DOMAINS, ASSESSMENT TOOLS, AND IMPLEMENTATION CHALLENGES

Program Outcome (PO)	Bloom's Domain	Assessment Tools	Key Implementation Challenges in Bangladesh
PO1 – Knowledge & Understanding	Cognitive (K1–K4)	Exams, Assignments	Over-reliance on rote memorization; teachers lack training in outcome-based question design
PO2 – Problem Solving	Cognitive (K3–K4)	Case Studies, Projects, Exams	Difficulty aligning assessments with CLOs/PLOs; limited competence in designing higher-order tasks
PO3 – Design & Innovation	Cognitive (K5–K6)	Projects, Open-ended Labs	Resource shortages (labs, ICT tools); insufficient institutional funding and infrastructure
PO7 – Communication & Teamwork	Affective	Group Assignments, Presentations	Heavy workload limits collaborative activities; lack of institutional encouragement for teamwork
PO11 – Lifelong Learning	Affective (K8)	Independent Assignments, Research Projects	Weak institutional support for self-directed learning; poor access to digital resources
PO12 – Entrepreneurship & Professional Ethics	Affective & Cognitive	Case Studies, Projects, Internships	Lack of industry collaboration; teachers' limited exposure to entrepreneurial practices

3. Findings and Discussion

The study identifies several factors influencing the effectiveness of OBE implementation in Bangladesh. Teachers generally acknowledge the importance of OBE; however, many report insufficient training and difficulty in designing outcome-based assessments. Institutional support in the form of professional development, ICT facilities, and workload management significantly affects OBE practices. In addition, resistance to change among faculty members and limited resources continue to hinder effective implementation. The findings also reveal that universities with stronger IQAC monitoring systems demonstrate better alignment between learning outcomes and assessment practices.

3.1 Institutional Support and Its Challenges

Effective OBE implementation depends heavily on institutional commitment. Universities must provide clear policies, adequate infrastructure, and continuous monitoring mechanisms. In Bangladesh, several challenges persist:

- Policy Gaps: Many institutions lack comprehensive OBE guidelines, leading to inconsistent practices across departments.
- Resource Constraints: Limited access to modern teaching aids, digital platforms, and assessment tools hampers effective implementation.
- Administrative Resistance: Institutional inertia and reluctance to adopt new frameworks slow down the transition.
- Quality Assurance Issues: Accreditation bodies emphasize OBE, but universities often struggle to meet the required standards due to weak internal quality assurance systems.

3.2 Teachers' Competence and Pedagogical Challenges

Teachers are central to OBE, yet their competence in designing and delivering outcome-based curricula remains a major challenge in Bangladesh.

- Lack of Training: Many faculty members have not received formal training in OBE pedagogy, assessment design, or constructive alignment.
- Traditional Mindset: A reliance on lecture-based teaching and rote assessments persists, making it difficult to shift toward student-centered learning.
- Assessment Difficulties: Designing outcome-based questions, projects, and case studies aligned with Bloom's Taxonomy requires skills that many teachers have yet to develop.
- Workload Pressure: Faculty members often face heavy teaching loads, leaving little time for curriculum innovation or outcome-based assessment design.

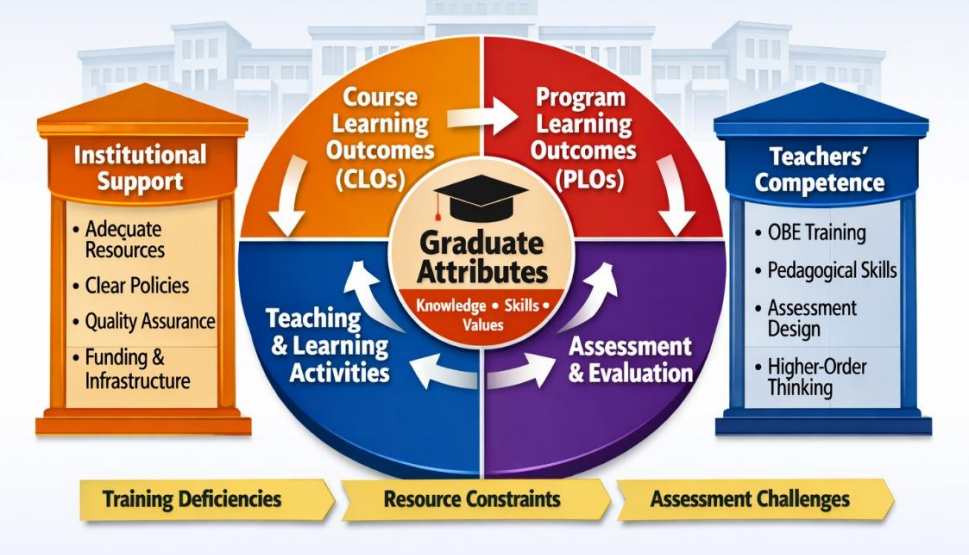


Fig.1 Conceptual Framework of OBE Implementation

4. Conclusion

The study concludes that the successful implementation of Outcome-Based Education in Bangladesh depends largely on institutional support and teachers' competence. Although universities have adopted OBE frameworks to improve quality assurance and student learning outcomes, significant challenges remain in terms of training, resources, and practical implementation. Strengthening faculty development programs, improving workload management, and ensuring continuous institutional support can contribute to more effective OBE practices in higher education.

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Student Mentoring System Assisted by Model of Motivation in Higher Education

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Abstract
Successful transition of higher education from high-school education for the diverse group of students is a vital concern. A holistic and effective student mentoring might be the critical strategy for enhancing quality teaching-learning and student development in higher education. This paper explores the concept, structure and function of a mentoring system through systematic advising, consulting and counseling process. It also introduces several models of motivation for both of the mentors and mentees to facilitate mentoring process. The proposed mentoring approach is figured to fit with outcome-based education system and accreditation requirement. The study suggests that structured mentoring system along with various models of motivation will significantly improve teaching-learning effectiveness, student engagement and institutional reputations.

***Keywords**:* Student mentoring, Student advising, Student consulting, Student counseling, Model of motivation, Higher education, Teaching–learning, OBE system.

1. Introduction

The Higher educational institutions (HEI) are increasingly expected to deliver high-quality teaching-learning to produce competitive graduates through student-centered learning management system [1 - 4]. One of the most effective approaches to assist that achievement is the mentoring system [2 - 4]. A holistic mentoring program provides guidance, support, and knowledge transfer between experienced teacher (mentor) and less experienced student (mentee), thereby enhancing both teaching quality and learning outcomes [Oinam D. S., 2017].

In academic settings, mentoring can occur at multiple levels, including faculty-to-faculty, faculty-to-student, and peer mentoring with motivational approaches [5 - 7]. This paper investigates faculty-to-student mentoring to contribute quality teaching-learning through a mentoring framework and proper management system. In addition, a set of models of motivation is introduced to stimulate students toward their successful endeavor of higher education along with professional development. It is believed that planning, execution and control of such a combined and structured mentoring system with motivational reinforcement will definitely enhance student's academic, personal and career development.

2. Concept of Student Mentoring

The effectiveness of OBE system depends on the alignment between CLOs, PLOs, teaching methods, and assessments. Student mentoring is considered to be an essential tool to support and execute OBE practice. Mentoring is a process to share knowledge and information by a person of higher experience to a person of comparatively less experience. In tertiary level education of university, orientation of fresh high school graduates from diverse background, economy, society and culture takes place. As a result, mentoring system is necessarily inserted in the curriculum to nursing students for their shaping from the beginning of initiation. A holistic monitoring system comprises planning, execution, monitoring, feedback and reporting for effective student's development and teaching-learning. The crucial concern is how the monitoring system will be planned and executed to conform to university's vision, mission and objectives. The following are some of important mentoring phases proposed to design and implement for effective student's transformation and holistic development.

3. Structure of Student Mentoring

Entire mentoring process for the university students can be realized based on the three vital phases, namely: Student's advising, Student's consulting and Student's counselling.

3.1 Student's advising

Student's advising is a process to advice students to advance their academic activities and performance smoothly as per student's academic outcomes (CO, PO) and credentials (GPA). A designated departmental teacher is responsible to maintain student advising of a group of students throughout their tenures.

3.2 *Student's consulting*
Student's consulting is a process to consult with the students of the class to resolve their regular class issues on class contents, teaching-learning performance or even career development and co-curricular activities. The course teacher is responsible to conduct student consulting during specific time of the semester.

3.3 *Student's counselling*
Student's counselling is a process to council at-risk and weak students of the department for supporting them with necessary suggestion and guidelines to resolve their academic and non-academic issues. The faculty members of the department are assigned by the department/university to conduct counselling session after every semester.

4. Management of Student Mentoring

The management of mentoring process can be performed by planning, execution and control of all the three phases of mentoring by means of suitable tools, techniques and resources. The policy and process of all the mentoring phases are demonstrated as follows.

4.1 Management of Student's advising
The first step of student's advising is to prepare a plan based on objectives, framework, resource, methodology, tools and schedule. The plan may be developed by the department or university authority based on advising policy. The second step is to execute the advising process by the assigned faculty member, called student advisor, by means of suitable advising management software. The advisor will assess student's overall status and performance and assist students to select suitable courses accordingly during course registration for the following semester. Besides, student advisor may also conduct tutorial and foundation class/training to make up student's deficiency. The entire advising process will be managed, recorded and monitored to facilitate the third step of advising, that is, feedback and control of student's performance and necessary action plan. In student's advising process, all the students of a cohort are continuously supervised by a group of student advisors until their graduation.

4.2 Management of Student's consulting
The first step of student's consulting is to prepare a schedule based on class routine and availability of the course teacher. The course teacher must encourage and motivate class students to utilize the consulting facilities to resolve their regular academic and non-academic issues. In the second step, the course teacher will conduct consulting sessions effectively as a group or individual student after every continuous assessment and record the discussion point and student's information for future reference and documentation. In the third step, the course teacher will track the class activities and student performance based on consulting process and make necessary action plan for further consulting and preparation of formative assessment.

4.3 Management of Student's counseling
The first step of student's counseling is to prepare a policy to identify the at-risk and weak students after every semester based on specific performance indicators. The second step is to assign departmental teacher as a counselor to execute the counseling process for the vulnerable students of the program. Special attention and critical analysis are required in this phase of mentoring as diverse issues are encountered with these vulnerable students. In particular cases, the students may be referred to the medical/psychological counseling. The entire counseling activities must be recorded, monitored and utilized for future reference and necessary action plan. The sequence of counseling process may be considered as follows.

- Recording student summary
- Tracking class attendance and performance
- Observing continuous assessment performance
- Identifying vulnerable students
- Conducting Counseling
- Preparing report

5. Student's Performance Tracking and Targeting

To facilitate the tracking and targeting of student's performance, student background information is collected from the beginning of the semester by the course teacher. A template of student summary is displayed in Table 1. Students are tracked and targeted based on student background summary and current performance (score, GPA, CO-PO, attendance, engagement etc.) to conduct mentoring effectively and consistently. A graphical tool is used to track and target the student's CGPA for proper guiding in mentoring session as shown in Fig. 1. The graph guides the student to take necessary action based on the target slope from the degraded CGPA.

A flow chart is developed as shown in Fig. 2 to conduct the consulting/counseling session where students are assessed in various aspects and guided by the course teacher accordingly. The chart helps the course teacher to identify root causes of the issues and hence find a necessary solution for the students. Finally a report is generated to record the data for future reference and accreditation purpose. A template of consulting report is presented in Table 2.

TABLE 1 TEMPLATE OF STUDENT BACKGROUND SUMMARY

S/N	Student Name	Student ID	Residence location	Other Job/Business (Yes/No)	Home Tutoring (Yes/No)	Current CGPA	Target CGPA	Attendance Status [%]
1								

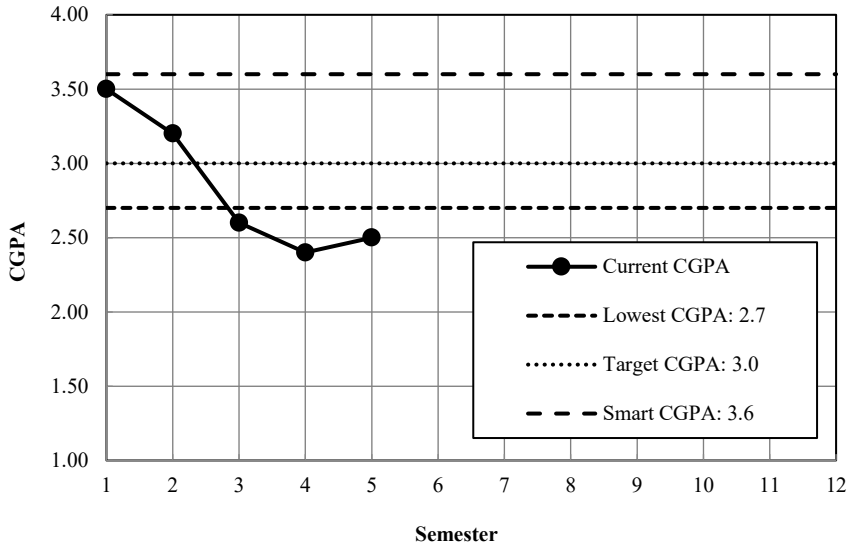


Fig.1 A graphical tool is presented to track and target a student's CGPA to facilitate proper guiding in mentoring session.

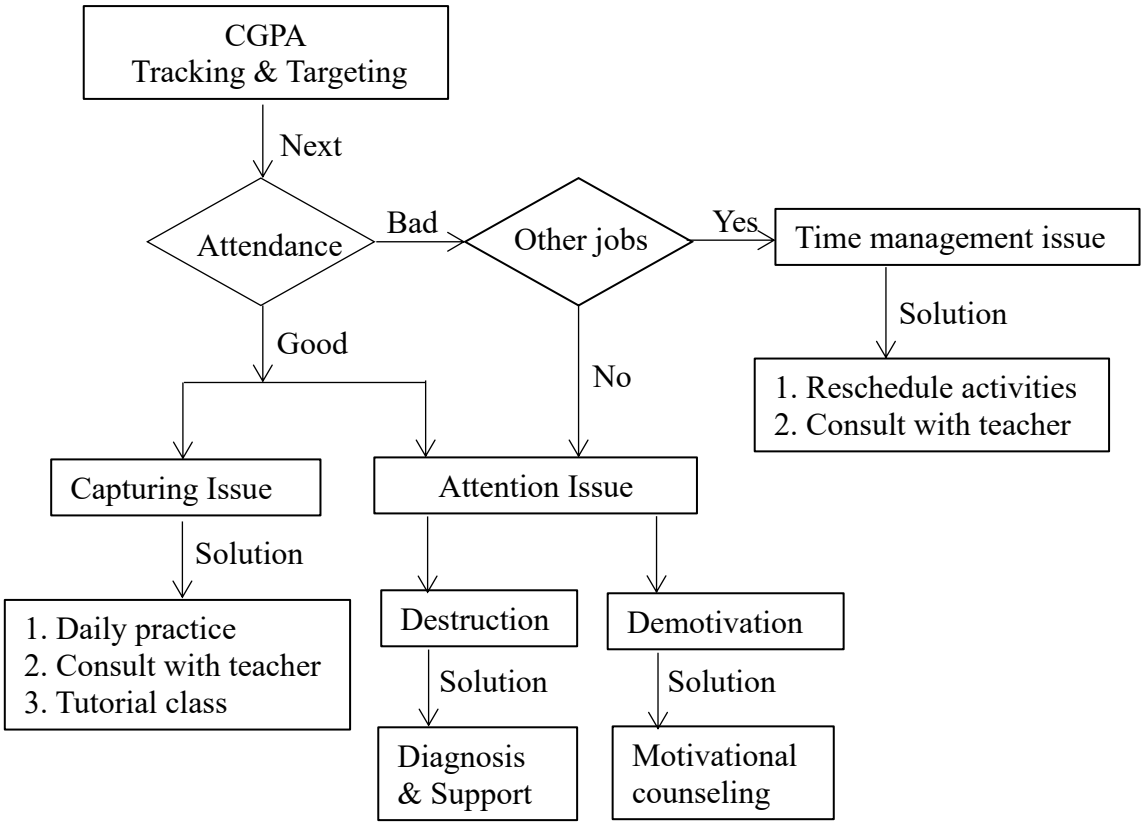


Fig. 2 A flow-chart is developed as a tool to conduct counseling/consulting effectively and consistently

TABLE 2 A SAMPLE OF COUNSELING REPORT

S/N	Student Name	Student ID	Counseling Date	Student Issues	Teacher Feedbacks
1	***** X	*****	*****	* Not regular in lesson preparation * Not regular in classes * Class attention problem * Shy to contact course teacher	* Provided academic support, counseling and suggestion. * Student is committed to be regular in class, home works and practices

6. Models of Student Motivation

Constructive enforcements play a vital role to convince and motivate learners. The following models are some of motivational tools to encourage students in the process of student mentoring.

6.1 Model of Critical Thinking

Value is the foundation of one's moral and ethics that shapes ultimate behavior. Critical thinking is an interactive workdone by mind and brain. People's mind encounters diverse issues and dilemmas in everyday life. People's mind seeks help from brain to resolve the issues and becomes stable with a suitable solution. In fact, the mind-brain interaction is a systematic process that occurs sequentially based on value, ethics and behavior of human as demonstrated in Fig. 3. The entire process is an iterative action and hence requires critical thinking to find the right and justified solution. Demonstration of this critical thinking model will surely enrich students with much matured thinking and decision-making skills.

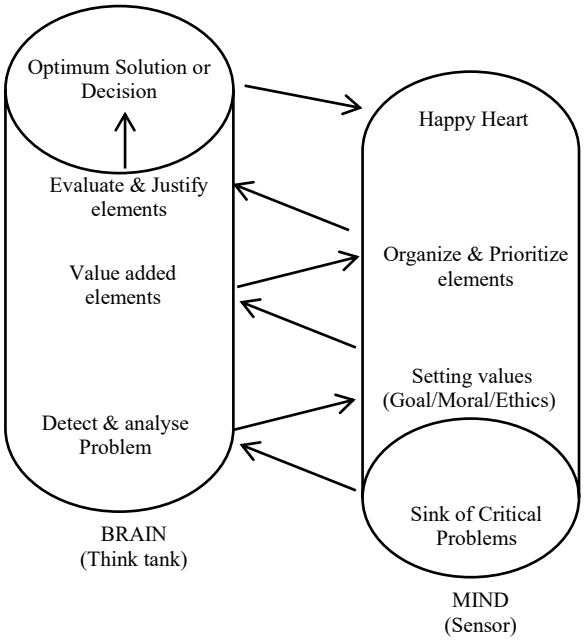


Fig. 3 Model of critical thinking as a function of interaction between brain and mind

6.2 Model of Cycle of Intelligence

The critical thinking may be properly accomplished by the help of harmony of diverse intelligences namely, basic intelligence, core intelligence, developmental intelligence, emotional intelligence and artificial intelligence. Students might be able to achieve those harmonized diverse intelligences through student lifecycle in higher education which is modeled by the concept of "Cycle of Intelligence".

In the first stage of life, initially one is guided by the basic intelligence. In fact, basic intelligence is intrinsically associated with one's core intelligence to focus personal values. With the course of time, in order to adapt with broader aspects in social and professional life, depth of basic intelligence and breadth of core intelligence are required to grow up through developmental intelligence with the help of artificial intelligence (as an innovation) and emotional intelligence to complete the cycle of intelligence for one's life. The structure and interdependence of various intelligences are demonstrated in the model of "Cycle of Intelligence" and shown in Fig. 4.

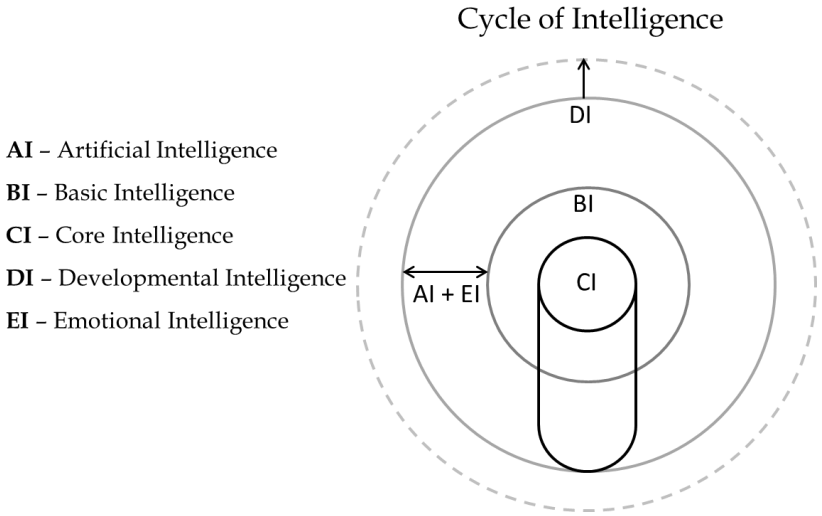


Fig. 4 Structure and interdependence of various intelligences are demonstrated in the model of "Cycle of Intelligence".

Concepts of five intelligences are defined as follows.

(a) *Artificial intelligence* (*AI*)
AI is the teaching machine to "think" and "learn" as that of human being and hence they can help people to resolve issues and perform tasks intelligently.
(b) *Basic intelligence* (*BI*)
BI is the foundation of human thinking leading to learning, reasoning, problem-solving, and adapting to regular situations. The breadth of *BI* is larger as compared to depth.
(c) *Core intelligence* (*CI*)
CI is more deeper, essential and most critical part of intelligence that is analytical, in-depth, and focused on a critical situation. The breadth of CI is limited as compared to depth as shown in Fig. 4.
(d) *Developmental intelligence* (*DI*)
DI is the ability to grow, adapt, and enhance one's cognitive, emotional, and social skills over a period of time. It depends on the state of moral development and life experiences**.**
(e) *Emotional intelligence* (*EI*)
EI is the ability to recognize, understand, manage, and influence emotions. It plays a crucial role in communication, relationships, decision-making, and leadership of individual and professional life.

6.3 *Model of Success*
Success is the ultimate target of student life in terms of academic credential and career development. Dismantling the theme of success might be one of the important constructive enforcements for the students in mentoring process. Concept of total success can be considered as an analogy of total energy of a body consisting of potential and kinetic energy. Ultimate success is accomplished by the combined effect of potential knowledge and efforts through a successful workdone. Accordingly, the Newton's law of motion can be considered to define knowledge and effort as an analogy of potential energy and kinetic energy which are mathematically demonstrated in Eq. (1) and (2) respectively. It can be noted that the coefficient, ½ is remaining in the equation in order to hold the Newton's law of motion which is not scientifically justified in this proposition.

$$\text{Knowledge, } K = mgh \tag{1}$$
$$\text{Effort, } E = (1/2)mv^2 \tag{2}$$

Where, m = merit, g = gravity of academic & experiential stress, h = height of degree and experience and v = velocity or motion of effort.

Eventually a graph of success can be developed and visualized as in Fig. 5 as a function of potential knowledge and motion of efforts. It is obvious from the analogy of Newton's law of motion that success depends on knowledge linearly, whereas it depends on motion of efforts exponentially. Therefore, it implies that effort is more crucial than potential knowledge to get a success.

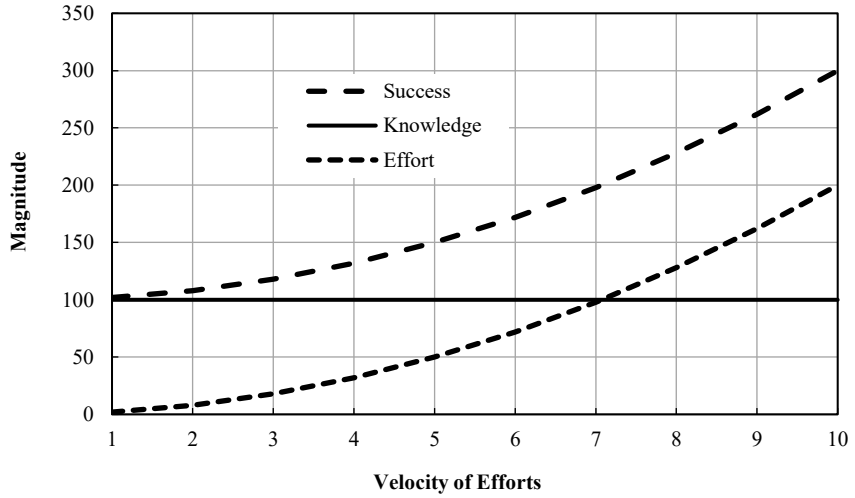


Fig.5 Ultimate success has been modeled by the effect of potential knowledge and motion of efforts, where motion of efforts elevates success drastically compared to knowledge.

7. Conclusion

This paper proposes a concept of student mentoring in higher education with the phases of student advising, student consulting and student counseling. A systemic approach of planning, execution and quality control are addressed to accomplish the mentoring process in diverse aspects. Various management tools, templates and flowchart are also introduced to facilitate the student consulting, counseling and reporting. In order to motivate students, several motivational models have been presented focusing on critical thinking, intelligence and ultimate success. It is believed that the concept of integrated student mentoring and relevant models of motivation will be very useful for executing student mentoring effectively and consistently in higher education.

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Determinants of Research Interest in HEIs: Mediating Role of Knowledge Sharing

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Abstract
Research interest (RI) among academicians is essential for strengthening the quality of higher education, research productivity, and institutional competitiveness. However, inadequate research environments in Bangladeshi higher education institutions (HEIs) often discourage faculty members from engaging in scholarly activities. Therefore, this study investigates the effects of institutional support (IS) and interpersonal trust (IT) on academicians' RI, with knowledge sharing (KS) serving as a mediating variable. Grounded in the theory of planned behavior, the study employed a quantitative research design and collected data from 401 faculty members of Bangladeshi public universities using a self-administered questionnaire. The data were analyzed using PLS-SEM. The findings reveal that IT and KS significantly influence RI, and that KS significantly mediates the relationships among IS, IT, and RI. However, IS did not show a significant direct effect on RI. The study contributes to the literature on research engagement and knowledge management by explaining the behavioral mechanism through which institutional and interpersonal factors shape academicians' research interest in HEIs.

***Keywords**:* Research Interest, Institutional Support, Technological Support, Interpersonal Trust, Knowledge Sharing, Faculty Member, Higher Educational Institutions

1. Introduction

SDG 4 emphasizes inclusive and equitable quality education, as well as the promotion of lifelong learning opportunities for all (Elfert, 2019). Within this global agenda, research has emerged as a critical priority for HEIs. Besides, HEIs' global ranking systems place strong emphasis on research-related indicators, including publication output, citation impact, and international collaboration. In this regard, faculty members' scholarly contributions play a significant role (Moher et al., 2018). Beyond institutional benefits, research activity improves teaching quality by integrating contemporary knowledge into curricula and fostering critical thinking among students. At the individual level, research output is closely associated with academic career advancement, promotion, recognition, and leadership opportunities (Lambovska & Todorova, 2021).

Recently, Bangladeshi HEIs have made notable progress in research output and global rankings (Ali, 2026). However, these institutions have been facing challenges in an improper research environment (Alam et al., 2026; Chowdhury et al., 2020; Hasan et al., 2024; Roy & Habib, 2024), which consequently makes academics feel disengaged from research (Biswas & Majumder, 2026). If this scenario persists, the teaching and learning environment in the country's HEIs will not improve (Chowdhury et al., 2020), and quality education will be limited to IQAC only. Therefore, understanding the elements that can influence academics' scholarly works is crucial.

The literature indicates that adequate research infrastructure and individual perceptions significantly bolster an academician's motivation towards research (Fauzi et al., 2019). Accordingly, both institutional and interpersonal factors have been identified as powerful stimulators of RI among the academics (Gusho et al., 2023; Li & Xu, 2024; Zanabazar et al., 2024). Although few studies attempted to explain academics' research performance and research productivity by employing these factors, their combined effects on RI remain underexplored. Moreover, existing studies have overlooked how faculty members' behaviors can serve as an underlying mechanism through which institutional facilities and interpersonal trust may lead to their RI. Thus, the present study proposes knowledge sharing as an intervening variable to investigate how institutional and individual factors impact RI. The study chooses KS because it demonstrates a strong behavior that academicians may adopt to establish a research-oriented environment within the HEI (Al-Kurdi et al., 2018; Ananda et al., 2022; Fauzi, 2023).

In the research world, when academic staff engage in knowledge exchange, it profoundly influences their collaborative research, academic excellence, and competitiveness (Ahmad & Karim, 2019; Al-Kurdi et al., 2018; Karim, 2023). The literature further suggests that IS and IT may shape academics' KS behavior (Al-Kurdi et al.,

2018; Farooq, 2018; Mutahar et al., 2022; Yeshinegus & Hong, 2022), which, in turn, enhances their intention and willingness to engage in research activities (Aulawi, 2021; Fauzi, 2023). Based on the preceding discussion, this study aims to examine the following question: do institutional support and interpersonal trust enhance academics' research interests in HEIs, with a focus on the mediating effect of KS?

2. Literature Review

2.1 Institutional Support and Research Interest

Institutional support plays a critical role in enhancing faculty research interest by providing essential resources, policies, and enabling environments (Akosile & Olatokun, 2020; Jolaee et al., 2014). It includes infrastructure, funding, technological tools, administrative services, and incentive systems, along with mechanisms such as training, mentorship, and collaborative research opportunities that facilitate knowledge creation and sharing (Jolaee et al., 2014). Empirical evidence shows that access to research resources and supportive policies significantly improves research interest and job satisfaction (Creswell, 2014), while recognition and incentives strengthen motivation and engagement (Fauzi et al., 2019). Research funding is a key determinant of scholarly output, and mentorship and collaborative networks further enhance research skills and publication performance (Merga & Mason, 2021). Additionally, supportive leadership, manageable workloads, and a research-oriented culture are crucial in sustaining academicians' research interest and engagement (Aboagye et al., 2021; Frantz et al., 2022; Mafindi, 2024).

2.2 Interpersonal Trust and Research Interest

Interpersonal trust refers to faculty members' confidence in colleagues' integrity, competence, and reliability, which is essential for collaboration. Trust fosters open communication and knowledge sharing, enhancing joint research outcomes (Utomo et al., 2020). It also increases willingness to share knowledge without fear of misuse, strengthening collaborative research processes (Sabetzadeh & Chen, 2025). Interpersonal trust promotes organizational commitment and engagement (Laschinger et al., 2000; Zanabazar et al., 2024). Furthermore, it creates psychological safety, encouraging creativity, risk-taking, and innovation in research (Mehmood et al., 2022).

2.3 Institutional Support and Knowledge Sharing

Institutional support plays a central role in promoting KS among faculty by providing resources, infrastructure, and a supportive organizational culture. Leadership commitment, resource allocation, and enabling policies encourage open communication and collaboration, thereby enhancing KS behaviours. Evidence shows that supportive institutional factors increase faculty engagement in knowledge exchange, as demonstrated in structured research networks that improve collaboration and research output (Al Rushud, 2021; Yeshinegus & Hong, 2022). However, inadequate facilities, lack of rewards, and unsupportive leadership can hinder KS practices (Yeshinegus & Hong, 2022). Additionally, institutional strategies and incentives are essential to overcome resistance and promote sustainable KS practices (Al-Kurdi et al., 2018).

2.4 Interpersonal Trust and Knowledge Sharing

Interpersonal trust is a key enabler of KS in academic environments, fostering collaboration, openness, and voluntary knowledge exchange among faculty members (Zhang et al., 2023). Trust reduces perceived risks related to knowledge misuse, intellectual property infringement, and a lack of reciprocity, thereby encouraging both tacit and explicit knowledge sharing (Mutahar et al., 2022). Empirical studies show that trust positively influences collaborative behaviors and increases the frequency and quality of KS interactions (Al-Kurdi et al., 2018; Johan, 2021). Furthermore, interpersonal trust enhances psychological safety, which is essential for open communication and innovation (Deredzai & Goronga, 2025; Vaida & Ardelean, 2019). Interpersonal trust strengthens the relational conditions necessary for sustained and effective knowledge sharing in higher education settings.

2.5 Knowledge Sharing and Research Interest

Knowledge sharing among faculty members has a significant positive influence on research productivity by strengthening collaboration, enhancing intellectual capital, and improving institutional research outcomes. KS facilitates interaction among academics, enabling the exchange of expertise and ideas that lead to more innovative and higher-quality research outputs (Selmer et al., 2014). Through active knowledge sharing, faculty members build collaborative networks that increase engagement in joint research and publication output.

Empirical evidence confirms that KS directly improves research capacity and productivity in HEIs (Pham et al., 2023). It promotes the generation of new knowledge and increases the dissemination of research findings through publications and scholarly communication (Ahmad & Karim, 2019). KS enhances research productivity by

fostering collaboration and collective problem-solving within academic environments, ultimately strengthening the research performance and scholarly impact of faculty members (Ahmad & Karim, 2019; Pham et al., 2023; Selmer et al., 2014).

2.6 Mediating Role of Knowledge Sharing

Knowledge sharing serves as a critical mediating mechanism that links organizational and individual factors to faculty research productivity. Rather than acting as an independent predictor, KS operates as a conduit through which institutional support and interpersonal trust are translated into enhanced research outcomes. Empirical evidence confirms that KS significantly mediates the relationship between organizational conditions and research performance, improving both the quality and quantity of scholarly outputs (Aulawi, 2021).

Prior studies further demonstrate that KS mediates the effects of organizational support and facilitating conditions on innovative behaviour and productivity (Fauzi et al., 2019; Ahmad et al., 2023). Similarly, KS has been shown to transmit the influence of intrinsic motivation, high-performance work systems, and leadership into research creativity and performance (Hassan & Din, 2019; Chen et al., 2024). Research grounded in behavioural frameworks also confirms that KS mediates the relationship between attitudinal factors and research productivity (Syed et al., 2021). Thus, KS functions as a central explanatory mechanism that converts structural and relational inputs into tangible research outcomes in academic settings.

2.7 Theoretical Framework

This study is grounded in the Theory of Planned Behavior, which posits that individuals' behavioral intentions are shaped by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). In the context of HEIs, academicians' research interests can be conceptualized as a form of behavioral intention influenced by both individual perceptions and contextual factors. IS contributes to perceived behavioral control by providing resources, funding, and research infrastructure, thereby enhancing academicians' confidence in their ability to conduct research (Ajzen, 1991; Raza et al., 2021). IT influences subjective norms by fostering a collaborative environment where knowledge exchange and research engagement are socially encouraged (Tan, 2015). KS reflects both attitudinal and behavioral components, as positive attitudes toward collaboration increase engagement in KS activities (Hassan & Din, 2019).

Within this framework, KS operates as a mediating mechanism that translates IS and IT into stronger RI. Empirical evidence suggests that KS enhances engagement, collaboration, and motivation, thereby strengthening behavioral intentions toward research (Fauzi et al., 2019). Thus, TPB provides a robust theoretical basis for explaining how contextual and social factors influence academicians' research interests through KS.

2.8 Development of Hypotheses

Based on an extensive review of relevant literature and guided by the theoretical foundation of TPB, the following hypotheses have been developed to structure the present study:

Hypothesis 1: Institutional support significantly influences research interest.
Hypothesis 2: Interpersonal trust significantly influences research interest.
Hypothesis 3: Institutional support significantly influences knowledge sharing.
Hypothesis 4: Interpersonal trust significantly influences knowledge sharing.
Hypothesis 5: Knowledge sharing significantly influences research interest.
Hypothesis 6: Knowledge sharing significantly mediates the relationship between institutional support and research interest.
Hypothesis 7: Knowledge sharing significantly mediates the interpersonal trust-research interest relationship.

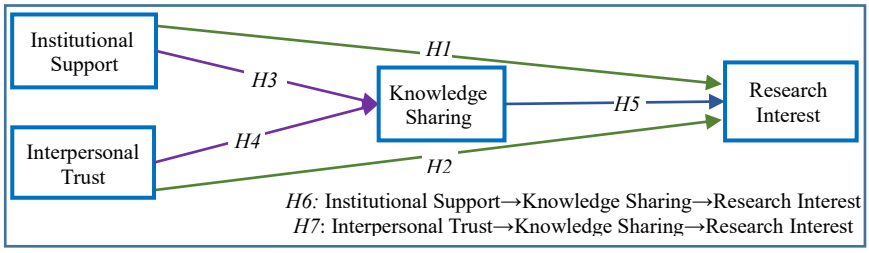


Fig.1 Research Framework

3. Methodology

3.1 Sample Frame and Data Collection

The study was conducted among faculty members of Bangladeshi public universities. The reason for choosing public universities is the substantial differences in organizational culture, working environment, and work settings between private and public universities (Iqbal et al., 2023), which may have different impacts on the study variables. Thus, the total number of academicians across the 53 public universities in Bangladesh is 17,042 (UGC, 2025), constituting the study's population. Data were collected from faculty members with at least 2 publications in peer-reviewed journals and at least 1 year of experience as full-time teachers. This is because newly hired faculty may not see the need for research and scholarly work.

Krejcie and Morgan's (1970) Table shows that the sample size is 375–377 when the population size is 15000–20000. So, this research considers at least 377 samples for further statistical testing. Following Karim's (2023) findings on the response rate (38.5%) among academicians at Bangladeshi HEIs, this research planned to contact a total of 980 respondents (377*100/38.5 =) for data collection. Due to the unavailability of the academicians' database, the researcher contacted the respondents conveniently. A self-administered questionnaire (in a Google Form) was sent to respondents via email (collected from institutional websites) and posted to the University Teachers' Association of Bangladesh Facebook group. A forwarding note was attached to the questionnaire to introduce the research purpose and applicable directives, ensure data confidentiality, and request participation in the survey. The questionnaire had two sections: (i) respondents' demographic information and (ii) the items of the study variables. A five-point Likert scale was used to capture the responses.

The data collection period lasted 4 weeks, from mid-February to mid-March 2026. Upon completion of this period, the survey received a total of 408 responses. Of which, 7 responses were excluded due to outliers, leaving 401 responses to proceed. No missing values were found, since responding to each question was compulsory. To produce robust results, the study chooses PLS-SEM for data analysis.

3.2 Respondents' Profile

Of the 401 respondents, males constituted the majority (69.3%), while females accounted for 30.7%. The majority of respondents (53.2%) were aged 31-40, followed by those aged 41-50 (20.5%) and those aged under 30 (20.0%), while only 6.3% were aged 51 and above. A significant proportion of respondents held a Master's degree (52.2%), followed by PhD holders (28.8%) and MPhil holders (14.6%), while a small number held postdoctoral qualifications (4.4%). In terms of academic rank, assistant professors were the most represented group (38.5%), followed by associate professors (32.2%), professors (15.6%), and lecturers (13.7%). Most respondents (60.5%) had 6-15 years of experience, while 25.9% had less than 5 years, and 13.7% had more than 16 years. The majority of respondents (35.7%) had published 6-10 papers, followed by those with 11-15 publications (23.2%). Additionally, 17% had published 2-5 papers, 12.8% had published 16-20, and 11.3% had published 21 or more.

3.3 Measurements

The measurement of RI was adopted from Fauzi et al.'s (2019) six-item scale, adapted from Thoreson et al.'s (1990) current concern scale for academicians, which appropriately captured academicians' perceptions. To measure IS, this study adapted three items from Sveiby and Simons' (2002) scholarly work, modified by Jolaee et al. (2014) as the organizational support scale, and four items from Akosile and Olatokun's (2019) reward system scale. The study then measured IT using four items from Lin's (2006) interpersonal trust scale. Finally, KS was measured using a five-item knowledge-sharing scale, modified from Huang's (2009) study, which was originally adapted from Bock et al.'s (2005) research. The alpha value of 0.79 indicated the scale's reliability.

4. Results

4.1 Summary Statistics and Correlation

The mean scores (ranging from 3.64 to 4.17) indicate a moderately positive perception of the study variables among respondents. The correlation coefficients indicate that all variables are significantly correlated with both KS and RI, suggesting that IS and IT play crucial roles in promoting both KS and RI. Also, KS is significantly associated with RI. For detecting potential common method variance (CMV), this study computed variance (45.98%) using Harman's single-factor test, which was well below the 50% threshold (Kumar, 2012), thus indicating CMV was not found to be a substantial issue in this study. Further, the study assessed multicollinearity among the constructs using PLS-SEM (Kock, 2015). The Variance Inflation Factor (VIF) values (ranging from 1.31 to 2.79) were below the threshold of 5, confirming the absence of multicollinearity (Hair et al., 2021).

4.2 Measurement Model

The study assessed the validity and reliability of the measurement items using the PLS-SEM approach (See Table 1). Reliability of the items was assessed using their item loadings. Items with loadings above 0.50 have been retained; thus, two items (IS4 and IS7) were removed (Hair et al., 2010). Composite reliabilities (CR) were greater than 0.70, indicating adequate consistency among the constructs. All the constructs met the average variance extracted (AVE) threshold of 0.5, demonstrating strong convergent validity (Hair et al., 2010). Further, the study assessed discriminant validity employing the HTMT Ratio. All HTMT values were below the recommended threshold of 0.90 (Gold et al., 2001; Henseler et al., 2015); thus, this study demonstrated discriminant validity.

TABLE 1 MEASUREMENT MODEL: RELIABILITY AND CONVERGENT VALIDITY

Constructs	Items	Loadings	Average Variance Extracted	Composite Reliability
Institutional Support	IS1	0.86	0.62	0.87
	IS2	0.87		
	IS3	0.85		
	IS5	0.55		
	IS6	0.77		
Interpersonal Trust	IT1	0.96	0.92	0.97
	IT2	0.96		
	IT3	0.96		
	IT4	0.96		
Knowledge Sharing	KS1	0.53	0.51	0.76
	KS2	0.77		
	KS3	0.66		
	KS4	0.81		
	KS5	0.76		
Research Interest	RP1	0.67	0.59	0.87
	RP2	0.84		
	RP3	0.77		
	RP4	0.79		
	RP5	0.74		
	RP6	0.79		

4.3 Structural model

The study evaluated the structural model to estimate the statistical significance of the structural paths between the constructs, employing a two-tailed test and 10,000 bootstrap subsamples (Ringle et al., 2020). Table 2 shows that IS has no significant influence on RI ($\beta = 0.08$, $t = 1.27$, $p = 0.20$), thus rejecting H1. IT and KS have a significant impact on RI ($\beta = –0.24$, $t = 5.23$, $p < 0.05$; and $\beta = 1.18$, $t = 8.13$, $p < 0.05$, respectively), therefore, supporting H2 and H5. Similarly, IS and IT emerge as significant predictors of KS, with $\beta = 0.21$ ($t = 6.23$, $p < 0.05$) and $\beta = 0.14$ ($t = 3.77$, $p < 0.05$), thereby supporting H3 and H4. Moreover, results demonstrated that KS significantly mediates the relationships between IS and RI ($\beta = 0.25$, $t = 4.76$, $p < 0.05$) and between IT and RI ($\beta = 0.81$, $t = 7.01$, $p < 0.05$); hence, H6 and H7 are supported.

The coefficient of determination (R^2) values indicate that all the latent variables (IS and IT), along with KS, explained 64% of the variance in RI; the three exogenous variables (IS and IT) explained 89% of the variance in KS, reflecting a moderate level and a substantial level of predictive accuracy, respectively (Hair et al., 2017). The f^2 of IS (0.01) and IT (0.09) demonstrated small effect sizes, whereas KS (0.42) showed a substantial impact on the R^2 for RI (Cohen, 1988). Also, f^2 of IS (0.16) exhibited a medium effect, and IT (0.10) showed a small effect on the R^2 for KS (Cohen, 1988). Finally, the results show that the Q^2 values for RI (0.47) and KS (0.94) are both substantially above zero, confirming strong predictive relevance for the constructs (Hair et al., 2017).

TABLE 2. RESULTS OF HYPOTHESES TESTING

Hs	Relationship	Beta	SD	T values	P values	Decision	R^2	f^2	Q^2	BCCI (2.5%-97.5%)
H1	IS→RI	0.08	0.07	1.27	0.20	Rejected	0.64	0.01	0.47	[-0.05-0.21]
H2	IT→RI	-0.24	0.05	5.23	0.00	Accepted		0.09		[-0.33-0.15]
H3	IS→KS	0.21	0.03	6.23	0.00	Accepted	0.89	0.16	0.94	[0.14-0.27]
H4	IT→KS	0.14	0.04	3.77	0.00	Accepted		0.10		[0.07-0.21]
H5	KS→RI	1.18	0.15	8.13	0.00	Accepted		0.42		[0.90-1.47]
H6	IS→KS→RI	0.25	0.05	4.76	0.00	Accepted				[0.15-0.36]
H7	IT→KS→RI	0.81	0.12	7.01	0.00	Accepted				[0.08-0.26]

Note: $p < 0.05$
Note: RI = research interest, IS = institutional support, IT = interpersonal trust, KS = knowledge sharing, BCCI = bias-corrected confidence intervals.

5. Discussions and Conclusions

5.1 Discussion

The findings supported all hypotheses except H1, indicating that IT and KS significantly influence academics' RI, and that KS mediates the relationships among IS, IT, and RI. Contrary to expectations, IS had no significant direct effect on RI, suggesting that institutional resources alone are insufficient to stimulate research interest. Instead, IS indirectly enhances RI by fostering KS behaviours. This may result from a mismatch between institutional support and faculty research needs, as general assistance often fails to address critical requirements such as funding, mentoring, and protected research time (Bozeman et al., 2013). Institutional policies, collaborative culture, and reward systems further facilitate KS by reducing structural barriers and encouraging interdisciplinary interaction (Fullwood et al., 2013; Husted & Michailova, 2010; Wang & Noe, 2010).

Interestingly, IT showed a significant negative direct relationship with RI, suggesting that excessive trust may reduce accountability, constructive conflict, and intellectual independence, potentially hindering research engagement (Adler & Kwon, 2002; Dirks & Ferrin, 2001; Langfred, 2004). However, IT positively influenced KS, supporting prior studies that emphasize trust as a foundation for psychological safety and open communication (Deredzai & Goronga, 2025; Vaida & Ardelean, 2019). KS also emerged as a critical driver of RI by facilitating collaboration, idea exchange, and innovation, thereby translating institutional and relational resources into meaningful research outcomes (Lee & Bozeman, 2005).

5.2 Theoretical and Practical Contributions

Grounded in the theory of planned behavior, this study contributes to the literature on RI, KS, and IS in HEIs. The study extends TPB by explaining how IS and IT shape faculty members' attitudes, subjective norms, and perceived behavioral control toward research engagement and KS behavior (Ajzen, 1991). It also empirically validates the mediating role of KS between institutional and relational factors and academicians' RI, thereby advancing knowledge management literature in academic settings. By contextualizing the study within Bangladeshi HEIs, the research broadens TPB's applicability in resource-constrained environments. It introduces an integrated framework linking IS, IT, and KS with faculty RI and academic engagement. The inclusion of interpersonal trust also broadens the relevance of organizational behavior theory in explaining knowledge-sharing behavior and research performance within academia (Johan, 2021).

This study offers practical implications for university administrators, policymakers, and faculty members for enhancing research interests in Bangladeshi HEIs. The findings suggest that institutions should strengthen IS by funding, fostering collaborative research initiatives, providing mentorship and technological infrastructure, and implementing incentive systems that encourage KS and research engagement. Furthermore, the strong mediating role of KS highlights the importance of cultivating IT, collaborative culture, and transparent governance practices. At the policy level, the study supports the development of coordinated research strategies and capacity-building initiatives to improve institutional research performance and global competitiveness (Boeren, 2019).

5.3 Limiting factors and further research possibilities

This study has several limitations. First, convenience sampling may limit the generalizability of the findings to all faculty members in Bangladeshi universities. Second, the study focuses solely on public universities, limiting the applicability of its findings to private or international institutions. Additionally, the context-specific nature of Bangladeshi HEIs may limit the external validity of the findings across different educational settings. Finally, the

study examines KS as the sole mediator, while other factors (e.g., motivation, leadership, and workload) may intervene in the relationships.

The author suggests future studies that use a probability sampling technique to examine the model and enhance the generalizability of the findings across broader academic populations. Comparative studies involving both public and private universities, as well as cross-country investigations, would provide deeper insights into how institutional contexts influence academicians' RI and KS behavior. Furthermore, other variables should also be investigated as potential intervening variables in future studies.

5.4 Conclusion

The study confirms that KS is a crucial behavioural pathway through which supportive institutional environments and interpersonal relationships stimulate research engagement. Grounded in the TPB framework, the study contributes to understanding how institutional and relational factors shape research-related behaviors in HEIs. The findings emphasize the importance of fostering collaborative cultures, transparent institutional practices, and active knowledge exchange to strengthen research interest and scholarly development in Bangladeshi HEIs.

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Dialogic Action Research Learning (DARL): A Pedagogical Innovation in Higher Education

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Abstract
Higher education institutions face growing pressure to graduate professionals equipped not only with knowledge but with critical inquiry, collaborative reasoning, and adaptive judgment. Lecture-dominant pedagogies remain prevalent in many contexts including Bangladesh yet are structurally misaligned with these demands. This paper presents Dialogic Action Research Learning (DARL), an integrative framework synthesizing sociocultural learning theory, dialogic pedagogy, reflective practice, experiential learning, and constructive alignment into a structured classroom process. The study documents DARL's application in BUS 675: Strategic Management and Sustainability a postgraduate course at BRAC University, Spring 2026 across fourteen weekly three-hour sessions. Guided by three research questions, the investigation draws on systematic session observation, student feedback cards, and comparative pre/post session data to examine how DARL affects engagement, conceptual depth, and metacognitive development. Findings indicate measurably enhanced participation, deeper conceptual application, stronger collaborative competency, and growth in reflective judgment. The paper argues that DARL is not a collection of active learning techniques but a theoretically coherent pedagogical system with significant implications for teaching practice, curriculum design, and faculty development.

***Keywords**:* Dialogic Learning, Action Research, Reflective Practice, Active Learning, Higher Education, Constructive Alignment, DARL

1. Introduction

The question of what universities are for has never carried more practical urgency. International bodies and national governments have converged on a shared account of graduate capability: critical thinking, collaborative problem-solving, adaptive reasoning, and the application of knowledge to problems that resist disciplinary categorization (UNESCO, 2021; OECD, 2019; World Economic Forum, 2023). Yet classroom practices in much of higher education and particularly in South Asian university contexts remain lecture-dominant, rewarding retention over reasoning and recognition over application. This misalignment is not a minor inefficiency; it is a structural problem requiring a different kind of pedagogical architecture (Biggs & Tang, 2011; Freeman et al., 2014).

This paper proposes and examines Dialogic Action Research Learning (DARL) as one such architecture a framework integrating dialogue, structured inquiry, reflective practice, collaborative learning, and iterative feedback into a coherent classroom process developed and implemented through the Learning and Teaching Innovation Center (LTIC) at BRAC University. Three research questions guide the inquiry:

RQ1: How does the DARL model operationalize its theoretical commitments through classroom structures in a postgraduate management course?
RQ2: What changes in student engagement, collaborative competency, and metacognitive awareness are observable across a DARL-implemented semester?
RQ3: What are the implications of DARL for instructional design, assessment alignment, and faculty development in higher education?

2. Literature review and conceptual foundations

DARL is constituted by the intersection of six theoretical traditions, each contributing what the others cannot supply alone. Together they provide the normative rationale, cognitive logic, and structural principles from which DARL's operational design is derived.

Dialogic Pedagogy. Freire (1970) and Bakhtin (1981) established dialogue a genuine exchange in which participants are open to being changed by what they encounter as central to meaningful learning. Alexander (2008) operationalizes this as 'dialogic teaching': classroom discourse that is cumulative, reciprocal, and purposeful. Wegerif (2011) extends the tradition into a theory of how learners develop thinking through encounter with genuinely different perspectives.

Action Research. Lewin (1946) and Kemmis and McTaggart (2005) provide DARL with its cyclical structure: planning, action, observation, and reflection. McNiff (2013) and Reason and Bradbury (2008) emphasize participatory character those whose practice is studied are agents, not subjects. In DARL, this manifests in student-generated questions and student-authored reflections as the primary currency of learning.

Reflective Practice and Transformative Learning. Schön's (1983) distinction between reflection-in-action and reflection-on-action provides the basis for DARL's structured weekly reflection. Brookfield (2017) extends this into critically reflective teaching. Mezirow (1997) adds transformative learning: genuinely significant learning requires critical examination of the interpretive frames through which content is processed not merely acquisition of new information.

Sociocultural and Constructivist Theory. Vygotsky's (1978) account of learning as socially mediated grounds DARL's peer interaction design. The Zone of Proximal Development is a design principle, not merely a metaphor. Wenger's (1998) communities of practice extend this into how professional identity is co-constructed through shared intellectual endeavor the theoretical basis for Learning Circles.

Experiential and Cooperative Learning. Kolb's (1984) cycle a concrete experience, reflective observation, abstract conceptualization, active experimentation which maps directly onto DARL's eight-phase structure. Johnson and Johnson (2009) provide the empirical foundation for DARL's collaborative architecture: positive interdependence, in which students' goals are genuinely linked, is the defining feature of cooperative rather than merely co-located learning.

Constructive Alignment. Biggs and Tang (2011) establish that intended outcomes, learning activities, and assessment instruments must point in the same direction. DARL addresses a common failure mode of innovative pedagogy misalignment between collaborative learning processes and individually competitive, recall-based assessments by designing assessment instruments across the full range of cognitive levels (Anderson & Krathwohl, 2001).

3. The Darl framework: conceptual architecture

DARL is best understood not as a technique but as a three-layer pedagogical system, in which Layer 1 (theoretical foundations) motivates and constrains Layer 2 (classroom components), and Layer 2 produces rather than merely aims at the learning outcomes of Layer 3. Removing any layer destabilizes the whole. This layering also addresses the most persistent misreading of active learning frameworks: the tendency to treat them as repertoires of technique rather than as theoretically coherent systems.

TABLE 1 DARL CONCEPTUAL FRAMEWORK — THREE INTERDEPENDENT LAYERS

Layer	Components	Theoretical Anchors
Layer 1 Theoretical Foundations	Sociocultural learning · Dialogic pedagogy · Reflective practice · Transformative learning · Constructive alignment · Critical pedagogy · Cooperative learning · Experiential learning	Vygotsky (1978) · Alexander (2008) · Schön (1983) · Mezirow (1997) · Biggs & Tang (2011) · Freire (1970) · Johnson & Johnson (2009) · Kolb (1984)
Layer 2 Classroom Components	Course Pack (4 cognitive levels) Rotating Learning Partners · Stable Learning Circles · Weekly Reflection Notes · Dialogic Facilitation · Case-Based Inquiry · U-Shape Classroom	Seven operationalized practices each traceable to a specific theoretical commitment in Layer 1
Layer 3 Learning Outcomes	Deeper Conceptual Inquiry · Collaborative Problem-Solving · Reflective Judgment · Strategic Integration · Metacognitive Awareness	Emergent capacities produced by the system not pre-set targets imposed from outside

3.1 The Eight-Phase Learning Cycle

Within this architecture, the operational rhythm of DARL is an eight-phase cycle directional but responsive, structuring each session from individual preparation through structured reflection:

TABLE 2 DARL EIGHT-PHASE LEARNING CYCLE

#	Phase	Description
1	Individual Preparation	Engage assigned materials; formulate initial questions; activate prior knowledge.
2	Question Generation	Construct questions at multiple cognitive levels — recall through synthesis.
3	Dialogic Engagement	Learning Partners discuss, challenge assumptions, surface productive disagreement.
4	Analytical Application	Apply theoretical frameworks to case contexts within Learning Circles.
5	Collaborative Problem-Solving	Circles co-construct strategic recommendations; negotiate competing interpretations.
6	Presentation & Peer Challenge	Groups present; other circles pose substantive challenges and seek clarification.
7	Structured Reflection	Written reflection notes record conceptual shifts and professional connections.
8	Feedback & Iteration	Reflections inform formative assessment; findings shape subsequent sessions.

The cycle inverts conventional lecture logic. Where lectures begin with expert transmission and end with student questions, the DARL cycle begins with student preparation and ends with student reflection. The instructor's role is not to initiate content delivery but to create and sustain conditions under which student inquiry can advance.

4. Methodology

The application of DARL in BUS 675 constituted a practitioner action research study (Reason & Bradbury, 2008) in which the research team comprising the course instructor and two co-authors operated simultaneously as designers, facilitators, and observers. This design is consistent with participatory action research epistemology: knowledge about practice is generated through recursive cycles of planning, action, observation, and reflection, rather than through experimental isolation of variables.

Data sources. Evidence was gathered through: (1) systematic observation notes across fourteen sessions, including a structured pre/post comparative observation in an early session; (2) student feedback cards (Day 2, n=16) coded thematically; (3) student reflection notes analyzed for conceptual specificity, theory-practice connection, and self-interrogation; (4) Learning Circle outputs and assessment submissions; and (5) structured research team debriefs following the advanced sessions in Weeks 12 and 13.

Setting. BUS 675 met weekly (6:30–9:30 p.m., 14 weeks, Spring 2026) in a U-shaped sitting arrangement at BRAC University. Students were postgraduate management professionals. A 14-chapter course pack was developed with assessment items spanning four cognitive levels (Anderson & Krathwohl, 2001). Learning Partners rotated weekly; Learning Circles (4–5 students) were stable from Week 2.

5. Findings

5.1 Observational Evidence: Pre- vs. Post-DARL

A comparative observation of a single session divided between a conventional lecture segment and a DARL-structured segment yielded the most immediate evidence of the model's effects:

TABLE 3 COMPARATIVE SESSION OBSERVATION — PRE- AND POST-DARL SEGMENTS (EMBA, BUS 675)

Dimension	Pre-DARL (Traditional Lecture)	Post-DARL (Session Observation)
Student Engagement	Passive reception; limited probing questions from a small proportion of students	Noticeably higher interaction; active application of concepts across all three learning teams
Interaction Quality	Instructor-led Q&A; real-life examples used to support answers	Peer-to-peer argumentation; competing interpretations negotiated within and between circles
Key Challenge	Students disengaged when content was abstract or unfamiliar	Time management and equal participation across teams; Team 3 relied on slides over dialogue

The DARL segment produced measurably higher interaction and concept application, though time management and uneven participation across learning teams were identified as areas for improvement — findings consistent with the broader active learning literature (Prince, 2004; Freeman et al., 2014).

5.2 Student Feedback: Thematic Analysis
Sixteen feedback cards collected at the close of an advanced session (Day 2) were coded thematically. The dominant themes and representative student voices are presented below:

TABLE 4 STUDENT FEEDBACK — THEMES AND REPRESENTATIVE VOICES (FEEDBACK CARDS, DAY 2, N=16)

Theme	Representative Student Voice (Feedback Cards, Day 2)
Interactive & engaging	*"The classes were participatory as we discussed every topic ourselves... the U-shaped seating arrangement also made the classes interesting."*
Method effectiveness	*"DARL is an effective method of teaching which helps students learn by their own. They can remember a case or multiple concepts for a long time."*
Collaboration & participation	*"Everyone got an equal chance to participate. Even if someone missed discussions, they could join anytime."*
Real-life application	*"Good approach to apply learned topics on real-life cases. Makes the learning interactive and impactful."*
Suggestion for improvement	*"Incorporate DARL in the earlier days of the semester. Random group assignments should be done to make teams diverse."*

The feedback reveals an unprompted recognition that the DARL structures rotating partners, U-shape arrangement, case discussion , produced qualitatively different learning conditions. Students identified reduced passivity, broader participation, and improved retention. Critical suggestions, earlier introduction of DARL, randomized group composition, clearer initial briefings confirm that students engaged with the model seriously enough to evaluate its design.

5.3 Major Learning Themes (Advanced Session, Week 12–13)
Externalized idea cards from Weeks 12 and 13 revealed three conceptual clusters: (1) corporate culture as an organizational variable not merely a descriptor — including leadership style, cultural artefacts, and the relationship between culture and strategy execution; (2) the insight that culture can function as a barrier to productivity, including in bottom-up dynamics; and (3) the alignment between leadership style and organizational goals as a determinant of strategic outcomes. The specificity and professional grounding of these reflections several students drew explicitly on their own organizations constitute evidence of the theory-practice integration that DARL is designed to produce.

5.4 Longitudinal Trajectory of Reflection Quality
Reflection notes coded across fourteen weeks showed consistent growth across three dimensions. Between Weeks 1–4, notes were predominantly descriptive. Between Weeks 5–9, the notes became more interrogative: students began asking why frameworks were structured as they are and identifying tensions between theoretical positions. By Weeks 10–14, several students produced reflections displaying the critical self-scrutiny that Brookfield (2017) identifies as genuinely reflective professional practice. The most marked shift occurred between Weeks 4 and 8, the period in which students became fluent in the reflective genre.

6. Discussions and implications

The evidence from BUS 675 addresses each of the three research questions. For RQ1, the framework tables in Section 3 demonstrate that DARL's classroom components are traceable to specific theoretical commitments not assembled eclectically but derived systematically. For RQ2, the observational data, feedback cards, and longitudinal reflection analysis collectively document improvements in engagement, collaboration, and metacognition that became more pronounced not less across the semester, suggesting cumulative rather than novelty-driven effects. For RQ3, the implications span three registers.

For instructors: DARL requires a different deployment of expertise anticipating where student reasoning is incomplete, designing questions that open rather than close exchange, and resisting the cultural impulse to resolve

uncertainty prematurely. This is not a reduction in subject-matter knowledge but a transformation in how it is used.

For institutions: Sustaining DARL requires professional development that engages theory, not only technique; assessment and promotion systems that reward pedagogical innovation; and physical infrastructure designed for dialogic learning. The U-shaped room is not incidental architecture and is never pedagogically neutral.

For research: This study's action research design generates rich practitioner knowledge but does not isolate causal mechanisms. Future work should examine DARL's effects across disciplinary and undergraduate contexts, test whether weakening specific components produces predicted deterioration in outcomes and develop quantitative instruments for the metacognitive and collaborative dimensions the model targets.

7. Conclusion

DARL transforms the classroom from a site of information transmission into a space of active inquiry, collaborative reasoning, and reflective learning. The BUS 675 experience demonstrates that this transformation is achievable within realistic institutional constraints and that it produces observable, cumulative improvements in learning quality across participation, conceptual depth, collaborative competency, and metacognitive awareness. The gap between the education higher education currently provides and the capacities graduates need is a design problem. The BUS 675 evidence suggests it is a solvable one.

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Reimagining Excellence in Higher Education: An Integrated Framework of Innovative Pedagogy, Blended and HyFlex Delivery, Faculty Development, and Inclusive Environments

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Abstract
Various countries have made teaching excellence a high priority in higher-education reforms. In rapidly growing systems like Bangladesh, where the number of enrollees has already crossed five million, the concern is serious. As student numbers grow, faculty development, pedagogical capacity and inclusive infrastructure lag behind. Our theoretical anchors are constructivism (Vygotsky, 1978; Biggs & Tang, 2011), Wenger's communities of practice (1998), Freirean critical pedagogy (Freire, 1970), and the Universal Design for Learning framework (CAST, 2018). Our empirical anchors are recent studies from Bangladesh and comparable contexts. Building on both, we propose the Interconnected Strategies for Faculty and Institutional Excellence (ISFI) model. Four operating principles structure ISFI: alignment, reciprocity, flexibility, and equity by design. Recent meta-analyses support the case for system-wide adoption, placing blended-learning effect sizes in the upper-medium to large range (Hedges' g ≈ 0.65; standardised mean differences of 0.64 to 2.23 in health-sciences cohorts). The paper closes by linking the framework to Bangladesh's quality-assurance architecture and asking what role Institutional Quality Assurance Cells (IQACs) might play in putting it into practice.

***Keywords**:* Teaching Excellence; Blended Learning; Hyflex; Outcome-Based Education; Faculty Development; Universal Design for Learning; Bangladesh; Quality Assurance; ISFI Model.

1. Introduction

In higher-education policy today, few questions provoke more disagreement than the question of what makes university teaching excellent. For nearly twenty years, rankings and research outputs have set the terms of the debate. But the picture is now shifting. A growing literature places teaching quality at the centre of the university's educational mission, alongside the institutional conditions that allow good teaching to happen (Biggs & Tang, 2011; Hattie, 2009). Synthesising more than 800 meta-analyses, Hattie (2009) concluded that feedback is among "the most powerful single moderators that enhance achievement" (p. 12). This is more than a rhetorical move. It has begun to alter how quality is measured and what kinds of evidence are taken to count.

With uncharacteristic force, Bangladesh is a setting where the question matters. There were only a few public universities in the country at independence 1971. As of today, the enrolment of students is more than 4.8 million, according to UGC Bangladesh 2024. When we add 358,414 students in the private sector and 551,821 distance learners served by the Bangladesh Open University, it becomes clear how much the growth is. Investment has fallen behind in pedagogical capacity. Bangladesh Maritime University expenditure. Meanwhile Tk 523,536 per student per year is being spent in Tk 523,536 yearly in each student in Tk 795.55 in National University. The structural difference in the sector can be better explained through this gap than any policy document. (Figure 2).

This paper organises its analysis around five dimensions of teaching excellence in contemporary higher education: innovative pedagogy, student-centred learning, blended and HyFlex delivery, faculty development, and inclusive environments. Our argument is that they should not be pursued as separate reform streams. We propose the Interconnected Strategies for Faculty and Institutional Excellence (ISFI) model as a heuristic to help institutions move beyond fragmented policy projects toward more coherent, context-responsive change. We see three contributions. First, an integrative framework that goes beyond what single-dimension intervention studies can deliver. Second, a deliberate foregrounding of Bangladeshi empirical work, which remains underrepresented in the international literature. Third, an explicit connection between the framework and Bangladesh's quality-assurance infrastructure. We argue that Institutional Quality Assurance Cells (IQACs) are well placed to operationalise it.

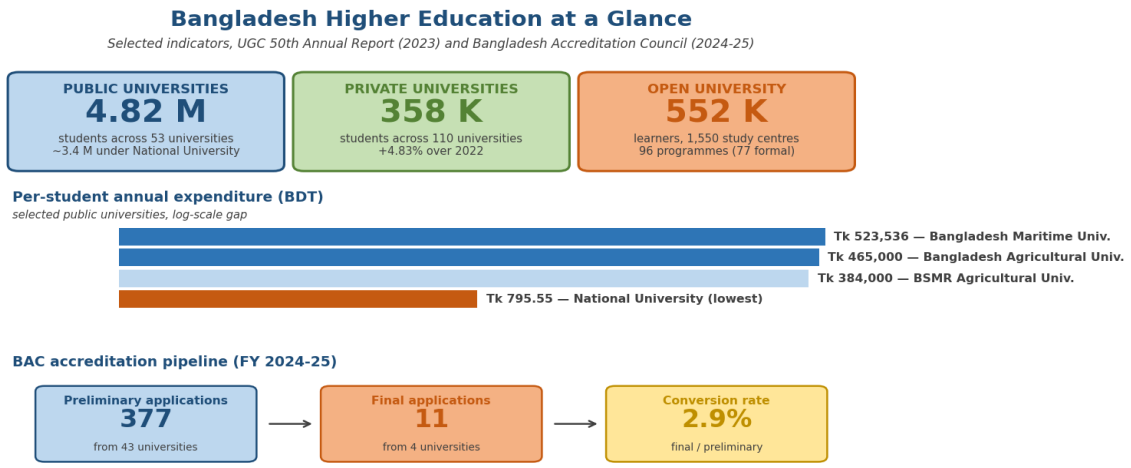


Fig.1 Bangladesh higher education at a glance. Selected indicators from the UGC 50th Annual Report (2023) and the Bangladesh Accreditation Council (2024–25 pipeline data).

2. The novelty and contribution of this work

While Education for Excellence is a core aim of higher education, policies in rapidly growing education systems have a tendency to suffer from a 'silo mentality' and assume that pedagogical, technological, and infrastructural changes are mutually independent. This paper contributes to the discussion in three unique ways:

Unlike the research that focuses on one intervention (UDL implementation or adoption of blended learning), this paper will present the Interconnected Strategies for Faculty and Institutional Excellence (ISFI) model. This heuristic offers to institutions a framework which can combine five interdependent dimensions (innovative pedagogy, student-centred learning, flexible delivery, faculty development, and inclusive environments) into an operational cycle.

This work will be able to connect constructivist theory, Freirean pedagogy and Universal Design for Learning (UDL) with recent empirical evidence drawn from Bangladesh, thereby avoiding the typical approach of considering non-Western contexts as only peripheral case studies. Rather, it defines the Bangladeshi experience as a major contribution to the scholarship of the world and shows how, within a resource-limited, high-enrollment system, equity by design can be realized.

Proposed concrete changes in the functioning of the Institutional Quality Assurance Cells (IQACs): Operationalizing Quality Assurance (QA). We do not see them as compliance auditing agencies but as "enabling integrators", as we call them, who make it possible to link more directly classroom innovations to national accreditation pipelines. The paper offers a practical roadmap for policy-to-institutional change with evidence-based performance cutoffs, like the lowest Hedges' g effect size for blended learning pilots.2. Theoretical foundations

The framework rests on three overlapping intellectual traditions. Each emerged largely in the global North, but South Asian scholars have engaged productively with all of them. Constructivism is the starting point. In the constructivist view, learning is an active, social, and context-bound activity through which students construct meaning; it is not a process by which content is transmitted to passive recipients (Vygotsky, 1978; Biggs & Tang, 2011). Vygotsky's zone of proximal development matters particularly for our argument. He defined it as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Cognitive development depends on dialogic interaction with more capable others, which means the conditions under which that interaction takes place carry as much pedagogical weight as the content being interacted with. The implication for Bangladeshi universities, where lecture delivery still dominates, is uncomfortable but clear. The dominant mode of teaching is poorly matched to what research tells us about how durable learning actually happens.

The third strand brings together Freire's (1970) critical pedagogy with the Universal Design for Learning framework (CAST, 2018). Freire's critique of what he called the 'banking model' of education remains, more than fifty years on, one of the most influential arguments in educational theory for a dialogic and transformative pedagogy. UDL complements that critique by translating it into a workable design vocabulary, organised around what CAST describes as "multiple means of representation, engagement, and expression" (CAST, 2018). Our principle of equity by design grows directly out of this convergence. The insistence is that inclusion be planned in from the outset, not patched on afterwards. Recent Q1 evidence supports both the framework and its limits. A systematic review of 20 UDL studies, drawing on data from 5,656 participants, found that faculty training in UDL improves teaching competence and student outcomes. But Creaven (2024) is right to warn that UDL on its own cannot substitute for changes in the built and social environment in which students learn.

3. Five dimensions of teaching excellence

3.1 Innovative pedagogy

Pedagogical innovation here means deliberate, evidence-informed departures from transmission-based instruction — problem-based and project-based learning, flipped classrooms, inquiry-based learning, and gamification — that target deeper, more transferable learning. The evidence is now substantial and crosses contexts. Suyo-Vega et al. (2024), reviewing 25 studies on innovative practices in higher education through the PRISMA protocol, identify student-centred approaches, technology integration, and feedback methodologies as the three converging strategies that distinguish effective from cosmetic reform.

These findings should be situated honestly within local constraints. Class sizes that exceed one hundred students in public-university sections, examination systems that reward recall over higher-order competency, and promotion structures that weight research above teaching all blunt the impact of innovation. Reform that ignores these enabling conditions risks what Fullan (2007) calls 'Christmas-tree' change — visually impressive, structurally disconnected.

3.2 Student-centred learning and the OBE turn

Student-centred learning is the reorganisation of the educational relationship, where the teacher is shifted from primary role to secondary role, and the student is shifted to the primary role.

From recipient to co-constructor, from student to facilitator, epistemic authority.SCL is operationalised through cooperative learning, peer instruction, think-pair-share, portfolio assessment, student-led seminars, and project work — strategies that share a single move, the reallocation of cognitive labour to the learner.

On formative assessment specifically, Rahman (2023) in Frontiers in Education found significant gains in mathematics achievement at a Bangladeshi non-government college through iterative, feedback-rich, student-directed assessment — consistent with meta-analytic findings on formative assessment as one of the highest-impact interventions available (Hattie, 2009). Hattie (2009) himself describes feedback as one of the "top 10 influences on achievement" in his synthesis of more than 50,000 studies. The persistent challenge is the friction between SCL's philosophy and an examination culture that rewards memorisation. Students whose prior schooling rewarded passive compliance often resist SCL not from lack of capacity but lack of preparation. Shifting this requires changes to assessment culture, which institutions with functioning IQACs are well placed to lead.

3.3 Blended, hybrid, and HyFlex delivery

The international evidence is now firm. Yu et al.'s (2025) meta-analysis of 133 empirical studies (n = 18,464) reports an upper-medium effect of blended learning on learning performance (Hedges' $g = 0.651$, $p < 0.001$). Du et al.'s (2022) meta-analysis of 25 nursing-education studies (n = 2,706) found significant blended-versus-traditional advantages across knowledge (SMD = 0.64), skill performance (SMD = 0.37), and satisfaction (SMD = 0.32). Niu et al. (2023), pooling 26 studies (n = 2,823), report still larger effects on knowledge (SMD = 0.73), skills (SMD = 0.86), and especially critical thinking (SMD = 2.23). Li et al.'s (2024) BOPPPS-model meta-analysis of 44 Chinese studies reports an SMD of 1.193 on overall student capacity. De Bruijn-Smolders and Prinsen's (2024) systematic review concludes that all 15 blended designs reviewed produced moderate-to-high engagement impacts. Engagement is now understood to mediate the link between blended-learning quality and outcomes (Han, 2024; Kok et al., 2025). Figure 3 summarises these findings.

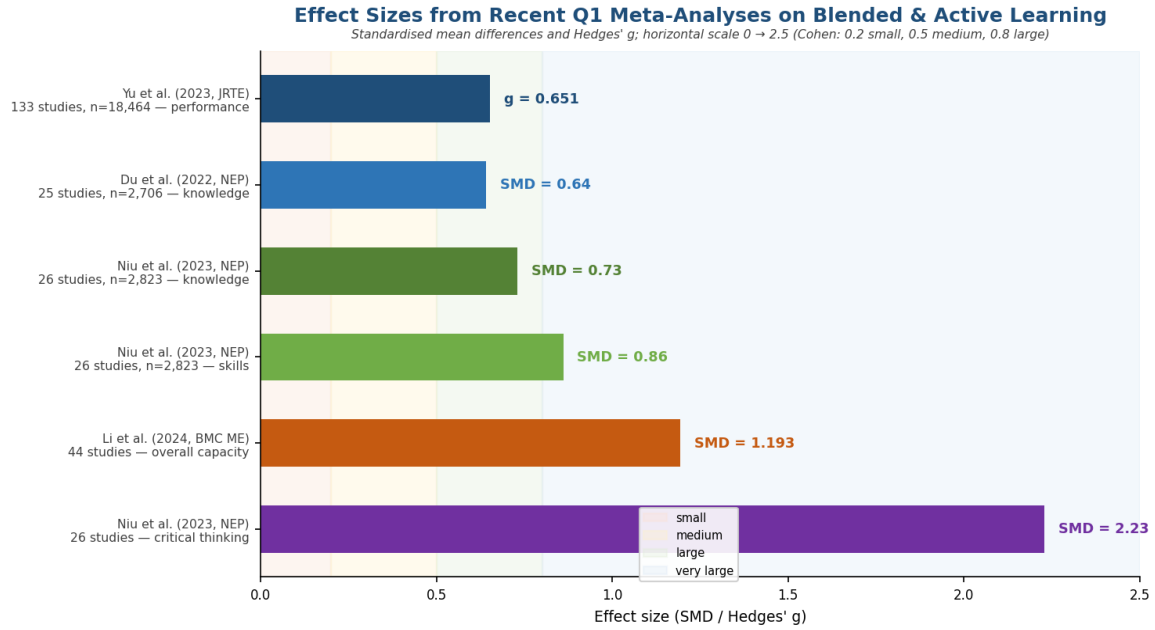


Fig.2 Effect sizes from recent Q1 meta-analyses on blended and active learning. Bars show standardised mean differences (SMD) and Hedges' g; reference bands indicate Cohen's small/medium/large/very-large thresholds. Sources: Yu et al. (2025); Du et al. (2022); Niu et al. (2023); Li et al. (2024).

HyFlex evidence is younger but converging. A scoping review by Cumming et al. (2024) of student and instructor experience identifies satisfaction gains, real benefits in access and flexibility, and persistent challenges in technology, equity, and instructor workload. The Gudoniene et al. (2025) systematic review in Sustainability extends the pattern, calling out faculty support and assessment redesign as the binding constraints. Romero-Hall et al.'s (2025) decade review consolidates this picture for undergraduate education. Finkel-Gates (2025) and Baker et al. (2024) both highlight HyFlex's particular value for socio-economically disadvantaged students and learners managing crises, while Bozan et al. (2024) caution that engagement gains depend on whether psychological needs for autonomy, competence, and relatedness are actually met.

3.4 Faculty development as enabling infrastructure

Faculty development is the "enabling condition" that each of the other dimensions rests upon. Innovative pedagogy requires faculty who are available and feel comfortable in doing it well. SCL requires teachers who have moved! Beyond the role of transmission in their knowledge. Educators must be able to blend and HyFlex delivery needs.can plan and execute a design that works across modalities. Inclusion requires 'challenging assumptions' from the part of the teacher. This is a different approach to faculty development, which is seen as a cornerstone instead of an add-on.It has a conventional status in Bangladesh, which it has frequently been forced into as compliance, which has not been satisfactory.

3.5 Inclusive and equitable learning environments

Inclusion, as we use the term, is not reducible to physical presence or formal enrolment. It refers to the structural and cultural transformation of learning environments so that diversity is designed for, not accommodated as deviation. Recent Bangladeshi scholarship has brought serious attention to this dimension. Islam and Alam (2024), working in the Justice-theory tradition, identify a cluster of overlapping barriers: insufficient physical infrastructure, missing assistive technologies, attitudinal barriers among faculty and peers, and policy frameworks that declare commitments without funding their enabling conditions. Rahaman et al. (2024), focusing on the University of Dhaka, apply UDL to assess provision for students with disabilities under SDG 4 and document the gap between formal commitments and lived experience. Chowdhury et al. (2024) make similar findings for neurodiverse students.

4. The ISFI model

This paper's central claim is that these five dimensions are most powerful when institutions pursue them together and not as parallel streams. We are not making an addition argument. Merging multiple good components is seldom equivalent to integrating them. Each dimension relies upon the others for its complete realisation, our

claim is structural. The use of innovative pedagogy without inclusive design is beneficial to some learners If faculty development is not taking place, student-centred learning will be implemented inconsistently and sometimes counter-productively. Models that are blended or HyFlex without equity considerations will widen gaps not narrow them. If the institutional commitment of faculty development is not strongly linked with inclusion, it may foster the very exclusionary norms inclusive pedagogy aims to complicate.

We provide the ISFI model, Interconnected Strategies for Faculty and Institutional Excellence, as a heuristic to plan these interdependencies. It is better to read it as a scaffold than a blueprint, something that institutions can tailor to their own resource constraints. The model comprises four operating principles, each of which corresponds to specific characteristics of the Bangladeshi policy landscape (Figure 1).

First principle is alignment. Pedagogical strategies, delivery modalities, assessment designs and faculty development programmes should relate coherently to well-defined learning outcomes; they should meet the heterogenous needs of learners. This can be summarized by the principle of "constructive alignment" as put by Biggs and Tang (2011): "All components in the teaching system, the teaching and learning goals, the learning methods, the assessment tasks are aligned." In Bangladesh the principle directly applies to the OBE doctrine that is required by the Bangladesh Accreditation Council. If what is taught, how it is taught, and how it is assessed do not align, students disengage, learn superficially, and get credentialed.

The second is the principle of reciprocity. Teaching and learning should be viewed as a two-way street where students' experience and learning outcomes are used to inform faculty development and institutional decision making. This is a threat to the prevailing system whereby institutions plan programmes, quantify the results and tend not to look at the quality of learning processes. Good feedback mechanisms are needed for reciprocity. Also critical is the institutional will to take action in response to the mechanisms that emerge, and this is frequently the more difficult of the two.

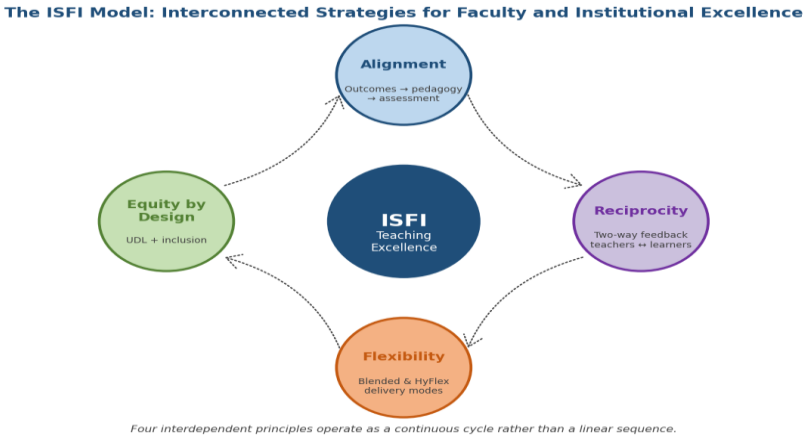


Fig.3 The ISFI Model. Four interdependent principles — alignment, reciprocity, flexibility, and equity by design — operate as a continuous cycle around a shared commitment to teaching excellence.

The third rule is flexibility. Delivery models, assessment formats, and support mechanisms must be flexible enough to meet the needs of an eclectic mix of students at the university. This principle is one that is expressed at the delivery level in the form of HyFlex. It does not seek to impose one way of participation on those that may not have the time to be physically present. In broader terms, flexibility is about changing the assumptions of one-size-fits-all that have been prevalent in higher education for a long time.

Equity by design is the fourth principle. The needs of individual students and compliance requirements must not be the basis for integrating and making things accessible; it must be part of the planning process of pedagogical, curricular and institutional decisions. The principle is based on the merging of the UDL and Freirean critique. It demands advancement rather than adaptation. Equity by design is not just a technical change in a context where the infrastructure to support inclusive practice is not developed in Bangladesh. It calls for a basic reorientation of institutional culture.

5. Implications for Policy and Practice

The ISFI model necessitates a fundamental shift in the quality assurance (QA) architecture of Bangladeshi higher education. Current national frameworks—overseen by the University Grants Commission (UGC) and the Bangladesh Accreditation Council (BAC)—rely heavily on input metrics (e.g., faculty qualifications, library holdings) and output indicators (e.g., pass rates, employment outcomes). While these are necessary for baseline accountability, they are insufficient for cultivating teaching excellence. A more robust policy framework must transition toward process-oriented indicators that evaluate how institutional resources are translated into pedagogically coherent, evidence-based learning experiences.

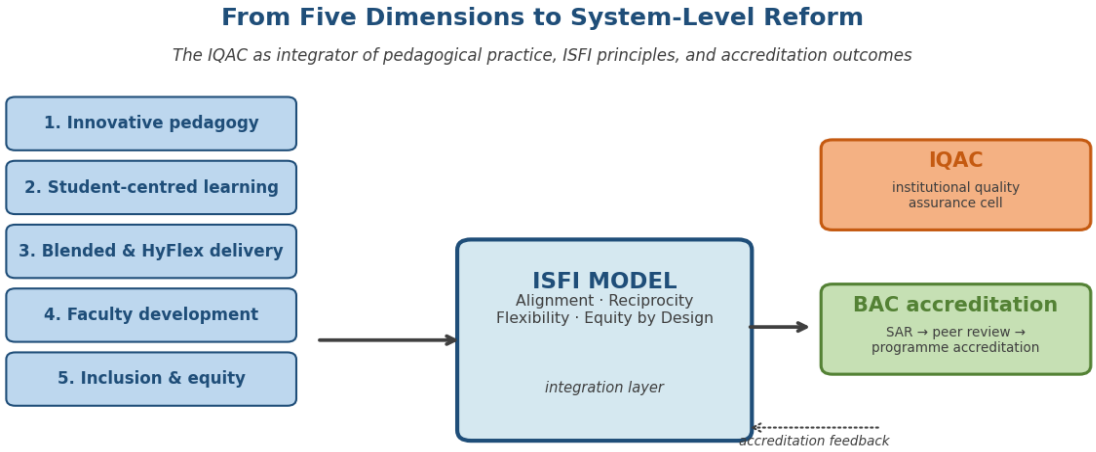


Fig.4 From five dimensions to system-level reform. The IQAC acts as an enabling integrator — connecting classroom practice and the ISFI principles to the national BAC accreditation pipeline in a single quality cycle.

To move from rhetoric to reality, we propose two critical benchmark thresholds for national policy review. First, institutional pilots for blended or HyFlex learning should demonstrate a minimum effect size of Hedges' $g \geq 0.4$—the recognized floor of the empirical range for educational interventions—before institutional scale-up. Second, the current accreditation conversion rate of 2.9% requires urgent structural intervention; if this remains below 5% by the end of the 2026–27 fiscal year, the BAC's processing capacity and internal support mechanisms must be subject to systematic audit and resource expansion. These benchmarks offer a rigorous, credible basis for evaluating institutional commitment to the ISFI model's operating principles.

6. Conclusion

Excellence in teaching and learning is a systemic achievement, not the product of a single intervention. It emerges from the coherent integration of five mutually reinforcing dimensions — innovative pedagogy, student-centred learning, flexible delivery, sustained faculty development, and inclusive environments — pursued within a quality culture committed to equity, reciprocity, and alignment. The ISFI model is offered as a practical conceptual framework for institutions seeking to operationalise that integrated vision. The growing body of Bangladeshi scholarship reviewed here demonstrates that local researchers are generating the contextually situated knowledge that policy and institutional reform need. What international scholarship has too often failed to do is take this work seriously as a contribution to global understanding rather than a regional case study of limited transferability. The evidence reviewed here — on blended and HyFlex learning, student-centred pedagogy, inclusive higher education, and faculty development — speaks to challenges and possibilities that recur across higher-education systems in the global South and beyond.The ISFI model needs to be implemented with political will, institutional investment and commitment on all levels of the system. Largely established policy frameworks. There is growing academic research. The institutional actors who can take the lead in this work are available in the sector, such as reform-oriented leadership, committed faculty, and functional IQAC. What is left is the choice to regard teaching excellence as an issue of quality, as opposed to a niche peripheral issue, and to structure institutional resources, incentives and quality-assurance authority.

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Study of Bilingual Language Use in the Classrooms of Different Bangladeshi Private Universities': A Quantitative Method Approach

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Abstract
The monolingual medium of instruction was a frequently useful medium of instruction (Bangla medium) in the education system in Bangladesh. Around 62% of students are likely to attend higher education in English in private universities. This change makes a translanguaging classroom practices by students and teachers. A total of 63 undergraduate students included in this study. The findings reveal that the majority (89%) of students are interested to use both Bangla and English in academic activities, switch in two languages during classroom discussions (92%) and self-directed study (83%) using bilingual language. Majority of the students (91%) opined that using both languages simultaneously enhances their understanding of course materials. The vast majority (88%) reported that their instructors actively encourage bilingual communication in class. The main reason for using bilingual language was a lack of proficiency in English (78%). We found significant statistical association between teacher and students classroom delivery and conversation and use of frequent bilingual language (x2= 22.88, Sig, P< .06; Gamma V= .21, Lamda λ = .29 df =7). Trans-languaging is a naturally occurring and pedagogically beneficial phenomenon in higher education, and recommends its formal integration into teaching methodology.

***Keywords**:* Trans-Languaging, Bilingualism, Private University, Higher Education, Classroom Practices, Bangladesh

1. Introduction

Learners and teachers in the classrooms use language as a medium of communication that helps us to negotiate meaning, sharing knowledge, and ways of participating in academic practice [1]. In multilingual contexts of use in the classrooms, where students navigate between their mother tongue (Bangla) to English for academic purposes [2], such boundaries of languages are often fluid rather than fixed in Bangladesh. In the recent decade's strategy of Translanguaging and flexible use of multiple linguistic approaches have become a powerful theoretical and pedagogical framework for understanding and supporting this fluidity [3]. Delivering and studying in translanguaging is a predominant classroom practice method in Bangladesh. Usually, English language has a prestigious position in higher education and professional life, Although Bangla remains the primary medium for daily life communication, and educational activities [4]. Teachers are used to this method and university students naturally move between the two languages in their academic activities. Using Bangla to clarify difficult English concepts, switching to English for formal written work, and fluidly blending both in classroom discussions are comfortable for them [5]. Such predominant bilingual practices, most of the cases formally acknowledged or systematically studied within our educational system [6-7]. The main goal of the study is to examine students' comfort levels in using Bangla and English in academic settings, the frequency with which they switch between languages, their perceptions of the educational value of bilingual language use, and the challenges they encounter. Although several studies have examined translanguaging within multilingual education on a global scale, there is a scarcity of research focused on the systematic implementation of translanguaging practices in tertiary-level classrooms in Bangladesh. In particular, there is a lack of research examining both teachers' perspectives and students' experiences regarding bilingual language use in English language learning. Therefore, this study aims to investigate translanguaging practices in Bangladeshi classrooms and explore how students' bilingual abilities can be leveraged to enhance learning. This study finding maybe materialize in education policy and contribute to translanguaging use in non-Western, postcolonial educational contexts, and provides locally grounded evidence for policymakers and academicians.

2. Methods

We collected quantitative data to investigate translanguaging practices within the classroom and to analyze how students' bilingual skills can enhance learning in the context of education in Bangladesh. Quantitative data were used for examining classroom interactions, the instructional strategies of teachers, and the perceptions of students

concerning language usage in educational settings. Seven domains were used to collect the data and the questionnaire was pre-tested before final data collection. Both Bangla and English language structured data collection format was used to collect the information from the respondents. A total of 63 undergraduate students studied in different private universities across Bangladesh was included following the purposive sampling method. The respondents from both Bangla and English medium backgrounds were included in our study sample.

A structured questionnaire was distributed among students to collect their perceptions regarding the use of Bangla and English in the classroom. The survey explores students' attitudes toward translanguaging and its impact on their learning. Structured interviews carried out with teachers to explore their beliefs and experiences regarding bilingual classroom practices. Collected data were edited and coded and then entered into the computer for analysis. The data was analyzed using the Statistical Package for Social Science (SPSS). A univariate logistic regression with adherence as the dependent variable was used to determine the variables. Secondly, Variables with significant univariate associations ($p< 0.05$) were entered into a multivariate logistic regression model using backward elimination to identify variables that are significant predictors of adherence to outcome calculation. Data analysis included frequency distribution, cross-tabulation, correlation and association, and statistically significant tests between variables (X2, p-value, and CI).

2.1 Ethical Consideration

Ethical clearance was obtained from the University of Fareast International, Dhaka, Bangladesh. Participants are informed about the purpose of the study, and their participation is voluntary. Confidentiality and anonymity of the participants are maintained to ensure ethics of research practices.

3. Results

3.1 Socio-Demographic Profile of Participants

The majority of participants fell within the age bracket of 20–25 years (n = 36, 58%), reflecting the typical profile of undergraduate students in Bangladeshi universities. The second largest group comprised students aged 18–20 years (n = 22, 34.9%), followed by those aged 25–30 years (n = 3, 5%). This distribution suggested that the sample represents a predominantly young, traditional-age university population. The gender distribution of the study shows a significant skew toward male respondents, with 49 male students (77.8%) and 14 female students (22.2%). No participants are identified as transgender. This gender imbalance may reflect the broader patterns of gender representation in certain academic departments at the participating institution, as well as broader societal factors that continue to affect women's participation in higher education in parts of Bangladesh. The occupational backgrounds of participants' family heads were diverse. The most commonly reported occupation was business (n = 22, 34.9%), followed by service-holders in government or private sectors (n = 15, 23.8%). Smaller numbers reported family heads who were farmers (n = 3, 4.8%), teachers (n = 3, 4.8%), and one each in occupations such as journalism, the garments industry, the armed forces (retired), veterinary practice, and an expatriate worker. This socioeconomic diversity suggests that participants come from a range of family backgrounds, which may influence their prior exposure to and attitudes toward English.

3.1.1 Part-Time Employment Status

A notable finding in the socio-demographic profile was the high proportion of students engaged in part-time employment: 43 out of 63 respondents (68.3%) reported working part-time alongside their studies, while only 20 (31.7%) did not. This finding has implications for how students engage with academic language: students balancing work and study may have more practical exposure to professional English in their workplaces, which could influence their attitudes and proficiency levels.

3.1.2 Institution Type and Major of Study

All respondents (100%) were enrolled in different private universities, with no representation from public universities. In terms of academic major, the largest group was English (n = 26, 41.3%), followed by Business Administration / BBA (n = 11, 17.5%), Computer Science and Engineering / CSE (n = 6, 9.5%), Textile Engineering (n = 1), and Bangladesh Tourism and Hospitality Management (n = 1). The predominance of English majors in the sample is particularly relevant, as these students are likely to have heightened awareness of and engagement with bilingual language practices in their coursework.

3.2 Translanguaging Attitudes and Practices

3.2.1 Comfort Using Bangla in Academic Settings

Participants were asked how comfortable they are using Bangla in academic settings. The findings indicate a high level of comfort: 21 students (34.4%) reported feeling very comfortable, and 28 (45.9%) reported feeling

comfortable — yielding a combined positive response rate of 80.3%. Eleven students (18%) were neutral, and only 1 student (1.6%) indicated feeling very uncomfortable. No student reported feeling uncomfortable. These results confirm that Bangla remains a language in which students feel cognitively and affectively secure within academic environments, even in private universities where English is often the mandated medium of instruction.

3.2.2 Comfort Using English in Academic Settings

When asked about their comfort level using English in academic settings, students demonstrated a comparatively lower but still predominantly positive response. Thirty-three students (54.1%) reported feeling comfortable, and 11 (18%) felt very comfortable, yielding a combined positive response of 72.1%. Fourteen students (23%) were neutral, and 3 (4.9%) reported feeling uncomfortable. No student indicated being very uncomfortable. The slightly lower comfort level with English compared to Bangla aligns with the prevailing understanding that English, for many Bangladeshi students, remains a language of aspiration and formal instruction but not of natural, everyday communication (Rahman, 2015).

3.2.3 Perceptions on Bilingual Language Use Enhancing Learning

A central question in this study concerned students' beliefs about whether using both Bangla and English simultaneously enhance their understanding of course material. The responses were overwhelmingly affirmative. Twenty-one students (33.3%) strongly agreed, and 32 (50.8%) agreed, producing a combined agreement rate of 84.1%. Nine students (14.3%) were neutral, and only 1 student (1.6%) strongly disagreed. No student disagreed. This finding represents one of the most decisive results of the study: an overwhelming majority of Bangladeshi undergraduate students perceive translanguaging not as confusion or linguistic compromise, but as a genuinely effective strategy for deepening academic comprehension.

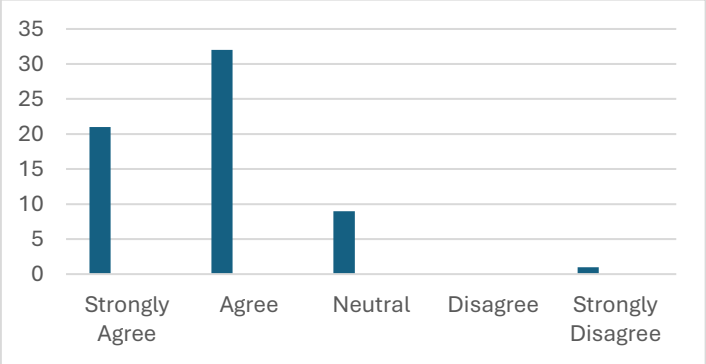


Fig.1 Both Bangla & English enhancing course material understanding

3.2.4 Frequency of Switching Between Bangla and English

To assess the behavioural dimensions of translanguaging, students were asked how often they switch between Bangla and English while studying or participating in class discussions. The responses demonstrate that language switching is not an occasional or marginal practice but a regular, habitual feature of academic life for the vast majority of participants. Thirteen students (21.3%) reported always switching between the two languages, 24 (39.3%) reported often switching, and 23 (37.7%) indicated that they sometimes switch. Only 1 student (1.6%) reported rarely switching, and no student indicated never switching. In aggregate, 98.4% of students switch between Bangla and English at least sometimes during their academic activities — a finding that underscores the naturalness and pervasiveness of translanguaging in this context.

3.2.5 Instructor Encouragement of Bilingual Language Use

Students were asked whether their instructors actively encourage the use of both Bangla and English in class. Fifty students (83.3%) responded affirmatively, indicating that instructor-facilitated translanguaging is a significant and recognised feature of classroom practice in the participating institution. Ten students (16.7%) indicated that their instructors do not encourage bilingual language use. This finding suggests that, despite the absence of formal institutional policy on translanguaging, many teachers have organically adopted bilingual instructional strategies, perhaps in response to student needs or their own pedagogical experiences.

3.2.6 Challenges in Using Bangla and English in Studies

Students were asked to identify the challenges they face when using both Bangla and English in their academic studies, and were permitted to select all applicable options. The most frequently cited challenge was a lack of

proficiency in English, selected by 37 students — making it by far the most prevalent barrier. Difficulty in switching between languages was the second most common challenge, cited by 13 students. Seven students reported experiencing stigma associated with using English — suggesting that social pressures may discourage some students from using English freely in peer interactions. Sixteen students selected 'None', indicating that they do not perceive bilingual academic language use as particularly challenging.

4. Discussion

The findings of this study provide compelling empirical evidence for the naturalness, prevalence, and perceived pedagogical value of translanguaging among undergraduate students in Bangladeshi private universities. About 98.4% of respondents reported switching between Bangla and English at least sometimes during classroom activities or self-directed study. This finding strongly corroborates the theoretical position advanced [7], who argue that translanguaging is not a deviation from language norms but a fundamental feature of bilingual cognition and communication. About 84% of students reported switching always or often, indicating a habitual, deliberate engagement with bilingual communication. Bangla elicits a combined comfortable or very comfortable response from 80.3% of students, compared to 72.1% for English. Furthermore, 4.9% of students felt uncomfortable using English, while no student reported discomfort with Bangla. This comfort differential speaks directly to the asymmetric power relationship between the two languages in the Bangladeshi educational context: English, though associated with social prestige and academic advancement, remains a language of aspiration rather than natural fluency for a significant proportion of students. This finding has important implications for pedagogy. The data from this study suggest that Bangladeshi classrooms already provide fertile ground for this kind of scaffolded bilingual learning, particularly when instructors validate the use of Bangla as a cognitive resource rather than treating it as an obstacle to English language development.

Student perceptions in this study go beyond mere preference: students are articulating an epistemological claim that they learn more, understand more deeply, and engage more meaningfully when allowed to draw on both languages. The finding that 83.3% of students report their instructors encouraging bilingual language use in class is an encouraging indicator that translanguaging is gaining de-facto recognition as a legitimate pedagogical tool, even in the absence of formal institutional policy. This pattern suggests that many Bangladeshi educators have responded pragmatically to their students' linguistic realities, informally adopting bilingual instructional strategies despite the persistence of English only ideologies at institutional and national policy levels. The challenges identified by students offer a nuanced complement to the predominantly positive picture of translanguaging attitudes. The most prevalent challenge — a lack of proficiency in English, students from lower socioeconomic backgrounds, rural educational backgrounds, or non-English-medium schools often arrive at university with significantly weaker English foundations — a gap that translanguaging alone cannot bridge without complementary support structures.

The socio-demographic profile of the sample adds important contextual texture to the findings. The high proportion of students engaged in part-time employment suggests that many participants occupy dual roles as students and professionals — a situation that may accelerate their need to navigate between Bangla and English in real-world communicative contexts, potentially reinforcing the translanguaging competencies they develop in the classroom.

5. Conclusion

The findings offer robust and empirically grounded support for the view that translanguaging is not merely a tolerated informal practice but a pedagogically valuable, student-affirmed, and educationally effective mode of engagement in Bangladeshi higher education. The informal and ad hoc nature of current translanguaging practices is recommended for long-term strategy to improve educational equity.

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Author contributions

All authors together conceived and developed the study under the lead of the first author. The 1st, and 2nd authors developed the study concept note and questionnaire. Both authors attended the synthesis of the data into SPSS for analysis and writing the draft version. Both authors developed the first draft and the entire team discussed the results and contributed to the final manuscript and approved the final draft of the manuscript.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Active Learning in the 21st Century: Techniques and Challenges

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Abstract
The rapid development of technology, globalization, and the changing demands of the modern workforce have transformed the educational landscape of the twenty-first century. Traditional teacher-centered instruction is gradually being replaced by student-centered pedagogies that emphasize critical thinking, collaboration, creativity, and problem-solving skills. Altogether, active learning has emerged as a key strategy for improving student engagement and learning outcomes. This paper overviews the concept of active learning within the context of twenty-first-century education, highlighting key techniques used in modern classrooms and the challenges educators face when implementing them. Besides the conventional lecture, active learning perception includes instructional strategies such as project-based learning, inquiry-based learning, flipped classrooms, collaborative learning, and technology-enhanced learning. It also includes modern pedagogical approaches, such as blended learning, service learning, and research-led teaching, which are essential for engaging students and enhancing learning outcomes. Successful active learning approach, however, requires advanced preparation such as effective teaching plan. In particular, the student-centered learning (SCL) begins with proper curriculum development including syllabus and material planning, lesson planning and classroom instruction practice. A successful SCL practice must involve student orientation to the learning objective, student collaboration, course management strategy and student accountability mechanism. SCL can facilitate achieving the learning objectives by motivating students in taking challenges both individually and as a group. This practice improves self-esteem, communication skills and working ability in a diverse, multicultural environment. However, limited resources, large class sizes, assessment challenges, and resistance to pedagogical change appear as potential barriers to active learning. Thus, although active learning offers significant benefits, its successful implementation requires institutional support, teacher training, and adequate technological infrastructure.

***Keywords**:* Active Learning; 21st Century Education; Student-Centered Learning; Educational Technology; Teaching Strategies

1. Introduction

Education in the twenty-first century is undergoing profound transformation due to rapid technological advancement, globalization, and the increasing demand for innovative skills in the modern workforce. Traditional education systems were largely based on lecture-based teaching methods in which students passively received information from teachers. However, this approach is increasingly considered inadequate for preparing students to thrive in complex and dynamic environments. Modern education emphasizes the development of twenty-first-century skills, including critical thinking, communication, collaboration, and creativity. These competencies are essential for addressing global challenges and participating effectively in knowledge-based economies.

Active learning has emerged as a powerful pedagogical approach that addresses these educational needs. Active learning involves instructional methods that engage students directly in the learning process rather than allowing them to remain passive recipients of information. Students participate in activities such as discussions, problem-solving tasks, collaborative projects, and reflective exercises that promote deeper understanding of the subject matter. According to Yuh and Thamrongsotthisakul (2020), active learning requires students to be intellectually, socially, and emotionally engaged in the learning process, which enhances comprehension and skill development. In recent decades, educational researchers and practitioners have increasingly advocated for the integration of active learning strategies into teaching practices. Studies show that active learning improves student engagement, academic performance, and retention of knowledge compared to traditional lecture-based methods (Freeman et al., 2014). Furthermore, active learning aligns with the goals of twenty-first-century education by fostering critical thinking, creativity, and problem-solving skills that are essential for modern society.

Despite its benefits, implementing active learning in classrooms is not without challenges. Teachers often face obstacles such as limited resources, large class sizes, lack of training, and difficulties in assessing student performance. This paper explores the concept of active learning in the context of twenty-first-century education,

identifies key techniques used to promote active learning, and discusses the challenges educators encounter when implementing these approaches.

2. Concept of Active Learning

Active learning refers to a teaching approach that encourages students to actively participate in the learning process through meaningful activities and reflection. Instead of passively listening to lectures, students engage in activities that require them to analyze, evaluate, and apply knowledge. These activities may include group discussions, collaborative projects, problem-solving tasks, case studies, and interactive simulations.

The concept of active learning is grounded in constructivist learning theory, which suggests that learners construct knowledge through interaction with their environment and experiences. According to this theory, learning occurs when students actively engage with new information and connect it with their existing knowledge. Teachers play the role of facilitators who guide students in exploring ideas and developing understanding.

Active learning has gained increasing attention because it enhances student engagement and motivation. Research indicates that students learn more effectively when they are actively involved in the learning process rather than passively receiving information. Active learning also supports the development of higher-order thinking skills such as analysis, synthesis, and evaluation.

Furthermore, the integration of digital technologies has expanded the scope of active learning in modern classrooms. Digital tools such as online collaboration platforms, virtual simulations, and interactive learning environments allow students to explore complex concepts and engage in experiential learning activities. As educational systems evolve to meet the demands of the twenty-first century, active learning is becoming an essential component of effective teaching practices (Özdoğru, 2022).

2.1 Student-centered Learning

Student-centered learning (SCL) is a modern teaching approach that aligns with global educational trends and integrates technology, collaboration, and active learning to achieve higher learning standards (Overby, 2011). Unlike traditional teacher-centered learning (TCL), SCL serves as a foundation for curriculum development rather than merely supplementing conventional teaching practices. It encompasses syllabus design, lesson planning, and classroom instruction (Emaliana, 2017). Effective implementation of SCL requires clear learning objectives, student collaboration, course management strategies, and accountability mechanisms. Syllabus design plays a critical role in this process, incorporating general and course-specific learning goals, structured course outlines, thought-provoking statements, authentic questions, and recognition of students' learning interests to enhance motivation and professionalism (Brush and Saye, 2000; Eberly et al., 2001). Furthermore, SCL curriculum design should address the function of course content, classroom power balance, teacher and student roles, and assessment purposes and procedures (Wright, 2011). These goals can be achieved through well-designed teacher training programs that promote positive attitudes toward SCL among both teachers and students. SCL also facilitates the achievement of learning objectives by motivating students to engage in challenges individually and collaboratively, thereby improving self-esteem, communication skills, teamwork, and the ability to function in diverse and multicultural environments (Overby, 2011). It strengthens student–teacher relationships, meets learners' needs, fosters ownership and identity, and supports competency development (Kaput, 2018). Moreover, SCL encourages learner engagement through resource-based learning and problem-solving activities that stimulate critical thinking and information-seeking behavior (Hannafin and Land, 2000). However, successful implementation requires consideration of factors such as students' access to and affordability of technology (Hannafin et al., 1997; Zhao et al., 2022).

Despite its significant benefits, SCL faces challenges related to differing opinions on its implementation and the difficulties of adoption, adaptation, scaling, and advancement, particularly in developing countries (Din and Wheatley, 2007; Hannafin and Land, 2000). In many cases, its application remains largely confined to soft-skill development rather than being fully integrated into course content, learner responsibilities, and assessment practices (Tangney, 2014; Wright, 2011). To maximize its effectiveness, students should be actively involved in activities such as problem-solving and policy debates, which can create a more engaging and effective learning environment. Nevertheless, Emaliana (2017) argues that SCL should be combined with TCL to achieve more effective learning outcomes. Such a balanced approach requires teachers to receive appropriate training in integrating both methods effectively; otherwise, maintaining a consistent and high learning standard within universities may be difficult. Therefore, in-house professional development and training initiatives are essential for ensuring the successful implementation of both SCL and TCL in higher education.

3. Techniques of Active Learning in the 21st Century

3.1 Project-Based Learning

Project-Based Learning (PBL) is one of the most widely used active learning techniques. In this approach, students work on complex projects that require research, analysis, and problem-solving over an extended period. These projects often address real-world issues, allowing students to apply theoretical knowledge in practical contexts.

Project-based learning promotes creativity, collaboration, and independent learning. It also encourages students to develop research and communication skills. Studies indicate that integrating technology into project-based learning enhances students' engagement and learning outcomes (Yani et al., 2026).

3.2 Inquiry-Based Learning

Inquiry-based learning emphasizes exploration and questioning. In this approach, students investigate topics by asking questions, collecting data, and analyzing evidence. Teachers guide the inquiry process by providing support and resources while encouraging students to develop their own understanding.

This method fosters curiosity and critical thinking. It also helps students develop research skills and scientific reasoning. Inquiry-based learning is particularly effective in science and social science education where exploration and analysis are central to understanding concepts.

3.3 Flipped Classroom

The flipped classroom is an instructional model in which traditional teaching methods are reversed. Students review learning materials such as videos or readings before class, while classroom time is dedicated to interactive activities such as discussions, problem-solving exercises, and collaborative work.

Research suggests that the flipped classroom approach enhances student engagement and promotes deeper learning by allowing teachers to focus on interactive activities rather than lectures (Baig & Yadegaridehkordi, 2023).

3.4 Collaborative Learning

Collaborative learning involves students working together in groups to achieve common learning goals. Activities such as group discussions, peer teaching, and cooperative problem-solving allow students to share knowledge and learn from each other.

Collaborative learning promotes communication skills, teamwork, and social interaction. It also encourages students to develop diverse perspectives and critical thinking abilities.

3.5 Gamification and Interactive Learning

Gamification refers to the use of game elements in educational contexts to increase motivation and engagement. Educational games, quizzes, and simulations provide interactive learning experiences that make learning more enjoyable and effective.

Gamification has been widely adopted in modern classrooms because it encourages participation and enhances students' motivation to learn.

3.6 Technology-Enhanced Learning

Technological advancements have significantly transformed active learning in the twenty-first century. Tools such as artificial intelligence, virtual reality, and online collaboration platforms provide immersive learning environments that support experiential learning.

Modern educational systems increasingly integrate digital technologies to prepare students for the digital age. These technologies enable personalized learning experiences and allow students to explore complex concepts through interactive simulations and multimedia resources (Kum Yoke et al., 2024).

4. Challenges of Implementing Active Learning

4.1 Resistance to Pedagogical Change

One of the major challenges in implementing active learning is resistance to change among educators and institutions. Many teachers are accustomed to traditional lecture-based teaching methods and may be reluctant to adopt new instructional approaches.

4.2 Limited Resources and Infrastructure
Active learning often requires access to technological tools, flexible classroom spaces, and digital resources. In many educational institutions, particularly in developing countries, limited infrastructure and technological support hinder the adoption of active learning strategies.

4.3 Large Class Sizes
Managing active learning activities in large classrooms can be difficult. Teachers may struggle to facilitate discussions, monitor group activities, and provide individualized feedback to students.

4.4 Assessment Challenges
Traditional assessment methods such as written examinations may not effectively measure the skills developed through active learning. Skills such as creativity, collaboration, and critical thinking require alternative assessment methods, including portfolios, peer evaluation, and project-based assessments.

4.5 Teacher Training and Professional Development
Effective implementation of active learning requires teachers to possess strong pedagogical skills and technological literacy. Without adequate training and professional development opportunities, educators may struggle to implement active learning strategies effectively.

4.6 Technological and Ethical Issues
The integration of emerging technologies such as artificial intelligence in education also raises ethical and practical challenges. Concerns about data privacy, technological readiness, and transparency can hinder the adoption of technology-based active learning environments (Yan et al., 2023).

5. Conclusion
Active learning has become an essential component of twenty-first-century education as it promotes student engagement, critical thinking, collaboration, and creativity. Unlike traditional lecture-based teaching methods, active learning encourages students to participate actively in the learning process and construct knowledge through interaction and exploration.

Various techniques such as project-based learning, inquiry-based learning, flipped classrooms, collaborative learning, and technology-enhanced learning have transformed modern educational practices. These approaches provide opportunities for students to develop practical skills that are essential for success in the modern world.

However, despite its advantages, implementing active learning presents several challenges, including resistance to change, limited resources, large class sizes, and difficulties in assessment. Addressing these challenges requires institutional support, teacher training, and investment in educational technology.

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Blended and Student-Centered Teaching Strategies for Effective English Language Teaching at the Tertiary Level in Bangladesh

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Abstract
This mixed-methods study examined the impact of a blended, student-centered English Language Teaching (ELT) approach on learner autonomy and English proficiency at the tertiary level in Bangladesh. Traditionally, ELT in Bangladesh has relied on teacher-centered grammar-translation methods, resulting in low learner engagement and limited communicative competence. The study involved 120 undergraduate students and 10 teachers from three private universities. Using a quasi-experimental pre-test/post-test control group design, the experimental group participated in a 14-week blended intervention combining face-to-face student-centered activities—such as task-based learning, peer feedback, and self-assessment—with asynchronous online tasks including video lectures and discussion forums. The control group continued traditional instruction. Findings revealed significant improvements in learner autonomy, speaking, writing, and overall English proficiency in the experimental group ($p < .001$). Qualitative data also indicated increased engagement, collaboration, and self-regulation, despite challenges related to internet access, device availability, and assessment practices. The study recommends adopting low-tech blended learning models, improving teacher training, and reforming assessment systems to support student-centered ELT in Bangladesh.

***Keywords**:* Blended learning, student-centered teaching, English language teaching, tertiary education, Bangladesh, task-based language teaching, flipped classroom, learner autonomy.

1. Introduction

As the main language of teaching in the majority of private institutions and a required subject from basic to tertiary education, English plays a crucial role in Bangladesh's educational system (Rahman & Pandian, 2018). English proficiency is widely acknowledged as a prerequisite for digital literacy, higher education, and international work (Hamid & Baldauf, 2013). Despite this acknowledgement, employer surveys and subsequent national evaluations have regularly revealed that Bangladeshi university graduates lack the functional English abilities necessary for professional communication (British Council, 2019; Siddique, 2020). The efficiency of current ELT pedagogies is being questioned by scholars and policymakers due to the ongoing disparity between educational investment and learning results.

Even after the National Education Policy (2010) formally supported communicative language teaching (CLT), teacher-centered lecture-based instruction and the Grammar-Translation Method (GTM) have historically dominated ELT in Bangladesh (Chowdhury & Kabir, 2014). This disparity is maintained by a number of institutional and cultural reasons. A strongly embedded culture of rote memorization, examination-oriented curriculum, large class numbers, and insufficient teacher training in CLT all work against pedagogical reform (Islam, 2019; Khan, 2021). Because they believe that student-centered techniques are time-consuming, challenging to administer, or incompatible with current evaluation systems, teachers frequently return to traditional methods (Rahman, 2017).

In addition to these difficulties, Bangladesh's rapidly growing digital infrastructure—which includes lower broadband costs, higher mobile penetration, and government-led digitalization projects like "Digital Bangladesh"—has produced previously unheard-of chances to incorporate technology into education (Andersson & Grönlund, 2009; Khan et al., 2020). This change was sped up by the COVID-19 epidemic, which compelled institutions to switch to online and hybrid learning virtually immediately, but with varying degrees of success (Mamun, 2021). Many universities have kept certain digital components after the epidemic, realizing that in-person training may no longer be adequate or desired.

In developing nations, blended learning—which is described as the deliberate fusion of in-person and virtual learning experiences (Garrison & Vaughan, 2008)—has shown promise. While increasing chances for student-centered pedagogy, blended learning approaches can lessen the resource load of entirely online education. For example, flipped classrooms free up class time for interactive, communicative activities by enabling students to

access lecture information asynchronously (downloaded for offline usage) (Lee & Wallace, 2018). In blended learning situations where regular information transmission takes place online, it is more feasible to employ task-based language teaching (TBLT), collaborative projects, peer feedback, and self-assessment.

However, there is still little study on integrated, student-centered ELT in Bangladeshi higher education. Previous research has either only looked at urban private colleges with greater facilities (e.g., Sultana, 2019) or has only looked at blended learning from the standpoint of technology adoption without doing a thorough pedagogical design (Ahmed & Hossain, 2020). Few research have investigated the integration of many student-centered techniques within a mixed framework or systematically examined learning outcomes using controlled designs. Therefore, this study addresses the following research questions:

1. To what extent does a blended, student-centered ELT intervention (combining flipped learning, TBLT, collaborative projects, and self-assessment) improve undergraduate students' overall English proficiency compared to traditional instruction?
2. What are the effects of the intervention on specific language skills (speaking, writing, reading, listening) and learner autonomy?
3. What are the perceptions of students and teachers regarding the feasibility, benefits, and challenges of implementing blended, student-centered ELT in Bangladeshi tertiary settings?

By answering these questions, the study aims to provide an evidence-based, context-sensitive framework for effective ELT that balances pedagogical innovation with local resource realities.

2. Literature Review

2.1 Student-Centered Learning in ELT

A paradigm change from the transmission model of education, in which the instructor is the only authority, to a constructivist model in which students actively create knowledge via participation, introspection, and social interaction is represented by student-centered learning (SCL) (Weimer, 2013). The needs, interests, and past knowledge of the students are taken into consideration while making instructional decisions in SCL, where the instructor takes on the role of facilitator, guide, or co-learner (Brown, 2007). SCL appears in English language instruction through a number of thoroughly studied methods. In order to encourage learners to utilize language communicatively, task-based language teaching (TBLT) structures instruction around meaningful activities (such as problem-solving or event planning) rather than discrete grammar points (Ellis, 2017). Jigsaw puzzles, peer tutoring, and group projects are examples of collaborative learning frameworks that encourage meaning negotiation and lessen language anxiety (Johnson & Johnson, 2009). The conventional lecture-homework pattern is reversed in flipped classrooms, where students interact with instructional materials (such as books and videos) prior to class, and class time is devoted to problem-solving and active application (Bergmann & Sams, 2012). Key elements of learner autonomy include self-assessment and learning contracts, which enable students to track their own development and take ownership of their education (Benson, 2011). When compared to teacher-centered teaching, meta-analyses consistently demonstrate that SCL techniques yield better language learning results, especially in speaking fluency, writing complexity, and long-term retention (Hattie, 2012; Norris & Ortega, 2006). However, institutional and cultural adjustments are necessary for the successful use of SCL in non-Western environments. Due to their earlier indoctrination into hierarchical, teacher-dependent classrooms, Asian students may first oppose SCL, but Littlewood (2007) noted that when SCL is presented gradually and openly, they adjust well.

2.2 Blended Learning: Definitions and Models

Although there are several definitions of blended learning (BL), Garrison and Vaughan (2008) provide the most frequently recognized definition, characterizing BL as "the thoughtful fusion of face-to-face and online learning experiences" (p. 5). In contrast to entirely online learning or "technology-enhanced learning," which might only sometimes use digital resources, BL purposefully combines both modes to produce a cohesive, life-changing educational experience.

There are several BL models for teaching languages. Subtypes of the rotation paradigm include lab rotation, station rotation, and flipped classrooms (Staker & Horn, 2012). Online training with on-site assistance is the mainstay of the flex approach. The enhanced virtual approach does not need daily attendance, but it does substitute certain in-person sessions with online activities. Because digital information may be downloaded once and viewed offline, the flipped classroom and low-tech rotation models are especially appropriate for developing nations with sporadic internet connectivity (Andersson & Grönlund, 2009). For ELT, BL has clear benefits. Through online

resources (videos, podcasts, readings), it offers more exposure to understandable input, promotes asynchronous interaction (discussion boards, group writing), permits self-pacing, and allots time for interactive speaking practice during in-person sessions (Neumeier, 2005). With an average impact size of g = 0.35, a meta-analysis by Means et al. (2013) revealed that BL settings offered superior learning results than either wholly online or totally face-to-face training.

2.3 Blended Student-Centered ELT: Synergies

Combining BL with SCL produces effects that reinforce each other. Discussion boards extend collaborative learning outside of the classroom, digital portfolios facilitate self-evaluation, and online tests free up class time for assignments. BL offers the structural flexibility and digital resources necessary for SCL to thrive (Garrison & Vaughan, 2008). On the other hand, SCL principles guarantee that BL is more than just a digital form of teacher-centered training (e.g., passively watching lecture videos). Active learning, choice, and learner voice are included into both online and in-person components of successful blended, student-centered ELT systems.

This synergy is supported by empirical research conducted in Asian environments. When compared to traditional instruction, Lee and Wallace (2018) saw notable improvements in speaking fluency and student satisfaction in a flipped EFL classroom in China. Writing coherence and grammatical precision were enhanced in Indonesia by TBLT administered in a mixed manner (Sulistyo & Cahyono, 2019). A mixed SCL intervention decreased absenteeism and raised student motivation in Pakistan (Ali & Khan, 2020). These studies highlight the need of careful design: online elements should not be viewed as optional extras but rather as accessible, interesting, and linked with in-class activities.

2.4 The Bangladeshi Tertiary ELT Context: Challenges and Opportunities

Gross tertiary enrollment increased from 13% to 24% between 2010 and 2020, demonstrating Bangladesh's impressive success in expanding access to education (World Bank, 2021). But quality is still inconsistent. The disparity between policy and practice is especially noticeable in ELT. Although the National Education Policy (2010) clearly promotes “learner-centered, communicative and participatory methods” (Ministry of Education, 2010, p. 14), GTM and teacher-centered lectures continue to be prevalent in classroom observations (Hamid & Baldauf, 2013; Islam, 2019).

This implementation gap can be explained by a number of obstacles. First, classroom-based mentorship is missing in CLT and SCL teacher training, which is irregular and frequently theoretical (Rahman, 2017). Second, high-stakes public tests (like Honours final exams) discourage creativity by rewarding memorization of model responses rather than communication skills (Chowdhury & Kabir, 2014). Third, small-group activities seem logistically challenging since class sizes frequently surpass 80–100 kids (Khan, 2021). Fourth, a common perception among educators and learners is that teacher-led explanation is necessary for "real learning" (Siddique, 2020).

However, there are also new opportunities. Over 98% of the population now has internet access because to the "Digital Bangladesh" plan (Bangladesh Telecommunication Regulatory Commission, 2022). In metropolitan regions, almost 85% of university students own smartphones (Ahmed & Hossain, 2020). Even previously hostile colleges embraced learning management systems (LMS) like Google Classroom, Moodle, or Canvas during the COVID-19 lockdowns (Mamun, 2021). Asynchronous video classes, online tests, and discussion boards gained popularity among educators and students. After the pandemic, this digital preparedness offers a basis for further blended learning.

Disparities in infrastructure still exist, though. Students from low-income households or those living in remote regions might not have access to dependable personal gadgets or the internet. Even if they are less often, power outages still happen. As a result, any suggested blended ELT strategy for Bangladesh has to be low-tech and offline-compatible, such as utilizing USB-based material distribution, downloaded video files, and SMS or WhatsApp for communication (Khan et al., 2020).

2.5 Empirical Gaps and the Present Study

While individual studies have looked at blended learning adoption (Ahmed & Hossain, 2020), flipped learning in private universities (Sultana, 2019), and CLT implementation in Bangladesh (Rahman & Pandian, 2018), no prior study has systematically combined multiple student-centered strategies (flipped, TBLT, collaborative projects, self-assessment) within a blended framework and evaluated outcomes using a quasi-experimental design with both quantitative proficiency measures and qualitative perceptions. The majority of current research is either restricted to attitude surveys, solely descriptive, or single-group pre-post (without control). By offering solid proof

of the viability and efficacy of a mixed, student-centered ELT approach adapted to the Bangladeshi tertiary setting, this study closes that gap.

3. Methodology

3.1 Research Design

The study used a sequential explanatory mixed-methods approach (Creswell & Creswell, 2018). A quasi-experimental pre-test/post-test non-equivalent control group design was employed in the quantitative phase. In order to contextualize and explain the quantitative results, a subset of students and all participating instructors participated in semi-structured interviews during the qualitative phase. When random assignment is impractical, this method is especially appropriate for intervention research in naturalistic educational contexts (Cohen et al., 2018).

3.2 Participants and Sampling

Three private universities in Bangladesh were used for the study: one in Chittagong (semi-urban, moderate infrastructure) and two in Dhaka (urban, comparatively superior infrastructure). Private institutions were selected because, in comparison to public universities, they usually have smaller class sizes (30–60 students) and more administrative freedom to apply pedagogical innovations (Rahman & Pandian, 2018).

Participants were 120 undergraduate students engaged in required English foundation courses, such as Communicative English and English for Academic Purposes. Two comparable groups were created by purposeful sampling:

• The experimental group (n = 60) consisted of 32 females and 28 males from three intact sections (one per university), with a mean age of 20.4 years (SD = 1.2).
• The control group (n = 60) consisted of 34 females and 26 males from three parallel intact sections at the same institutions; their mean age was 20.6 years (SD = 1.1). An independent t-test was performed on pre-test English scores to verify baseline equivalency; the results indicated no significant difference (p =.81, see Results section).

Students were told that their involvement would not impact their course grades and that it was entirely optional. Written informed consent was acquired. Participants were ten English language instructors from the same three universities—six of them were female and four were male. Their tenure as teachers varied from two to fifteen years (M = 7.8 years). After obtaining training on the intervention, five instructors were assigned to instruct the experimental group, while five teachers in the control group carried on with their regular practices. For the purpose of classroom observations and interviews, all instructors provided their approval.

3.3 Instruments

3.3.1 English Proficiency Pre-test and Post-test

In collaboration with three ELT specialists, the researcher created a 100-point English competence exam. There were four portions of the test:

• Reading (25 points): One short-answer comprehension passage (10 points) and one multiple-choice cloze exam (15 items).
• Listening (25 points): Pre-recorded audio is used to give two brief dialogues (10 multiple-choice questions) and one monologue (5 short-answer questions).
• Writing (25 points): One email writing assignment (10 points) and one guided paragraph (150 words, 15 points).
• Speaking (25 points): Recorded answers to three questions, such as "Describe a memorable event" and "Give your opinion on..." An analytical rubric (fluency, grammar, vocabulary, pronunciation) was then used to score the responses by two separate raters; the inter-rater reliability was r =.86. A pilot test with thirty non-participating students confirmed the parallel versions of the pre-test and post-test, which had different material but the same degree of difficulty (Cronbach's α = 0.89). Every test was given in person under uniform circumstances.

3.3.2 Learner Autonomy Scale

Students' self-perceived capacity to oversee their own learning was assessed using the 15-item Learner Autonomy Scale, which was modified from Zhang and Li (2011). A 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) was used to score the items. Examples include "I evaluate my own progress," "I set my own learning goals," and "I look for extra English practice outside of class." The present sample's Cronbach's α was 0.84.

3.3.3 Semi-Structured Interview Guides

Teachers (all 10) and students (10 experimental group students, purposefully chosen for diversity in competency level) each had their own set of guidelines. The following topics were covered in student interviews: (a)

experiences with blended learning; (b) perceived improvements in English proficiency; (c) difficulties; and (d) recommendations for enhancement. The following topics were discussed in teacher interviews: (a) implementation fidelity; (b) observed student involvement; (c) pedagogical and technological obstacles; and (d) perspectives on sustainability. Every interview took place in a private room, lasted 20 to 30 minutes, was audio recorded, and was verbatim transcribed.

3.4 Intervention Design and Implementation

The study's suggested Blended Student-Centered ELT Framework (see Discussion section for the final framework) guided the design of the 14-week (one semester) experimental intervention. Four teaching approaches were used into the intervention:

1. Flipped classroom: Every week, students had access to 10- to 15-minute pre-recorded video lectures on vocabulary, grammar, or discourse elements. These lectures could be downloaded using Google Classroom or sent via USB for offline viewing. Before class, a quick online test using Google Forms assessed understanding.

2. Task-based language teaching (TBLT): Two hours per week of in-person instruction centered on communicative activities, such organizing a campus event, completing a case study, or drafting a survey. The pre-task, task cycle, and language concentration stages described by Ellis (2017) were followed in the tasks.

3. Collaborative projects: Students completed a semester-long project (such as a digital storytelling film or a mini-research presentation) in small groups of four to five people. Groups used a standardized online form to submit weekly progress reports and get peer comments.

4. Self-assessment and reflection: Every two weeks, students wrote a brief reflection on their development and filled out a self-assessment checklist connected to learning goals. The teacher was given access to them, but they were only judged for completion rather than correctness. The control group continued to follow the school's current curriculum, which included teacher-led lectures, textbook grammar problems, sporadic pair work, and midterm and final summative exams. There were no flipped, TBLT, or systematic self-assessment components.

The experimental group's teachers attended a two-day (12-hour) training workshop that covered the following topics: (a) the justification for blended student-centered learning; (b) how to make and upload basic video lessons using a laptop or phone; (c) facilitating TBLT tasks; (d) running online discussion forums; and (e) giving formative feedback. A detailed weekly lesson plan was provided, but teachers were encouraged to adapt tasks to their students' needs.

3.5 Procedure

• Week 0: Teacher training was provided and ethical permission was obtained.
• Week 1: Both groups took pre-tests, and student permission was obtained.
• Weeks 2–15: The experimental group received an intervention, whereas the control group received regular teaching. Fidelity checks: Using a standardized checklist, the researcher made two surprise observations for each group, for a total of six observations per group.
• Week 16: Both groups took post-tests.
• Weeks 17 and 18: Ten students and all ten instructors participated in semi-structured interviews.

3.6 Data Analysis

SPSS Version 26 was used to examine quantitative data. For both pre- and post-test results, descriptive statistics (means, standard deviations) were calculated. The two groups were compared during the pre-test and post-test using independent-samples t-tests. An analysis of covariance (ANCOVA) was used with pre-test scores as the covariate and post-test scores as the dependent variable in order to account for pre-test differences even though there was no random assignment failure. Cohen's d, which is read as small = 0.2, medium = 0.5, and large = 0.8, was used to report effect sizes. The assumptions of homogeneity of variances (Levene's test $p > .05$) and normality (Shapiro-Wilk $p > .05$) were verified and satisfied. Reflexive theme analysis was used to examine qualitative data (Braun & Clarke, 2006). The approach had six stages: (1) becoming acquainted with the transcripts; (2) creating preliminary codes; (3) looking for themes; (4) evaluating themes; (5) defining and labeling themes; and (6) writing up. Twenty percent of the transcripts were independently transcribed by two coders, with an inter-coder agreement of 87%. Discussions were used to settle disagreements. The research questions were then addressed by integrating themes with quantitative data.

4. Results

4.1 Quantitative Results

4.1.1 Baseline Equivalence

Table 1 shows pre-test and post-test descriptive statistics. An independent t-test confirmed no significant difference between experimental and control groups on pre-test total scores, $t(118) = 0.24$, $p = .81$, indicating successful matching.

TABLE 1 DESCRIPTIVE STATISTICS AND COMPARISON OF PRE-TEST AND POST-TEST SCORES

Variable	Group	n	Pre-test M (SD)	Post-test M (SD)	Mean Gain	t (post)	p	Cohen's d
Total (100)	Experimental	60	52.3 (9.1)	74.6 (8.4)	22.3	10.31	<.001	1.89
	Control	60	51.9 (8.7)	58.2(9.0)	6.3			
Speaking (25)	Experimental	60	11.4 (2.9)	18.2 (2.3)	6.8	12.07	<.001	2.21
	Control	60	11.1 (2.8)	12.5 (2.8)	1.4			
Writing (25)	Experimental	60	12.1 (2.7)	17.9 (2.5)	5.8	10.24	<.001	1.87
	Control	60	11.9 (2.6)	13.1 (2.6)	1.2			
Reading (25)	Experimental	60	15.3 (3.1)	20.1 (2.9)	4.8	6.45	<.001	1.25
	Control	60	15.2 (3.0)	16.8 (3.1)	1.6			
Listening (25)	Experimental	60	13.5 (2.8)	18.4 (2.6)	4.9	7.83	<.001	1.51
	Control	60	13.7 (2.7)	15.8 (2.9)	2.1			
Autonomy (75)	Experimental	60	43.1 (6.2)	68.4 (6.7)	25.3	14.98	<.001	2.75
	Control	60	42.8 (6.4)	49.3 (7.2)	6.5			

Note. M = mean; SD = standard deviation; all post-test comparisons used independent t-tests.

4.1.2 Post-test Comparisons

On the overall post-test score, the experimental group scored considerably better than the control group (74.6 vs. 58.2, $t(118)=10.31$, $p<.001$, $d=1.89$). The intervention had a significant practical impact, as evidenced by the extremely large effect size. Speaking ($d=2.21$) and learner autonomy ($d=2.75$) showed the most improvements in individual abilities, followed by listening ($d=1.51$), writing ($d=1.87$), and reading ($d=1.25$). At $p<.001$, every improvement was statistically significant.

4.1.3 ANCOVA Results

ANCOVA was performed using the pre-test total as a covariate to account for any pre-test variance, even if it was not significant. After adjusting for prior proficiency, the intervention effect was still significant ($F(1, 117) = 86.42$, $p <.001$, partial $\eta^2 = 0.43$), meaning that 43% of the variation in post-test scores was explained by the intervention. This has a significant impact.

4.2 Qualitative Results

Six main themes emerged from a thematic analysis of ten student and ten teacher interviews: (1) greater motivation and engagement; (2) enhanced speaking confidence; (3) learner autonomy development; (4) advantages of collaborative learning; (5) infrastructure and technology barriers; and (6) assessment misalignment. Representative quotations are used to illustrate each concept.

Theme 1: Enhanced motivation and involvement

English lessons were frequently described by students as being more engaging due to the mixed style and student-centered activities. The flipped and task-based components necessitated active involvement, in contrast to standard lectures that seemed passive. "In the past, I would simply sit and copy notes off the board. I now watch movies at home, and we really converse in class. I no longer want to skip class. (Female, experimental, S24). Instructors also saw increased engagement in online forums and attendance. Weak pupils began contributing to

the forum as well. They questioned one another. In my usual classes, I never noticed that. (T03, female, eight years of experience)

Theme 2: Enhanced self-assurance when communicating

Reduced fear about speaking English was the most often reported advantage. The mix of low-stakes task-based engagement and pre-class preparation (viewing vocabulary/pronunciation videos) was the reason given by the students. We make errors when working in groups, but friends support us. The instructor doesn't interject. My shyness has decreased. I was unable to utter a single sentence at first. I can now speak for a minute. (Male, S07, experimental). Instructors attested to seeing longer turns and more voluntary speaking.

Theme 3: Growth of student independence

It seems that the reflection diaries and self-evaluation checklists promoted metacognitive awareness. Students said they set personal objectives and looked for practice outside of the classroom. We write down what we've learnt and what we still need to work on every two weeks. I became aware of my weakness in the past tense. I thus viewed more videos by myself. (Female, experimental, S12). This qualitative result is highly supported by quantitative autonomy scale increases (d=2.75).

Theme 4: Collaborative learning benefits

Students appreciated group projects and peer review, pointing out that working together lessened the stress of studying on their own and introduced them to a variety of language usage. One of my friends is proficient in grammar, while another excels in pronunciation. We support one another. Although the project was challenging, we completed it as a team. (S19, male). Nonetheless, a few students reported sporadic instances of free-riding, which they addressed by using peer assessment forms that were included into the project design.
Theme 5: Technological and infrastructural barriers

Despite generally favorable results, instructors and students noted serious difficulties. Lack of personal computers, restricted data plans, and poor internet were the most prevalent. "In my village house, the internet might be really sluggish at times. I was unable to view the entire video. I thus arrived late for the class discussion. (Female, experimental, S15). Instructors also observed that although the majority of students owned cellphones, not all of them had headphones or enough storage. "I had to provide USB disks to five pupils who claimed not to have access to the internet at home. The institution need to offer computer lab time for viewing films. (Male, T08, 12 years of experience)

Theme 6: Assessment misalignment

Teachers emphasized that there was a conflict between the intervention and institutional standards because the university's summative exams (final and midterm) still assessed memorization rather than communication skills.

"I enjoy teaching in this manner, but students question me at the end of the semester if this will be covered in the test. Additionally, the exam consists entirely of multiple-choice questions and textbook-based short answers.

Thus, they experience conflict. (T06, female, six years of experience). Students expressed similar concerns, saying they would put in even more work if projects and participation were given greater weight in the course grade.

4.3 Integration of Quantitative and Qualitative Findings
Students' stated increases in self-control and confidence are consistent with the substantial impact sizes for speaking and learner autonomy. While speech and autonomy were previously overlooked, conventional education already included some reading practice, which may account for the smaller (but still significant) benefit for reading. Teachers' worries regarding sustainability and certain students' continued difficulties with online components can be explained by the qualitative issues of technology and evaluation. The suggested structure in the Discussion section is informed by these combined findings.

5. Discussion

The efficacy of a blended, student-centered ELT intervention in Bangladeshi higher education was examined in this study. The findings offer compelling proof that, in comparison to traditional education, flipped learning,

TBLT, group projects, and self-evaluation combined in a mixed format greatly enhances learner autonomy and English competence, particularly speaking and writing. These results provide new insights unique to Bangladesh's resource and assessment setting, while also supporting and expanding earlier research in comparable Asian contexts (Lee & Wallace, 2018; Sulistyo & Cahyono, 2019).

5.1 Why Blended Student-Centered ELT Works in This Context

The very large effect on speaking (d=2.21) is particularly noteworthy. In traditional Bangladeshi classrooms, speaking practice is minimal due to large classes, exam focus, and teacher-centered norms (Hamid & Baldauf, 2013). The flipped model freed face-to-face time for interactive tasks, while the online component allowed students to prepare vocabulary and pronunciation asynchronously. This preparation reduced the cognitive load during speaking tasks, enabling more fluent production (Ellis, 2017). Additionally, the low-stakes nature of peer interaction in TBLT lowered affective filters (Krashen, 1985), which is crucial for learners with high language anxiety. The dramatic increase in learner autonomy (d=2.75) suggests that self-assessment and reflection tools, combined with choice in project topics and pacing, effectively shifted responsibility from teacher to learner. This finding contradicts the stereotype that Bangladeshi students are passive and teacher-dependent (Siddique, 2020). When provided with structured autonomy-supportive tools, students readily adopted self-regulatory behaviors. This echoes Littlewood's (2007) observation that Asian learners adapt to SCL when it is introduced with clear scaffolding. The smaller but still large effect on reading (d=1.25) may be explained by the fact that both groups received some reading instruction. However, the experimental group's advantage likely came from increased exposure to authentic texts during online research for projects and peer feedback activities.

5.2 The Proposed Framework: Low-Tech Blended Student-Centered ELT

Based on the findings and teacher/student feedback, the study proposes a Low-Tech Blended Student-Centered ELT Framework for Bangladeshi tertiary institutions (see Figure 1 for conceptual model; described narratively here). The framework consists of three interconnected phases repeated weekly:

Phase 1: Pre-class (Asynchronous, Low-Data)

- Objective: Prepare foundational knowledge and lower anxiety.
- Activities:
- Teacher uploads a short (5–10 min) video lecture (downloadable for offline viewing).
- Students complete a 5-question online quiz (Google Forms) or a simple worksheet.
- Optional: Students post one question or comment on a discussion forum (text-based, can be done via mobile).
- Technology needed: Smartphone or shared computer; free Google tools; USB distribution as backup.

Phase 2: In-class (Face-to-Face, Interactive)

- Objective: Apply knowledge communicatively through tasks.
- Activities:
- Brief clarification of pre-class questions (5–10 min).
- Task cycle (40–50 min): Students complete a meaningful task (e.g., role-play, problem-solving, survey creation) in pairs/small groups. Teacher circulates and facilitates, not corrects.
- Peer feedback (10–15 min): Groups exchange work using a simple rubric (e.g., "two stars and a wish").
- Language focus (10 min): Teacher highlights useful language observed during tasks.
- Technology needed: None (printable handouts optional).

Phase 3: Post-class (Reflective and Consolidation)

- Objective: Promote metacognition and self-regulation.
- Activities:
- Students complete a self-assessment checklist aligned with weekly objectives.
- Short reflection (2–3 sentences) on what was learned and one area for improvement.
- Optional extension task (e.g., find one online resource related to the topic).
- Technology needed: Smartphone or paper journal.

Cross-cutting principles:

- Low-tech by design: All online components have offline alternatives (USB, paper).
- Assessment alignment: At least 30% of course grade should come from continuous, task-based assessment (projects, portfolios, participation) rather than only final exams.
- Teacher support: Weekly peer coaching and access to a repository of ready-made tasks.

This framework directly addresses the challenges identified in interviews: it minimizes real-time internet dependence, uses familiar free tools, and reduces teacher workload through structured repetition.

5.3 Addressing Implementation Barriers

The qualitative findings highlighted three major barriers: technology access, teacher readiness, and assessment mismatch. Each requires systemic responses:

Technology access: Universities can establish "offline labs" where students download weekly materials. Mobile data bundles for educational use could be negotiated with telecom providers (as seen in other developing countries). The framework's offline alternatives ensure no student is excluded. Teacher readiness: Pre-service and in-service teacher education must include hands-on practice with blended, student-centered methods—not just theory. Peer observation and mentoring networks (e.g., using WhatsApp groups) provide ongoing support. Assessment mismatch: This is the most structural barrier. Without examination reform, even the best interventions face resistance. Departments should introduce continuous assessment schemes (portfolios, presentations, projects) that carry significant grade weight. The study's framework includes a suggested 40% continuous, 60% final exam split, which is feasible within existing university regulations in many private institutions.

5.4 Comparison with Previous Studies

The effect sizes in this study (d = 1.25 to 2.75) are larger than those reported in some Western meta-analyses of blended learning (e.g., Means et al., 2013 reported g = 0.35). This discrepancy likely reflects the very low baseline of student-centered and blended practice in Bangladesh. In contexts where traditional instruction is extremely passive, any well-designed intervention produces dramatic initial gains (Hattie, 2012). However, replication studies with longer durations are needed to see if gains stabilize or grow. Compared to other Bangladeshi studies, this research provides more robust evidence due to its controlled design and mixed methods. Sultana (2019) found positive attitudes toward flipped learning but did not measure proficiency gains. Ahmed and Hossain (2020) reported technology adoption barriers but did not implement a full pedagogical intervention. The present study bridges that gap.

6. Implications

6.1 For Pedagogy and Practice

University English teachers in Bangladesh should consider adopting the Low-Tech Blended Student-Centered ELT Framework incrementally. Starting with one component (e.g., flipping one class per week or adding a self-assessment checklist) reduces initial workload. Teachers are encouraged to collaborate in small communities of practice to share video lessons and task ideas. The framework does not require expensive LMS; Google Classroom, WhatsApp, or even printed materials with QR codes for video downloads suffice.

6.2. For Teacher Education

Both pre-service (B.Ed., M.Ed.) and in-service professional development programs must integrate blended, student-centered ELT as a core competency. Training should move beyond one-off workshops to sustained mentoring, with demonstration lessons and co-teaching. University ELT units can establish peer observation protocols focused on student-centered indicators (e.g., student talk time, task clarity, feedback quality).

6.3. For Policy and Curriculum

The University Grants Commission (UGC) of Bangladesh and individual university academic councils should revise English foundation course curricula to include explicit learning outcomes for speaking fluency, learner autonomy, and digital literacy. More importantly, assessment policies must be amended to allow at least 30–40% continuous assessment weight for tasks, projects, and portfolios. Without this change, blended student-centered ELT will remain a marginal innovation rather than a systemic reform.

6.4. For Infrastructure Investment

University administrations should invest in basic blended learning enablers: reliable Wi-Fi in key areas, computer labs with offline access, and provision of USB drives or low-cost tablets for students in need. These investments are modest compared to the potential learning gains demonstrated in this study.

7. Limitations and Future Research

This study has several limitations. First, the quasi-experimental design, while robust for naturalistic settings, cannot completely rule out selection bias. Although pre-test equivalence was achieved, unmeasured variables (e.g., motivation, prior technology experience) might have differed. Future research should use cluster randomized

controlled trials when feasible. Second, the study duration was only one semester (14 weeks). Longitudinal follow-up (e.g., 6 or 12 months post-intervention) is needed to assess retention of gains and whether learner autonomy persists without structured support. Third, the sample was limited to private universities in two cities. Public universities, which enroll the majority of Bangladeshi undergraduates, typically have larger classes (100+), less technological infrastructure, and more rigid curricula. Replication studies in public universities are essential before generalizing the framework nationally. Fourth, the study did not measure long-term teacher burnout or fidelity after the researcher's support ended. Implementation science approaches could examine how teachers adapt the framework autonomously over time. Fifth, the learner autonomy scale, though reliable, was self-report. Future studies could incorporate behavioral measures (e.g., voluntary use of online resources tracked via analytics, or learning contract completion rates). Finally, cross-cultural comparisons with other South Asian countries (India, Pakistan, Nepal) would help determine which components of the framework are universally effective versus context-specific.

8. Conclusion

This study provides compelling evidence that blended learning, when deliberately integrated with student-centered strategies such as flipped classrooms, task-based language teaching, collaborative projects, and self-assessment, significantly improves English proficiency and learner autonomy among tertiary students in Bangladesh. The very large effect sizes for speaking and autonomy underscore the potential of this approach to address long-standing deficiencies in communicative competence. Equally important, the study identifies realistic barriers—technology access, teacher readiness, and assessment misalignment—and offers a practical, low-tech framework to overcome them. For Bangladeshi higher education to produce graduates with functional English skills, a systemic shift toward blended, student-centered ELT is not merely desirable but necessary. Policymakers, teacher educators, and university administrators must act collaboratively to align curriculum, assessment, infrastructure, and professional development with this evidence-based vision.

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Blended Mode of Class Scheduling: Perspectives from Faculty, Non-Teaching Staff, And Students in the Context of Private Universities of Bangladesh

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Abstract

The rapid expansion of blended learning models has influenced higher education institutions to reconsider the weekly class-schedule structure. Yet, few studies have examined how four in-person days plus one online day (4+1) are perceived by the full spectrum of university stakeholders. This research addresses that gap by asking three questions: What are the preferences of faculty, non-teaching staff, and students for a blended schedule? Which benefits and drawbacks do they associate with it? How might these insights inform policy-making? The post-pandemic situation has made technology-assisted learning a more common scenario for all 3 stakeholders (students, faculty, and admin officer) of a higher education institute. Faculty members are likely more at ease in conducting online classes when needed, and students are more comfortable in using AI tools related to online classes and assessments. Authorities tend not to prefer or include online classes as a regular mode, instead use them as an "Emergency backup". For data collection, an online survey was conducted with the participation of 2208 students, 113 faculty members, and 54 non-teaching staff members. 83.24% students, 92.48% faculty members, and 74.05% admin staff expressed their preference in favor of conducting at least one day of online classes in a week.

Keywords: Hybrid Learning, Blended Learning, Post-Pandemic Higher Education, Blended Schedule

1. Introduction

Online Learning emerged as a new era of Educational Transformation back in 1981 in the USA; however, it was initially considered as just another form of distance learning at that period due to its traditional lecture-based approaches. Later on, the term E-Learning was invented in the mid-90s that led to the emergence of Educational Technology with the features of asynchronous hybrid learning or blended learning. Online learning is on the other hand, is considered as the "Fifth generation" of distance education (Taylor, 2001) It is termed as a form of distance education where technology mediates the learning process, teaching is delivered completely using the internet, and students and instructors are not required to be available at the same time and place. It does not include more traditional distance education instruction methods, such as print-based correspondence education, broadcast television or radio, videoconferencing in its traditional form, videocassettes/DVDs, and stand-alone educational software programs. However, Blended learning refers to the practices that combine (or blend) traditional face-to-face instruction with online learning. The idea of blended learning started getting academic acceptance during the covid 19 pandemic situation all over the world.

In a more comprehensive survey of 1,963 students in Kerala, Shameera and Khan (2023) found that 72.8% of students preferred traditional classroom instruction, 23.2% preferred blended learning, and only 4% preferred fully online modes. Their preferences were largely determined by factors such as psychological stress, teacher support, technical proficiency, and device availability. Similarly, 61% of students preferred offline learning,31% preferred blended learning, and only 8% chose online education, according to Ella et al. (2022). Cost Savings and access to recorded content were cited as benefits of online learning, while mental exhaustion, diminished focus, and an increased workload were cited as drawbacks.

2. Methodology

A mixed-methods approach has been used to collect and analyze both qualitative and quantitative data.

2.1 Sampling
All faculty members, administrative staff, and students of a reputable private university in Bangladesh were selected as the sample for this research.

TABLE 1 DEMOGRAPHIC CHARACTERISTIC OF THE SAMPLE: (N=2375)

Designation	Total Number
Faculty Member	113
Administrative Staff	54
Student	2 208

A total of 2,395 participants responded to a structured survey across three stakeholder categories. Faculty members (n = 133) from all four faculties and students (n = 2,208) were drawn from ten academic departments, and the same for the officers.

3. Results

3.1 Perspectives of Faculty Members on Blended Mode of Class Scheduling
Survey responses from faculty members showed a strongly positive orientation toward the 4-day physical + 1-day online (4+1) hybrid scheduling model. Overall, 92.48% of faculty members (n = 123 out of 133) expressed a strong preference for the hybrid schedule over five full physical days. Preference for the hybrid model was particularly high on academic dimensions (86.47%), financial considerations (84.96%), research (84.96%), and reputation (90.23%). The most contradicting criterion was administrative coordination, where 53.38% preferred the hybrid format and 46.62% preferred five physical days, reflecting the skeptical views on whether the ongoing administrative structure would be able to adapt to this shift.

TABLE 2 PREFERENCES OF FACULTY MEMBERS: 4+1 HYBRID VS. 5-DAY PHYSICAL CLASS (N = 133)

Category	Perception for 4+1 Hybrid Schedule	Perception for 5-Day Physical Class	Percentage for 4 Days	Percentage for 5 Days
Academic Perspective	71	62	53.38%	46.62%
Administrative Perspective	88	45	66.17%	33.83%
Health Perspective	113	20	84.96%	15.04%
Financial Perspective	113	20	84.96%	15.04%
Research Scope	120	13	90.23%	9.77%
Institutional Reputation	98	35	73.68%	26.32%
Environmental Aspects	123	10	92.48%	7.52%
Total	123	10	92.48%	7.52%

Thematic analysis of the survey conducted among faculty members revealed two dominant themes. The first, Faculty members demonstrated strong support for the 4+1 hybrid scheduling model, with 92.48% (n = 123) expressing a final preference for the blended approach over the traditional five-day physical schedule. Although preferences were somewhat divided on academic and administrative dimensions, the majority leaned toward the hybrid model, viewing it as an effective way to balance teaching responsibilities, research productivity, and overall well-being. Respondents particularly appreciated the reduction in daily commuting time (often 3–5 hours), which helped alleviate fatigue, while the additional non-teaching day was valued for research, scholarly work, and improved work-life balance. Nevertheless, some faculty members raised concerns about potential declines in academic rigor, student engagement, and institutional reputation if the online component lacks adequate infrastructural and pedagogical support.

TABLE 3 PERSPECTIVES OF NON-TEACHING STAFF MEMBERS

Category	Perception for 4+1 Hybrid Schedule	Perception for 5-Day Physical Class	Percentage for 4 Days	Percentage for 5 Days
Research Output	43	11	79.63%	20.37%
Institutional Reputation	42	12	77.78%	22.22%

Environmental Aspect	34	20	62.96%	37.04%
Final Decision	40	14	74.07%	25.93%

Administrative and non-teaching staff showed sufficient support for the 4+1 hybrid scheduling model, with 74.07% (n = 40 out of 54) expressing a final preference for the blended approach. Respondents particularly valued the hybrid model for enhancing operational efficiency, reducing institutional costs, and improving employee well-being through fewer commuting days. While a strong majority supported the hybrid format across most criteria, some concerns were raised regarding coordination, accountability, and the need for continuous student support services. A few participants suggested a balanced implementation, maintaining five physical days for critical units such as admissions and accounts while adopting the 4+1 model for other departments.

3.2 Student Perspectives on Blended Class Scheduling

Students demonstrated the broadest and most consistent support for the 4+1 hybrid model across all stakeholder groups. A total of 83.24% of students (n = 1,838 out of 2,208) expressed a final preference for the hybrid schedule over five full physical days. Student support was highest on health and well-being grounds (83.61%), financial considerations (83.11%), and environmental dimensions (79.21%). Support was comparatively lower—though still a strong majority—for research and lifelong learning (75.14%) and institutional reputation (75.23%), reflecting some student concern about whether hybrid schedules could maintain academic rigor and institutional standing.

TABLE 4 STUDENT PREFERENCES: 4+1 HYBRID VS. 5-DAY PHYSICAL CLASS SCHEDULE (N = 2,208)

Category	Total	Perception for 4+1 Hybrid	5-Day Physical Class	Percentage for 4 Days	Percentage for 5 Days
Academic wellbeing	2208	1748	460	79.17	20.83
Health Concerns	2208	1846	362	83.61	16.39
Financial Concerns	2208	1835	373	83.11	16.89
Research	2208	1659	549	75.14	24.86
University Reputation	2208	1661	547	75.23	24.77
Environment	2208	1749	459	79.21	20.79
Final Decision	2208	1838	370	83.24	16.76

Qualitative themes from student interviews included "Flexibility as Liberation," reflecting students' appreciation for the opportunity to revisit recorded lectures, manage commute-related time costs, and balance academic obligations with part-time employment or family responsibilities. Students from outer Dhaka districts specifically noted that reduced commuting requirements made participation more sustainable. This finding resonates with Tran's (2023) observation that the OMO model can bridge geographic and socioeconomic access gaps when implemented with adequate technological support.

A second theme, Concern regarding in-person classroom interaction among students, captured the social dimension of learning that can be disrupted with repeated use of the online modality of learning. Another insight arose from survey responses indicating that students from lower-income households faced persistent difficulties accessing reliable internet and suitable devices for synchronous online sessions, echoing structural inequities documented in the broader South Asian literature (Iqbal et al. 2020).

4. Discussion

The findings carry direct implications for how blended schedules should be designed and communicated in Bangladeshi private universities. First, a fixed hybrid ratio—where a predetermined proportion of each course is delivered online—is unlikely to serve all disciplines equally well. Students and faculty members both expressed a preference for discipline-specific flexibility. Face-to-face components in blended learning serve distinct pedagogical objectives depending on the course type: comprehension-oriented courses benefit from discussion, Q&A, and tailored teacher elaboration, while application-oriented ones rely on in-person settings for lab work, practicum experiences, and case-based practice (Buhl-Wiggers et al., 2023). The practical sessions, including lab classes and courses emphasizing collaborative skills, were seen as requiring higher in-person classroom engagement. Challenges conducting lab work in online settings, difficulties translating practical skills into real-life situations, and an unbalanced use of simulations as substitutes for hands-on work represent recurring concerns

in the blended learning literature (Chiu, 2020; Wu & Luo, 2022, as cited in Sareen & Mandal, 2024). In contrast, lecture-based foundational courses were seen as more suitable for online delivery. This aligns with broader evidence that discipline acts as a moderating factor in blended learning effectiveness, and that equivalent or improved learning outcomes are possible when classroom time is strategically reduced and replaced with structured online environments (Müller et al., 2023). Garrison and Kanuka (2004) similarly cautioned that a more flexible scheduling format that allows learners and instructors to 'time-shift' is essential, yet institutionally challenging, requiring a fundamental rethinking of how courses are offered.

Second, the findings reveal that students value in-person interaction for its social functions—not merely its instructional functions—suggesting that blended schedules should deliberately protect synchronous in-person time for community engagement activities, facilitate peer learning, and support mentoring relationships. This is consistent with research by Mendieta-Aragón et al. (2023), which found that online teaching must actively support the established benefits of an in-person learning environment, including student participation and peer interaction, while promoting students' self-regulatory processes and development of learning networks and communities. Furthermore, in-person discussions have been found to foster a sense of community by facilitating interaction with peers and deepening engagement through personally relevant connections, motivating active participation and student confidence—functions that online environments complement but do not fully replicate (Garces et al., 2024). The Community of Inquiry (CoI) framework also emphasizes that social connectedness is a prerequisite for creating learning opportunities within communities in blended synchronous course designs, requiring that learners communicate with peers in meaningful ways and that all participants engage in open, trustworthy communication (Meer et al., 2021; Huizinga et al., 2022).

Third, equity considerations must be mainstreamed into classroom scheduling as well. The digital divide should also be kept in consideration while implementing a blended learning approach, even at the university level. This concern is especially salient in the Bangladeshi context: despite widespread digital initiatives, Bangladesh continues to grapple with digital disparity and social inequality rooted in multifaceted socioeconomic conditions, where ICT education has largely failed to equip students with essential digital skills across three interconnected dimensions—equal access, resources, and digital literacy (Shoieb & Islam, 2024). A cross-national study covering Bangladesh among other developing countries found that in developing countries, the gap in access to ICTs between the privileged and underprivileged is rather wide, structured around complex socio-economic levels and geographic spread, with large sections of the population lacking access to basic digital capabilities (Mathrani et al., 2021). Rasheed et al. (2020) further note that the biggest institutional challenges to adopting blended learning include technological provision issues such as the high cost of digital content production, overly complex technology causing student distraction, and the need to develop tools compatible with diverse learning styles—barriers that are amplified in resource-constrained university settings. Accordingly, blended models integrating online and offline resources, alongside subsidies for devices, expansion of internet connectivity, and development of digital literacy among both students and educators, have been recommended as actionable measures to address these challenges in the Bangladeshi higher education context (Kabir, 2025).

5. Conclusion

This study has examined the perceptions of faculty members, non-teaching staff members, and students of one (1) Bangladeshi private university towards blended scheduling of academic activities. 92.48% of faculty, 83.24% of students, and 74.07% of non-teaching staff expressed a final preference for the 4+1 hybrid model—and 83.55% of all 2,395 respondents have preferred it overall. The survey data establishes a clear stakeholder mandate for hybrid scheduling. Faculty members value the pedagogical potential of blended scheduling but require stronger institutional support. Students appreciate the flexibility and accessibility benefits—particularly for health, financial, and environmental reasons—but also have shown their concern regarding lower engagement during online sessions, and lack of attention span. The non-teaching staff members, too often invisible in institutional planning, experience significant coordination challenges that require targeted support from the higher management. Future research should pursue longitudinal designs to examine how blended scheduling perceptions and outcomes evolve as institutional capacity matures.

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Cultural Resistance to Modern Pedagogies in Bangladesh: Insights from Project-Based Learning (PBL) and Total Physical Response (TPR)

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Abstract
Education plays a significant role in national development, but Bangladesh lags far behind in implementing innovative, student-centered teaching techniques such as Total Physical Response (TPR) and Project-Based Learning (PBL). The study explores the cultural hurdles that hinder the implementation of these pedagogical reforms within the historical context of Bangladesh's traditional education system. Teachers, parents, and graduates who were exposed to international education were interviewed through qualitative research in order to identify how policy gaps, infrastructural limitations, and cultural values impacted pedagogical practice and student outcomes. Findings reveal deep-rooted cultural values like hierarchical teacher-student relations, conservatism concerning gender, and opposition to change, combined with poor school infrastructure and weak teacher training, restrain effective pedagogical change. The study recommends culturally responsive interventions, more teacher training, community engagement, and policy congruence to align new methods with existing values. This research adds to the education reform debate through offering practical ways of aligning innovation with cultural context with the aim of improving teaching quality and learning results in Bangladesh.

***Keywords**:* Pedagogy, Resistance, Cognitive Domain, Experiential, Rote Memorization, Rub etc.

1. Introduction

Education is one of the priority sectors for the development of any nation, and proper infrastructure is the foundation of efficient learning processes. Playgrounds, libraries, laboratories and computer centers, and other facilities are crucial for students' success (Kibria & Hasan, 2024). However, Bangladesh lacks proper infrastructure, which results in poor performance in public schools, among other educational problems (Kapur, 2019, Mustary, 2021). This can be illustrated by the high dropout rate since out of 100 kids who are enrolled in grade one, only 32 go to upper secondary education (UNICEF, 2023).

In 20078, Bangladesh introduced a creative curriculum, stressing the role of well-prepared professionals in providing quality outcome-based education (OBE), which failed due to lack of insufficient preparation (Kibria & Hasan, 2024, Jasim et al., 2022). Many teachers did not understand what to do and what their role was, and the plan to conduct five-day training for 418,000 teachers ended up affecting only 280,000 of them (Nilratan, 2023). Infrastructure issues also prevented positive changes since proper library, laboratories, and other facilities could help sustain students' enthusiasm and support new teaching practices (Pal, 2010; Kapur, 2019). Moreover, proper teacher preparation is crucial for promoting inclusive education as developing countries may struggle with training teachers for working with diverse students (Forlin & Hopewell, 2006; Siddik et al.,2020).

Although the world has made great progress concerning implementation of student-centered pedagogical practices like Total Physical Response (TPR) and Project-Based Learning (PBL), Bangladesh does not seem to benefit from them due to various reasons (Conroy,1999). Notably, apart from infrastructure challenges, cultural norms can hinder the introduction of modern innovations in education. The traditions of classroom hierarchies and rote learning contradict modern pedagogies, which stress the significance of independent work, cooperation, and critical thinking (Gardiner & Robinson, 2009). This paper aims to explore how cultural traditions, norms and beliefs affect the application of modern pedagogical practices in Bangladesh by explaining the why teachers' attempts to apply such approaches as PBL and TPR may fail in this country and demonstrate the need for taking cultural specifics into account in implementing reforms.

2. Objective of the Study

The primary objective of the study is to explore cultural barriers to modern teaching methods in Bangladesh and to propose strategies for integrating these methods with traditional values to enhance student learning. To achieve this goal, the study focuses on the following objectives-

1. Identifying the cultural factors that contribute to resistance against modern teaching methodologies.
2. Examining the impact of cultural resistance on teaching practices and student outcomes.
3. Proposing strategies to integrate modern pedagogical approaches with traditional cultural values.

3. Literature Review

Effective teaching strategies have become imperative since a syllabus alone is not enough to guarantee success (Dick,1987). The strategies help link instructional objectives with desired learning outcomes that will improve students' knowledge acquisition, critical thinking, and skill development (Reiser,2001). Contemporary learning environments value various, learner-centered methods (Shatunova & Falyakhov, 2015), which differ from conventional teacher-centered and rote learning practices prevalent in Bangladesh (Shatunova & Shabalin, 2014; Perse,2017). The cultural settings prevent the introduction of new teaching methods that foster inquiry, cooperation and problem-solving (Qizi, 2021).

Project-Based Learning (PBL) supports collaborative learning, reflective practice and career development (Carpenter et al., 2007; Chang and Lee,2010). It motivates learners and builds their self-confidence (Almulla, 2020; Gardiner & Robinson,2009; King, 2006). However, challenges, including heavy workloads and inequitable assessment, persist (Bashan & Holsblat, 2012). A successful implementation of PBL requires reconciling the approach with cultural and logistic constraints in Bangladesh.

The Total Physical Response (TPR) method links movement and language acquisition (Asher, 1969; Conroy, 1999, Celestino, 1993; Yang, 2024). It minimizes students' stress levels and increases their comprehension ability. Although it creates an engaging classroom environment, the large number of students and inadequate resources limit its effectiveness (Seely, 1981; Zhang, 2019).

Alternative modern learning approaches, such as collaborative learning, flipped classes, gamification, and differentiated instruction, demonstrate global success (Taylor, 2022; Center for Teaching Innovation, n.d.). Nevertheless, they are yet to gain acceptance in the country's traditionally oriented classrooms. There is sufficient literary evidence on the merits and drawbacks of such pedagogical methods, but there is no analysis of cultural resistance against these innovations. This paper focuses on cultural obstacles and ways to cope with them.

4. Methodology

The research adopted a qualitative research design to understand the cultural barriers hindering the application of innovative pedagogical approaches- specifically, PBL and TPR. Conducted in the rural and semi-urban settings of Sylhet region, purposive sampling was used to select fifteen (15) participants comprising of teachers, parents and exchange program alumni. Data were collected through semi-structured interviews with the use of a participant information sheet, followed by transcription and thematic analysis based on the framework provided by Braun and Clarke (2006). Strict anonymity and confidentiality were maintained to protect participants' identities. Limited scope, smaller number of participants, social desirability bias, exclusion of major influential groups like policymakers and students and loss of meaning limits the generalizability of results.

5. Barriers to Modern Pedagogical Approaches

The thematic analysis identified intertwined cultural, structural and institutional barriers to implementing PBL and TPR in the schools of rural and semi-urban Bangladesh. These barriers are summarized in Table 1, along with CERQual confidence rating. These barriers are summarized in Table 1, which presents the *Summary of Qualitative Findings (SoQF)* alongside CERQual confidence ratings. Confidence judgements for CERQual were made using four factors for each theme, including, (i) any methodological concerns with the data from interview used, (ii) degree of coherence between patterns, (iii) sufficient in quality and quantity, (iv) pertinence of findings in relation to the Bangladesh Education setting. The three confidence levels of High, Moderate, and Low depend on how trustworthy a finding is. Findings that are high in confidence (such as being resistant to change and having structural challenges) have strong and consistent evidence, while moderate and low-confidence findings are more situational.

TABLE 3 SUMMARY OF QUALITATIVE FINDINGS (SQOF)

Theme	Key Insights	Representative Evidence	CERQual Confidence Level
Resistance to Change	Teachers reluctant to adopt modern pedagogy due to inadequate training and reliance on memorization.	Alumni noted trainers lacked understanding; teachers described new methods as burdensome and prefered repetition.	**High** – Strong coherence and rich data from multiple respondents.
Cultural Constraints	Gender norms and parental expectations conflict with collaborative, project-based learning.	Teachers reported cross-gender collaboration as socially problematic; parents distud projects, equating learning with homework.	**Moderate** – Consistent but limited to specific rural contexts.
Structural Limitations	Overcrowded classrooms, poor facilities, and digital illiteracy hinder implementation.	Educators highlighted classes of 70~100 students and lack of logistical support for technology.	**High** – Well-supported by multiple sources and consistent evidence.
Administrative Rigidity	Limited teacher autonomy restricts innovation despite training.	Alumni reported principals constrained freedom to design classes, suppressing pedagogical experimentation.	**Moderate** – Some variation in experiences across institutions.
Policy Disconnect	Urban-centric reforms fail to address rural realities; weak community engagement fuels resistance.	Respondents noted policies designed for elite Dhaka schools; directives for parental inclusion often ignored.	**Low** – Limited data and potential contextual bias.
Pedagogical Misalignment	Assessment remains focused on rote recall; coaching culture undermines collaboration.	Educators stressed reliance on cognitive domain only; teachers resisted cooperation due to private coaching interests.	**Moderate** – Coherent but limited by small sample size.

As seen in Table 1, the highest confidence ratings are related to resistance to change and structural issues. These barriers were backed up by consistent and rich data from multiple sources. Cultural, administrative, and pedagogical barriers received a moderate rating, meaning that evidence was less consistent and varied depending on the context. Policy barriers were assigned to the lowest confidence level rating because the data were weak and possibly biased towards urban perspective. These ratings influenced the following analysis of each barrier withing the literature and possible implications of the results.

6. Discussion

Resistance to Change is associated with high confidence due to solid evidence of teachers' unwillingness to employ new methods. It is consistent with the findings by Shatunova and Shabalin (2014) regarding lack of rapport between students-teachers in traditional hierarchical classroom culture and with Perse (2017)'s findings about memorization-based teaching.

Cultural Constraints, being associated with a moderate level of confidence, reveal localized barriers to innovation, namely patriarchal gender stereotypes and parental skepticism. Cross-gender interaction remains socially sensitive, while parents equate learning with homework and grades. These findings echo with Almulla (2020) and Gardiner & Robinson (2009)'s argument.

Structural Limitations, having a high level of confidence, are described by consistent evidence of overpopulated classrooms, poor facilities, and lack of digital literacy. Such barriers are corroborated by literature, specifically by Bashan & Holsblat (2012) and Chang & Lee (2010), who pointed out the necessity of adequate logistics and professional autonomy to employ innovations.

Administrative Barriers have been rated moderately because they varied depending on the institution, yet evidence remained consistent with Chang & Lee (2010)'s discussion regarding administrative decisions restricting teachers' autonomy.

Policy Disconnect was assigned a low confidence rating since evidence remained weak. Nevertheless, evidence from participants confirmed the findings by Taylor (2022), which criticized top-down reforms without considering local needs.

Pedagogical Misalignment received a moderate level of confidence as well. Although modern curriculums require students' critical thinking and teamwork, evaluation still focuses on their ability to memorize, thus disregarding the affective and psychomotor domains of development (Celestino, 1993; Yang,2024).

Teacher Behavior and Coaching Culture contribute to maintaining traditional pedagogy. Competitive approaches and reliance of private coaching discourage collaboration, echoing Carpenter et al. (2007) and King (2006).

Overall, the study illustrates how reform process is hampered by opposition, conservatism, inadequate infrastructure, and implementation issues. With a view to addressing these problems and bringing contemporary teaching methods in alignment with Bangladesh's educational system, systematic intervention and cultural relevance are necessary.

7. Strategies for Implementing Modern Pedagogies

From the above interpretations, following approaches are suggested for successful integration of modern pedagogies in the mainstream education culture. Prioritizing teacher trainings, fostering trust and communicating methodologies with the parents to deal with cultural conservatism, addressing and improving infrastructural and management barriers, alignment of policies with national and local priority indicators, building rapport amongst student & teacher, encouraging collaborative competition on competency, and reforming assessment methods with clear rubrics etc. are required to mitigate the resistance of both cultural and structural factors faced while adopting modern pedagogies. For every recommendation, respective confidence rating is included aligning with CERQual to ensure that the strength of evidence collocates with priorities for future actions. Effective adaptation of these initiatives will assist educators and policymakers in efficient integration of modern pedagogical practices in Bangladesh's educational system.

7.1 Systemizing Educator Capacity Building (High Confidence)

The study showed high reluctance of teachers toward change and competence building. Hence, proper teacher training programs needs to be curated in accordance with the local needs. Practical sessions, classroom management, blended, hybrid or hyflex models can assist teachers transform from rote-based teaching to a student and learning oriented approach.

7.2 Addressing Cultural Conservatism for Building Trust (Moderate)

Cultural barriers such as gender norms and parental skepticism were mentioned with moderate confidence. Through meetings and forums with parents and effective communication of learning goals and approaches should be included to build trust. Involvement of respected community leaders, introduction of transitional same-gender group works will further sanitize the cultural resistance.

7.3 Improved Infrastructure and Logistics Supports (High)

Overcrowded classrooms and poor academic facilities were constantly mentioned, rating the structural barriers with high confidence. Affordable solutions such as flexible scheduling, mobile activity stations, rollaway whiteboards, modular furniture, printed visual aids can ease and mitigate such challenges. Furthermore, training and familiarizing school administration with pedagogical approaches will create a collaborative environment and culture of empowerment, rather than control, ensuring the promotion of innovation in academic institutions.

7.4 Reforming Teacher Culture and Assessment Methods (Moderate)

Pedagogical misalignment was rated with moderate confidence with repeated evidence of rote-based evaluation system and expanding coaching culture. Assessment systems should expand beyond result based memorization by introducing clear rubrics, group projects, oral presentations and experiential evaluations. Simultaneously, coaching culture should be reshaped through rewarding collaboration, linking career growth and ensuring transparency between classroom teaching and private tutoring.

Furthermore, addressing the policy disconnect should be given much prioritization. National education reforms must be decentralized and adaptable to rural contexts. School Managing Committee (SMC) should be actively involved, and community engagement should be encouraged as a measure of reform success. Bridging the gaps collectively by following these steps systematically will work as an enabler for the effective translation of new pedagogies in the rural schools of Bangladesh.

8. Conclusion

The reform of education system of Bangladesh lies in adapting modern pedagogical models to nation's cultural and structural realities, rather than just introducing or adopting. The study shown that deep rooted values like hierarchical teacher-student relationships, exam driven priorities, gender conservatism, and social skepticism –

remains significant barriers to student-centered approaches like PBL and TPR. These cultural challenges are further reinforced by overcrowded classrooms, weak administrative as well as teacher autonomy, and rote-memorization based assessment systems which fail to reflect long term learning goals. Addressing these issues requires a comprehensive and systematic approach. Teacher education must advance beyond fragmented session towards sustained mentorship and capacity building that reflects local classroom context. Participatory policies should be designed with flexibility which include both rural and urban diversity. Sensitization initiatives can help bridge the gap between new pedagogical practices and community perspectives. Finally, curriculum objectives should be aligned with outcome-based assessments methods with clear rubrics, which reinforces each other. Essentially, pedagogical reforms in Bangladesh should be developed as locally adapted designs that respect cultural sensitivity and encourages innovation, instead of imposing them as external or fragmented models. Only through striking a balance between modern approaches and traditional values, and holistic response can promise the education which will be inclusive and future-proof for the education sector of Bangladesh.

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From Criteria to Clarity: The Role of Rubrics in Advancing Assessment Pedagogy in Higher Education

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Abstract
Higher Education has been undergoing an incredible transformation from the "old" summative assessment paradigms and forms to more transparent, formative and learner-centered assessment practices. In this metamorphosis, rubrics have become an essential pedagogical tool that spans among the three processes of teaching, learning and assessment. The PRISMA framework was used to synthesize findings from open sources of research, between 2010 and 2026 related to rubric-based assessment in higher education (HE), as a systematic review paper. This review critically explores the conceptual frameworks, pedagogical aims and contexts of rubrics in various educational fields. The results suggest that rubrics improve the transparency, consistency and fairness of assessment, by communicating the criteria and level of standards for assessment. They also provide opportunities for formative feedback, assessment learning, and student self-evaluation and judgment. Furthermore, the review emphasizes the diversified practices of rubric use in global settings and emerging practices in Bangladesh where rubrics have come to be used to tackle subjectivity in learning and enhance learning outcomes in examination-based contexts. Although these are advantages, the study highlights several limitations, such as a danger to over-simplify complex learning outcomes, poor rubric design, and contextual and cultural influences. It is revealed that the rubrics effectiveness relies on the rubrics structure and the pedagogical practice and the engagement of the educator as well as the students. The paper concludes that if rubrics are designed thoughtfully and contextually, they can be effective in facilitating assessment practices. They allow for the shift from opaque assessment systems to more open, conversational and learner-centered assessment. It is necessary to incorporate digital technologies while maintaining the central role of human judgment in ensuring validity and educational integrity.

***Keywords**:* Rubrics, higher education, assessment pedagogy, systematic review, PRISMA, formative assessment, Bangladesh

1. Introduction

In recent times, the paradigm of assessment in higher education has been shifted from traditional assessment approach to continuous improvement and feedback based assessment where assessment is not only a mechanism to grade the students, rather it underscores the teaching-learning process that safeguards student engagement, academic achievement, and professional excellence. The traditional assessment process focuses on evaluating the students learning, ignoring teaching-learning engagement, constructive feedback, and proper encouragement. It does not always promote and encourage the continuous learning with effective feedback. Adopting rubrics into assessment process, the teachers can evidently enlist the assessment criteria to promote learning, instructional methods, and assessment strategies.

Rubric is a criteria-based assessment framework that outskirts specific performing standards and varying levels of achievements making clear the expectations for both the instructors and students. It also plays an important role for improving transparency, driving self-assessment, cultivating learners' performance, and promoting both summative and formative assessment practices among diverse domains and disciplines (Bidna, 2024; Tian, 2026). The structural and effective use of rubrics in higher education facilitates the objective evaluation and shows the pathways for students' self-regulations and reflective engagement that minimize the apparently existing gap between instructional intent and measurable outcome (qizi, 2026).

With the change of time rubric has been an effective tool of assessment. It is getting mammoth -scale prominence due to advance assessment literacy and pedagogical clarity. The evolving significance of Outcome-Based Education, competency-oriented learning, learners-centered pedagogy, and continuous learning improvement entails integration of rubrics for quality and sustainable learning in higher education. The traditional assessment process is based on subjective evaluation and inconsistent grading standard that do not possess clarity. In contrast,

with clearly articulated criteria, rubrics help develop assessment pedagogy through the formative assessment practices that underscores continuous feedback and active learners' participation so that learners can identify their own strength and weakness that lead towards a culture of 'Assessment for learning' from 'Assessment of Learning.'

Therefore, the study inclines to unearth the contribution of rubrics to advancing assessment pedagogy in higher education through the shipment of assessment criteria into clarity, transparency, and meaningful learning engagement. More specifically, the study seeks to examine the role of rubrics in developing feedback practices, emphasizing formative assessment, safeguarding expected learning outcome with assessment process in higher education.

2. Literature Review

2.1 Conceptualizing Rubrics in Higher Education Assessment

Rubrics are systematic scoring criteria that comprise three basic elements: grading criteria, quality descriptors, and scoring mechanism (Ling, 2025; Ragupathi & Lee, 2020). There are two major types of rubrics: analytic and holistic rubrics. Analytic rubrics offer criterion-specific feedback and therefore, effective for formative assessment and instructional practices. On the contrary, holistic rubrics evaluate overall performances and are applicable for summative evaluation (Jonsson & Svingby, 2007). Rubrics are pedagogical instrument that bridge the gap between teaching, learning, and assessment (Panadero & Jonsson, 2013).

2.2 Rubrics and Assessment for Learning

Rubrics facilitate the learning process by providing scopes for continuous improvement through formative assessment and student engagement (Black & Wiliam, 2009). Research demonstrates that rubrics make constructive alignment among learning objectives, institutional practices, and assessment strategies (He et al., 2022). Rubrics make students understand grading criteria, quality writing, and ways to achieve well scores (Park, 2026).

2.3 Transparency, Reliability, and Fairness in Assessment

While traditional grading system relies heavily on subjective judgments, rubrics eliminate these inconsistencies by criterion-referenced standards (Ling, 2025). Nawrin and Sadek (2022) asserted that rubrics enhance reliability and validity objectivity and equity in evaluation. Additionally, rubrics ensure accountability and legitimacy in judgment by building trust between learners and instructors (Grainger, 2021).

2.4 Global and Contextual Perspectives on Rubric Use

The effectiveness of rubrics varies depending on the context. In Western higher education, rubrics are integral to quality assurance, assessment practices, and accountability frameworks (Taylor et al., 2024). Countries like China and Malaysia are frequently using rubrics in language evaluation and competency based curriculum. In these contexts, studies confirm that rubrics enhance student motivation and engagement (He et al., 2022; Ling, 2025).

In the Middle East, rubrics are increasingly getting attention in evaluation and feedback mechanism (Goodwin, 2019). In Bangladeshi higher education, the use of rubrics is still emerging but they become potential part in the OBE curriculum. However, the implementation of rubrics fall short for many challenges, like institutional issues, socio-cultural resistance, limited training opportunity, hierarchical teacher-student relationship, etc. The existing literature shows the potentiality of rubrics. However, there is a need for systematic and context specific studies on rubrics and addressing the challenges to integrate them into ongoing pedagogical activities. Therefore, this study offers a comprehensive examination of rubric based assessments and their pedagogical and contextual applications.

3. Methodology

3.1 Research Design

Following a qualitative literature review and PRISMA framework, this study examines the timeliness, proximity and prominence of rubric in the assessment practices in higher education. The thematic systematic literature review approach helps identify, evaluate, and synthesize existing literature on rubric-based evaluation, feedback (formative and summative), and assessment paradigm in higher education. To identify the key conceptual themes, recurring ideas, pedagogical concerns, and assessment synthesis, the review process was focused on two issues: (1) the growing significance of rubric-based assessment in higher education, (2) the requirement of structured synthesis among major trends, challenges, and research gaps in the literature of assessment pedagogy.

3.2 Data Sources

The data had been collected from multiple sources: among them the major electronic databases included Scopus, Eric, Web of Science, and Google Scholar. In addition, relevant scholarly books, journal proceedings were also taken into consideration. To capture contemporary trends, developments and environments, the data were collected from the literature published between 2010-2016.

3.3 Search Strategy

To align with the goals of the study, the researchers carefully selected keywords, and followed Boolean combinations. The keywords were:

- "rubrics in higher education"
- "assessment pedagogy"
- "formative assessment"
- "grading rubrics"
- "assessment for learning"
- "rubric-based assessment"
- "feedback mechanisms"
- "student learning outcomes"
- "assessment transparency"

3.4 Inclusion and Exclusion Criteria

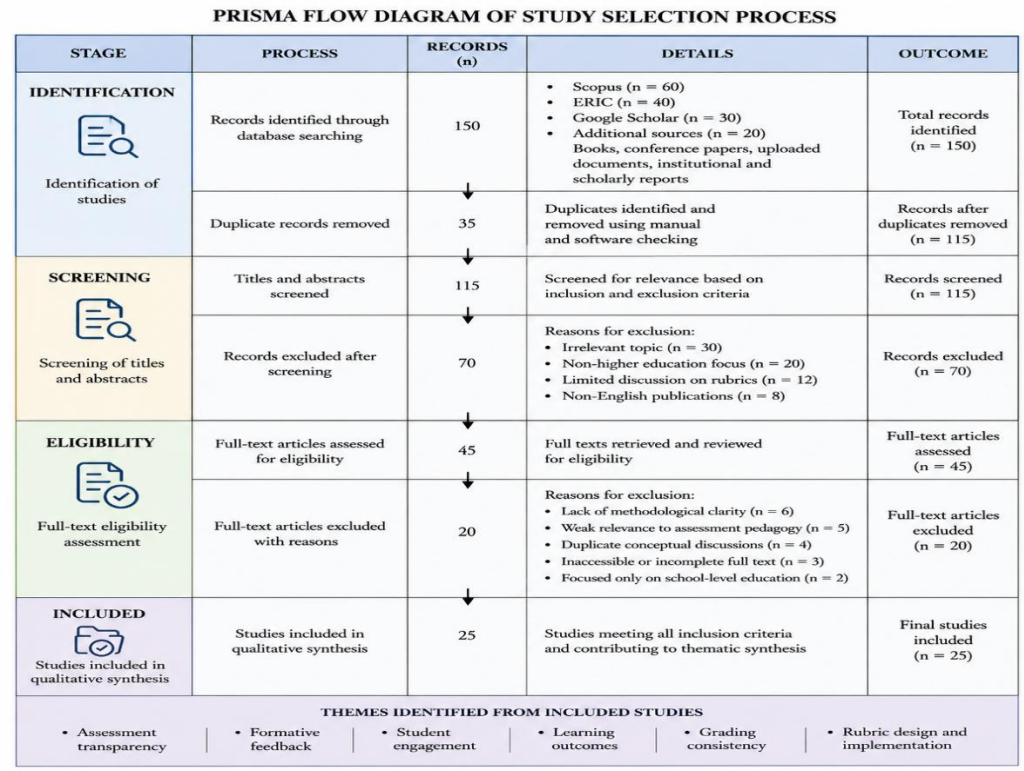
TABLE 1 INCLUSION CRITERIA INCLUDES

Criteria	**Description**
Context	Higher education
Type of Publication	Peer-reviewed journals and scholarly books
Language	English
Time Period	2010–2026
Focus	Rubrics and assessment practices

TABLE 2 EXCLUSION CRITERIA INCLUDES

School-level studies	Outside the scope of higher education
Non-academic blogs and websites	Limitation of scholarly rigor
Duplicate studies	Redundancy
Irrelevant assessment studies	Not specifically focused on rubrics

3.5 PRISMA Flowchart



3.6 Data Analysis

Qualitative thematic analysis was used for data analysis. The following table indicates the process:

Extract	Initial Code	Category	Theme
"Rubrics improve grading consistency"	Consistency	Assessment fairness	Transparency
"Students understand better"	Precision	Learning support	Assessment for learning
"Rubrics guide feedback"	Feedback	Formative assessment	Feedback mechanisms

3.7 Ethical Consideration

This study required no formal ethical approval as no human participants were involved. However, all secondary sources were duly acknowledged and cited following APA citation guidelines to maintain academic rigor.

4. Findings and Discussion

The findings of the data demonstrate that rubrics are not only grading tools, but they serve as instruments to ensure transparency, fairness, feedback, engagement, formative learning, and thereby, uplift pedagogical values.

4.1 Transparency and Consistency

The reviewed literature finds that the use of rubric based assessment reduces inconsistencies, grading bias, personal interpretation, by ensuring standardized criteria, establishing performance indicator, and ensuring students' trust.

TABLE 4.1 TRANSPARENCY AND CONSISTENCY FINDINGS

Dimension	Major Findings	Educational Implications
Transparency	Clear assessment criteria reduce ambiguity and improve understanding of expectations (Brookhart, 2013)	Students better understand academic requirements
Consistency	Standardized grading improves reliability and evaluator agreement (Reddy & Andrade, 2010)	Fairer and more dependable assessment outcomes
Bias Reduction	Rubrics minimize subjective judgment and grading inconsistency (Panadero & Jonsson, 2013; Stevens & Levi, 2013)	Increased grading objectivity

Shared Standards	Teachers and students develop common understanding of performance expectations (Brookhart, 2013)	Improved assessment trust and communication
Accountability	Consistent assessment practices strengthen institutional quality assurance (Reddy & Andrade, 2010; Stevens & Levi, 2013)	Enhanced academic accountability

4.2 Rubrics and Assessment for Learning

Rubrics promote assessment for learning, in addition to assessment of learning (Balck & William, 2009). Rubrics-guided learning enables students for self-regulated learning and improved academic awareness (Panadero & Romero, 2014).

TABLE 4.2 RUBRICS AND ASSESSMENT FOR LEARNING

Aspect	Findings	Learning Outcomes
Self-regulation	Students monitor and evaluate their own learning progress (Panadero & Romero, 2014)	Increased learner autonomy
Metacognition	Rubrics encourage reflective thinking and self-awareness	Improved critical awareness
Active Learning	Students engage more intentionally with learning tasks (Panadero & Romero, 2014)	Greater participation and engagement
Learning Alignment	Assessment aligns closely with learning objectives and teaching activities (Nicol & Macfarlane-Dick, 2006)	Enhanced instructional coherence
Formative Assessment	Continuous feedback supports ongoing improvement (Panadero & Romero, 2014)	Better academic performance

4.3 Rubrics as Feedback Mechanisms

In higher education landscape, rubrics are considered highly influential feedback mechanisms (Brookhart, 2017; Nicol, 2010). Rubrics-based assessment provide more detailed and organized feedback (Brookhart, 2017), by enabling the instructors to divide assessment into different dimensions and performance levels (Panadero & Jonsson, 2013).

TABLE 4.3 RUBRICS AS FEEDBACK TOOLS

Feedback Dimension	Findings	Educational Benefits
Structured Feedback	Detailed criterion-based responses improve feedback clarity (Brookhart, 2017; Nicol, 2010)	Clearer understanding of performance
Feedforward	Rubrics guide future improvement and learning development (Panadero & Jonsson, 2013)	Sustainable academic growth
Revision Support	Students use rubric criteria to revise assignments effectively (Brookhart, 2017)	Better academic refinement
Communication	Transparent feedback strengthens teacher-student interaction (Nicol, 2010; Brookhart, 2017)	Improved feedback interpretation
Formative Cycles	Rubrics support continuous developmental assessment (Panadero & Jonsson, 2013)	Long-term learning improvement

4.4 Rubrics and Student Engagement

The thematic analysis reveals that rubrics contribute to learner engagement, motivation, autonomy, and assessment literacy.

TABLE 4.4 RUBRICS AND STUDENT ENGAGEMENT

Engagement Dimension	Findings	Impact on Students
Learner Autonomy	Students independently assess their own work (Andrade, 2010; Panadero, 2017)	Increased responsibility
Motivation	Clear expectations reduce anxiety and increase confidence (Carless, 2015; Andrade, 2010)	Greater academic motivation
Participation	Students engage more actively in classroom learning (Carless, 2015)	Improved interaction and involvement
Assessment Literacy	Rubrics help students understand grading systems (Panadero, 2017; Andrade, 2010)	Better academic awareness
Peer Learning	Rubrics support peer and collaborative assessment (Carless, 2015)	Enhanced collaborative learning

4.5 Global and Contextual Applications

Although it is globally acclaimed that rubrics are important tools for establishing transparency, consistency and formative learning, their pedagogical application largely varies depending on institutional policies, logistic support, assessment literacy, educational traditions and philosophies.

The data identified three contextual dimensions; rubric practices in western countries, in Asian countries and in Bangladesh.

4.5.1 Western Countries

Western countries, especially the United States, United Kingdom, Canada, Australia, extensively and systematically integrate rubrics into higher education assessment systems. In these contexts, rubrics are embedded within outcome-based education, competency based learning and student-centered pedagogical framework.

TABLE 4.5.1 RUBRIC APPLICATIONS IN WESTERN COUNTRIES

Major Area	Findings	Educational Implications
Outcome-Based Education	Rubrics align assessment with learning outcomes (Stevens & Levi, 2013; Brookhart, 2013)	Improved curriculum alignment
Digital Integration	LMS-based digital rubrics enhance grading efficiency (Panadero & Jonsson, 2013; Stevens & Levi, 2013)	Faster feedback delivery
Formative Learning	Strong emphasis on self and peer assessment (Panadero & Jonsson, 2013)	Enhanced reflective learning
Institutional Support	Faculty training improves rubric implementation quality (Brookhart, 2013; Stevens & Levi, 2013)	Greater consistency in assessment
Standardization Concerns	Excessive structure may restrict creativity (Panadero & Jonsson, 2013)	Possible reduction in flexible learning

4.5.2 Asian Countries

The findings show increasing emphasis on rubric-based assessment practices in Asian countries, including China, Malaysia, Japan, India and South Korea. These countries are adopting modernization initiatives and gradually moving towards competency based assessment models in higher education.

TABLE 4.5.2 RUBRIC APPLICATIONS IN ASIAN COUNTRIES

Major Area	Findings	Educational Implications
Educational Reform	Competency-based assessment practices are expanding (Carless, 2015; Panadero, 2017)	Improved learning alignment
Hybrid Pedagogy	Traditional and modern assessment approaches coexist (Carless, 2015)	Transitional assessment culture
Faculty Preparedness	Limited training affects rubric effectiveness (Panadero, 2017)	Inconsistent implementation
Examination Culture	Strong focus on grades limits formative engagement (Carless, 2015)	Reduced reflective learning
Technological Growth	LMS and online rubrics are increasingly adopted (Panadero, 2017)	Expanded digital assessment practices

4.5.3 Rubric Applications in Bangladesh

The reviewed literature also points towards how rubrics are gaining attention in higher education level in Bangladesh for implementing quality assurance, outcome based education, and accreditation standards (Alam, 2018; Rahman, 2021).

TABLE 4.5.3 RUBRIC APPLICATIONS IN BANGLADESH

Major Area	Findings	Educational Implications
Assessment Transparency	Rubrics improve grading fairness and objectivity (Shahidullah & Rahaman, 2022; Kabir & Neazy, 2019)	Increased accountability
Outcome-Based Education	Rubrics support accreditation and learning outcomes (Alam, 2018; Shahidullah & Rahaman, 2022)	Better competency measurement
Faculty Training Gaps	Limited expertise affects rubric construction quality (Stevens & Levi, 2013)	Variable implementation quality
Institutional Constraints	Large classes and limited resources hinder adoption (Kabir & Neazy, 2019; Alam, 2018)	Reduced implementation effectiveness
Cultural Resistance	Traditional examination culture slows reform (Alam, 2018)	Slow pedagogical transformation

4.5.4 Comparative Global Rubric Practices

The effectiveness of rubric depends on well-designed pedagogical approaches. Institutional readiness, availability of technology, assessment literacy of the faculties, etc. are also driving factors for rubrics implementation. Rubric based assessments are effective in Western higher education because of institutional readiness and formative assessment cultures (Stevens & Levi, 2013; Brookhart, 2013). On the contrary, many Asian countries are facing challenges with the implementation of rubric pedagogy (Carless, 2015; Panadero, 2017).

TABLE 4.5.4 COMPARATIVE GLOBAL RUBRIC PRACTICES

Context	Strengths	Challenges
Western Countries	Advanced formative assessment and digital integration (Stevens & Levi, 2013; Brookhart, 2013)	Over-standardization concerns (Torrance, 2007)
Asian Countries	Expanding educational reforms and technology adoption (Carless, 2015; Panadero, 2017)	Examination-oriented traditions
Bangladesh	Growing focus on transparency and quality assurance (Rahman, 2021; Kabir & Neazy, 2019)	Limited infrastructure and training

4.6 Challenges and Limitations of Rubric Pedagogy

Lack of teacher preparedness, contextual adaptation, institutional readiness, and well-designed assessment practices poses hindrances to consistency, transparency, and pedagogical value of rubric implementation (Reddy & Andrade, 2010; Brookhart, 2013).

TABLE 4.6 CHALLENGES AND LIMITATIONS OF RUBRIC PEDAGOGY

Challenge	Description	Implications
Vague Descriptors	Criteria may lack clarity and specificity (Brookhart, 2013; Jonsson & Svingby, 2007)	Student confusion and inconsistent grading
Training Gaps	Limited faculty preparation weakens rubric quality (Reddy & Andrade, 2010; Brookhart, 2013)	Poor implementation effectiveness
Rigid Assessment	Over-standardization may reduce flexibility (Torrance, 2007; Panadero & Jonsson, 2013)	Restricted creativity and critical thinking
Cultural Resistance	Traditional systems resist alternative assessment approaches (Torrance, 2007)	Slow pedagogical transformation
Institutional Barriers	Resource limitations hinder implementation (Kabir & Neazy, 2019; Alam, 2018)	Reduced assessment effectiveness
Technological Constraints	Limited LMS infrastructure affects digital rubric use (Ifenthaler & Yau, 2020; Redecker & Johannessen, 2013)	Difficulty integrating online assessment

4.7 Emerging Trends in Rubric Pedagogy

At present rubrics are not only tools for assessment, rather indispensible parts of data driven, competency based, and AI-based educational platforms (Holmes et al., 2019; Selwyn, 2019). The reviewed literature demonstrates that rubric pedagogy is moving towards more adaptive and learner-centered assessment pedagogy (Redecker & Johannessen, 2013; Stevens & Levi, 2013).

TABLE 4.7 EMERGING TRENDS IN RUBRIC PEDAGOGY

Emerging Trend	Description	Educational Significance
AI-Assisted Assessment	Automated feedback and intelligent evaluation systems (Holmes et al., 2019; Selwyn, 2019)	Increased assessment efficiency
Digital Rubrics	Online rubric systems support transparent grading (Redecker & Johannessen, 2013; Stevens & Levi, 2013)	Faster and clearer assessment
LMS Integration	Rubrics embedded within digital learning systems (Ifenthaler & Yau, 2020; Redecker & Johannessen, 2013)	Improved workflow management
Competency-Based Education	Rubrics align with measurable competencies (Gulikers et al., 2004; Holmes et al., 2019)	Skills-oriented learning
Learning Analytics	Rubric-generated data support personalized learning (Ifenthaler & Yau, 2020; Holmes et al., 2019)	Data-informed instruction
Participatory Rubrics	Co-created and peer-assessment rubrics increase engagement (Panadero, 2017; Carless, 2015)	Greater learner autonomy
Online Learning Support	Rubrics improve consistency in virtual learning environments (Redecker & Johannessen, 2013; Stevens & Levi, 2013)	

5. Conclusion

Rubrics have been a major force in the higher education landscape for shifting the traditional grading continuum to a newer grading scheme that is more transparent, consistent, structured, and oriented toward the learner. However, the effectiveness of rubrics depends on;

- Thoughtful design (clear, aligned, and discriminating descriptors)
- Contextual adaptation (sensitive to disciplinary and cultural differences)
- Active engagement (by both educators and students throughout the learning cycle)

AI and digital platforms have become integral to contemporary education, influencing rubrics pedagogy through prioritizing personalized learning and subsequent feedback. Rubrics support efforts in teaching and learning in addition to assessment, and play a key role in creating an effective and equitable higher education institution; this creates change from criteria to clarity.

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A Working Paper: Students' Perception on Level of Feedback on Assessment Works

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Abstract
Marketing students generally anticipate feedback on their assignments and written work, and many instructors dedicate significant time and effort to delivering detailed, personalized responses. However, providing such feedback becomes difficult and time-intensive in contexts with large class sizes, high student–faculty ratios, and courses that demand extensive communication. Additionally, while students often claim to value feedback, instructors frequently notice that some do not actively apply it. This working paper suggests that students' perception toward both their instructor and the feedback they receive may differ depending on the amount of feedback provided—whether it is extensive and detailed or minimal. Additionally, this research assumes that students' personality traits also play a role in forming such perception. It also proposes that these perceptions are influenced by students' mindset, specifically whether they hold a fixed or growth mindset. To examine these ideas, the study conducts experiments with undergraduate marketing students in Bangladesh. The findings of this research may help the academicians to be more productive and effective in proving useful feedback to students' assessment works, which may lead to greater student satisfaction.

***Keywords**:* Feedback, Perception, Uncertainty Avoidance, Culture, Mindsets

1. Introduction

Feedback is "information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007, p. 81). According to Ackerman and Gross (2010) feedback is critical information students receive from instructors regarding their assignments and exams. Scholars mentioned that feedback can help students to understand the basis for their earned or likely grades and provide information to help them improve on future assignments (Ackerman & Gross, 2010).

Earlier Tahmina and Podder (2023) stated that students write and submit assignments to the course teachers as part of the partial fulfilment of a course or the degree they are studying for. While Tahmina and Podder (2023) reported that in Bangladesh many teachers grade the assignments without informing the learners about the strengths and weaknesses of the assignments, in a different research Shorna and Suchona (2020) pointed out that Bangladeshi universities' teachers do provide feedback – verbally or in writing.

It is important to note that feedback is acknowledged as an essential element of improving the learning process of the students (Al-Bashir et al., 2016). In Bangladesh, a large number of universities (public and private) offer courses on marketing as it is a popular and market demanding subject to study in (Jannat, 2025). Students, who are studying in marketing, frequently expect and request feedback on exams, papers, and other assignments (Ackerman & Gross, 2010). The question remains, however, how much feedback is enough for students to use it effectively to improve their performance and at what length course instructors should go to provide feedback.

2. Level of Feedback and Liking the Course Instructor

Findings from Ackerman and Gross (2010) study revealed that marketing students prefer to have relatively small amount of feedback on their works. However, Rowe and Wood (2007), Loh and Teo (2017), and Shorna and Suchona (2020) reported that students, in general, prefer more detailed feedback. It is noteworthy to remember that the Ackerman and Gross (2010)'s work was based on the United States of America (USA), which is a westernized, modern, developed country where the uncertainty avoidance tendency is weak, as per Hofstede (2011) cultural dimension. That means in USA people are "comfortable with ambiguity" and they "dislike of rules – written or unwritten" (Hofstede, 2011, p. 10). On the other hand, countries that have strong uncertainty avoidance tendency have a "need for clarity and structure" and an "emotional need for rules" (Hofstede, 2011, p. 10). Previously scholars reported that people from high uncertainty avoidance culture want to have more frequent, detailed, useful, quality feedback to improve further (Fischer et al., 2021). As Bangladeshi society depicts a strong uncertainty avoidance tendency (Dutta & Islam, 2016), it can be assumed that Bangladeshi students, who are

studying in marketing at universities, would prefer to have a high level of feedback that has detailed, structured feedback with much clarity. This assumption contradicts with what Ackerman and Gross (2010) identified, however, it is worth finding out whether their findings reverses for a different cultural context. It is recognized that the ability to make helpful comments on students' work represents a characteristic of good teaching (Ramsden, 2003). As student-teacher interaction is a key element of active learning process in marketing (Peterson, 2001) and majority of the students believe that feedback from instructors can help them identify their strengths and weaknesses and improve their future work (Booth & Hyland, 2000), students would appreciate those teachers who provide detailed, high level of useful feedback. Nonetheless, extant literature does not shed any light on whether Bangladeshi students who are studying marketing at universities prefer low level-less feedback or high level - detailed feedback on their works. This creates a void in our existing knowledge focusing on higher education sector in Bangladesh. To fill this gap, the current study proposes the following hypotheses to test:

Hypothesis (1a): In the context of Bangladesh, marketing students will like instructors in their role of instruction who offer high levels of feedback on assignments more than those who offer low levels of feedback.
Hypothesis (1b): In the context of Bangladesh, marketing students will like instructors in their role of instruction who offer high levels of feedback on assignments more than those who offer no feedback.
Hypothesis (1c): In the context of Bangladesh, marketing students will like instructors in their role of instruction who offer low levels of feedback on assignments more than those who offer no feedback.

3. Neuroticism and Perception of Feedback

According to Ackerman and Gross (2010) feedback by nature must be negative to an extent if it is to be helpful in improving students' performance. Much of the feedback that instructors give on assignments is to specifically point out the flaws of a student's work and to motivate the student to improve (Ackerman & Gross, 2010). This kind of feedback is meant to be received by the students as "constructive criticism" (Ackerman & Gross, 2010). Despite that Butler (1988) reported that feedback comments can be discouraging and threatening to a student's self-perception and, particularly for weaker students, carry substantial risk of being misunderstood. In such cases students may perceive feedback as unfair and/or unhelpful (Butler, 1988).

Scholars reported that personality traits affects academic performance (Apostolov & Geldenhuys, 2022). Neuroticism, one of such personality traits, describes someone as anxious and impulsive (Apostolov & Geldenhuys, 2022). Krasman (2010) reported that highly neurotic people seek more feedback from supervisors and coworkers in a workplace. However, neurotic people are inherently more sensitive to competence-related threats and very sensitive to negative feedback that question their ability (Swift & Peterson, 2018). Neuroticism represents a tendency to experience negative emotional states and negative feedback has been found to weaken motivation of people who score high on neuroticism (Swift & Peterson, 2018). As people from strong uncertainty avoidance culture tend to be more neurotic (Hofstede, 2011) and Bangladesh is a country like that (Dutta & Islam, 2016), it can be assumed that Bangladeshi students would perceive high level-detailed feedback from university course instructors as less fair and less helpful. Hofstede (2011) identified that usually people from high uncertainty avoidance culture tend to be intolerant of deviant persons and ideas. Therefore, as feedback given by teachers usually diverges from what students wrote/expressed in the assignment/exam, it is plausible that students would not accept such feedback well. If feedback comments in general are perceived by highly neurotic people as negative and critical, then receiving more feedback is likely to be perceived as even more negative and critical.

Therefore, this research proposes to test the following hypothesis:

Hypothesis 2: In the context of Bangladesh, marketing students will perceive high levels of feedback as more unfair and unhelpful than low levels of feedback when it is directed to them individually.

4. Mindset and Perception of Feedback

According to Yeager and Dweck (2020) people can have either growth or fixed mindset about their capabilities. Mindset is a theory about responses to challenges or setbacks (Yeager & Dweck, 2020). Jordan and Audia (2012) mentioned that the differences between individuals' beliefs in knowledge as fixed (fixed mindset) or malleable (growth mindset) explain their reactions toward performance evaluations. The fixed mindset orients people toward performance goals in which they strive to gain favourable judgments of their worth and competence (Murphy & Dweck, 2016). On the other hand, growth mindsets orient people toward learning goals in which they strive to increase their competence and mastery (Murphy & Dweck, 2016). Unlike the fixed mindset holders, growth mindset inspire people to pursue learning goals, seeking not only encouragement but also critical feedback

(Murphy & Dweck, 2016). Researchers earlier found that students with growth mindset accepts criticism more positively and learn from their mistakes while those who have fixed mindset tend to ignore useful negative feedback by feeling threated by it (Gauthreaux, 2015; Hwang, 2025; Zhang et al., 2020). Ramani et al. (2019) stated that growth mindset holders, compared to fixed mindset holders, prefer to have more structured, thorough information in a feedback so that they can follow that to improve further. Hence, it can be logically deducted that whether students have growth or fixed mindset would play a role to determine how they would perceive the feedback on their assessment works. Based on the previous research findings, it can be assumed that students with growth mindset will perceive the high level-detailed feedback on their assessment works as more fair and helpful compared to those students who have fixed mindset. Therefore, this study proposes the following hypothesis:

Hypothesis 3: In the context of Bangladesh, marketing students mindset (fixed vs. growth) will moderate the relationship between feedback level (high vs. low) and their perception of feedback in such a way that -
a. with high level-detailed feedback, students with growth mindset will perceive such feedback as more fair and helpful compared to those students who have fixed mindset.
b. with low level-less feedback, students with fixed mindset will perceive such feedback as more fair and helpful compared to those students who have growth mindset.

5. Proposed Research Methodology

The study will use a between-subjects experimental design to measure how students react perceptually to different amounts of feedback in a scenario using a hypothetical assignment from a course they would be taking the next semester. This research will collect data from the undergraduates students (aged 18+) of who are enrolled in Consumer Behaviour course at three top ranked private universities in Bangladesh. To select the universities and research participants, a convenience sampling approach will be used. Students will be informed that the study would help the instructor improve instructional feedback. For each condition of the experiment, the sample size will be 40, which means a total of 120 participants will take part in this study. Data will be collected at the beginning of the semester. The measurement instruments for this research will be adapted from Ackerman and Gross (2006), Ackerman and Gross (2003), and Dweck et al. (1995). Independent t-test and ANOVA will be used to analyse the data.

6. Theoretical and Practical Implications of this Research

The finds of this research will help minimize the existing knowledge gap regarding the variation of students' perception of feedback and instructors in terms of cultural differences, which follows Hofstede's cultural dimensions. It will also shed light on how cultural differences and personality traits works together in a learning environment. Furthermore, this research findings will advance the applicability of theory of mindset in higher education learning settings.

In practice this research findings will guide Bangladeshi academics in marketing field to provide better constructive feedback on students' assessment works, which the students will find fair and helpful. The outcomes of this study will also advance academicians teaching skills as they will learn to analyse students' mindset and to provide feedback based on that. Not only that but also by identifying the right pattern of providing feedback of assessment works, university teachers will be able to organize their workload more conveniently. By receiving more tailored, useful feedback, university students will be motivated to perform and their overall quality of education will be improved, which will eventually help to enhance university's overall reputation.

7. Conclusion

This working paper is trying to shed light on a critical question that academicians face continuously that whether too much feedback would be counterproductive for students' performance. By finding answer to this question both students and marketing educators' productivity level can be improved. The revelation from this research will add novel value to Bangladeshi higher education sector, especially for those who are involved with teaching and learning activities related to marketing.

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Rethinking High-Stakes Testing: Impacts on Student Learning and the Need for Competency-Based Assessment

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Abstract
In Bangladesh, we often find students in private universities preparing for the civil service exams at the expense of their academic studies. Civil service or government jobs are highly sought after due to the variety of benefits they provide. Drawing on washback theory by Alderson and Wall (1993) and motivation theory by Dörnyei (2001), the study examines how a high-stakes test taken for getting a position in the Bangladesh Civil Service (BCS),and how it affects the academic performance, learning strategies, and motivation of private university students. Using a qualitative-multiple case study approach, data were collected from tertiary students through interviews. The findings suggest a change in the assessment criteria of the Bangladesh Civil Service. While the current examination focuses on retention and rote memorisation, the proposal will instead focus on 21st-century competency skills—critical thinking, collaboration, communication, and creativity. Besides suggesting a change in the assessment strategies of this examination, this study concludes by providing guidelines on how a student may effectively continue his BCS exam preparation while doing his academic studies.

***Keywords**:* High-Stakes Tests, Academic Performance, Critical Thinking, BCS, Validity, Creativity, Test Anxiety, 21st-Century Competency-Skills.

1. Introduction

1.1 Background and context

The future of a student, teacher, or institution is highly dependent on its testing process. If a testing process is not student-friendly, students may not continue their studies and drop out. That is why different nations in the world follow different testing criteria, such as Singapore, Finland, and New Zealand, which are not dependent on high-stakes testing; teachers are intended to cooperate with learners. People's first choice in Finland is to become a teacher because teachers get lots of opportunities, such as housing, healthcare, child education in this profession. They feel that it is very prestigious for teaching communities (Linda Stade Foundation, 2017).

On the other hand, test assessment is important in China, South Korea, and India. They assess learners' capability through high-stakes testing such as the "*Suneung",* which is the most critical college entrance exam conducted by professors and high school teachers across the country in a secret location in South Korea. This test defines students' entire academic careers, with most students arriving at the venue at 7 am and not getting home until midnight ("South Korea's Life," n.d.). The high unemployment rate is one of the main reasons students in Bangladesh are so inclined to take the BCS exam. Moreover, lower compensation and a lack of professional benefits from private companies lead students to rely solely on government jobs. "The private sector is full of uncertainties. Layoffs can happen at any time without due reasons" (Anonymous, 2024, para. 8). That is why thousands of graduates from different universities opt to sit for BCS exams every year to ensure a better living.

According to Ahmmed (n.d.), job security is rare in Bangladesh except for public services and specific private jobs (as cited in The Daily Star, 2014, para. 33). Consequently, the assessment criteria of government exams play a crucial role in students' lives as well as in the academic curriculum. This study provides some solutions for students who are facing difficulties in their academic studies due to the preparation for high-stakes tests. This study was carried out in Dhaka, Bangladesh. The data has been collected from undergraduate students of public/private universities in Dhaka.

1.2 Research questions:

CRQ: Why does high-stakes testing make it harder for students to do their regular coursework?
RQ: (a) What challenges do private university students face in continuing their academic studies?
(b) How do these limitations impact their drive to sustain strong academic performance?

1.3 Significance of the study

As far as I know, not much research has been done to find out how high-stakes testing affects students' academic work. This study addresses the gap by demonstrating how the overall test construction disrupts the routine activities of private university students.

2. Literature Review

2.1 Avoiding higher-order skills:

Shepard and Dougherty (2015) talk about the bad effects of high-stakes testing in the United States. Their research showed that teachers who graded students often found their scores to be inconsistent and were pressured by parents, the media, and the test administrators to give students scores they didn't deserve. Students in Bangladesh who are getting ready for important tests often get extra help with basic skills like grammar, punctuation, and sentence structure. As a result, the development of higher-order skills is neglected, since these tests do not emphasize critical thinking, creativity, or analysis. Also, people often avoid low-stakes test content because high-stakes testing puts so much emphasis on the assessment criteria. Nonetheless, low-stakes testing methods such as quizzes, flashcards, mind maps, and other practice tests are beneficial for evaluating students' knowledge and pinpointing areas for enhancement in a non-threatening setting (Barton, personal communication, 2023).

2.2 Minimising test performance:

A study by Polesel, Dulfer, and Turnbull (2012) talks about the impact of high-stakes testing on school students and their families in the Australian context. According to them, high-stakes testing is connected with the educational landscape, and it is important to judge students' health, well-being, memorisation, and learning rather than the technical aspects of the design or testing program. The findings of the study stated that high-stakes testing has negative effects on service delivery and professional student-parent-teacher relationships. A study by Ahmed et al. (2018) shows that critical test instruction can impair memory retention and general cognitive abilities, which negatively impacts test performance (as cited in Fuad, 2023, para. 6).

2.3 Test Anxiety and Mismanagement:

An August 2002 study by IDRA Newsletter states that high-stakes testing creates negative washback on students and teachers around the world. The discussion's results say that high-stakes testing is unfair for students because some of them don't do well on tests and become anxious about the results. Because of this, they can't show how well they could do on an alternative bigger scale, thus, minimizes their motivation later on. It makes students less likely to stay in school and more likely to drop out. Fuad (2019) asserts that high-stakes tests induce excessive anxiety and stress in students due to the necessity of memorizing extensive information (para. 2-3). In Bangladesh, students who don't achieve the grades often fall in trouble with their parents because failing is a socially embarrassing thing to do (Amin, 2018).

2.4 Devaluing creativity and misunderstandings:

Spann (2015) discusses the negative effects of high-stakes testing in the Japanese context. According to Spann (2015), putting so much emphasis on test prep disrespects teachers' values, knowledge, and ability to connect with their students in the classroom. Students frequently lack trust and understanding even when they are well-versed in each other's abilities and accomplishments. "Because the teacher has a large amount of data over time, they are better able to judge how well students do on one-time traditional high-stakes tests" (Spann, 2015, p. 5). The authority sometimes places too much emphasis on instruction, leaving good teachers feeling demotivated, discouraged, and disgusted (IDRA Newsletter, 2002). As a result, students' competencies are not well judged and evaluated through this biased testing instructions.

2.5 Hampering learning environments:

Another article by Amein and Berliner (2003) reports the negative effects of high-stakes testing on students' motivation and learning in the United States context. Findings claim that students lost inspiration and college dropout rates increased because of high-stakes testing. Data again reveal that the dropout rate soared from 4 to 6 percent in high schools, and many of them didn't participate in the graduation exams later on. Moreover, the way wealth and power are spread out in Bangladesh is shown in the traditional education system. Wealthy parents send their kids to well-known schools and pay for private lessons, hoping that their kids will get better grades on the tests (Amin & Greenwood, 2018). When they don't get the grades they expect, they are less likely to keep continue their education. Therefore, an one time high-stakes test creates negative washback among students and teachers and make them focus on something less significant than learning. Recent research shows a transformation from traditional one time assessment to ongoing competency-based approaches in higher education. Competency-based assessment emphasizes on measuring students' practical skills, real-world abilities and feedback rather than rote memorisation and exam scores (Cano et al., 2023).

2.6 Conceptual Framework:

High-stakes tests influence students' behavior, according to Fulcher (2010). In Bangladesh, the BCS exam's assessment strategies change the way students study from academic subjects to preparing for the exam. This research is based on Alderson and Wall's (1993) theory of washback, which looks at how preparing for the BCS affects students' learning and how much they participate in institutions. This study further examines Dornyei's (2001) motivation theory, demonstrating that students are influenced by explicit rewards, such as career opportunities, which have shifted their focus from academic achievement and critical thinking to exam success. The researcher then elaborates on a conceptual framework positing that high-stakes tests are the primary factor which influences students' academic performance and motivation.

3. Methodology

3.1 Research Design

This research employs an interpretivist paradigm that acknowledges diverse perspectives of participants (Cohen & Crabtree, 2006). The interviews were done in person, and the researcher asked them a variety of questions about the high-stakes testing. The researcher subsequently opted for a qualitative multiple-case study methodology for this investigation. The researcher employs the snowball technique, wherein one participant recruits the subsequent participant (Naderifar, Goli, & Ghaljaie, 2017), in conjunction with homogeneous sampling to select participants exhibiting similar characteristics. Table 1 displays the details of every participant by their ages, qualifications, knowledge and experiences. Coded names have been used instead of real names in the findings and discussion.

TABLE 1 PROFILE OF THE STUDENTS WHO PARTICIPATED IN THE RESEARCH (PSEUDONYMS, EACH MEMBER IS CODED WITH P1-P4)

No.	Name, age and code	Academic qualifications	Knows language assessment and testing	Experience in participating in high-stakes testing
1.	Rabby 24 (P1)	BA in English at a private university.	Yes	Yes
2.	Tasnim 23 (P2)	Bachelor of Business Administration (BBA) at a private university.	Yes	Yes
3.	Tusher 25 (P3)	BSc in Electrical and Electronics Engineering (EEE) at a private university.	Yes	Yes
4.	Rahat 24 (P4)	BA in Sociology at a public university	Yes	Yes

3.2 Multiple Case Study Approaches

A case study represents a real-world scenario in which participants engage in decision-making via inquiries or open-ended dialogues. It makes complicated situations easier to understand and helps people talk about real things (O'Leary, 2017). Zaborek (2009) also added that a multiple case study is a valuable technique when a research problem's complexity makes it difficult to design standardised inquiry instruments and when answers to research questions are contained in multiple data sources. Creswell (2013) contends that a multiple-case study examines genuine situations through comprehensive and nuanced data collection across diverse information sources.

3.3 Data analysis:

The researcher has used qualitative thematic analysis for analysing this study. Kuckartz (2019) describes four phases of qualitative data analysis for any research work. The research question plays the role of a central element in this method. After collecting the data, the researcher transcribed it into MS Word in the first phase. In the second phase, data were coded. Subsequently, in the third phase, the researcher generated themes that emerged while analysing the data. At the end, the researcher interpreted the results based on generated themes. Table 2 shows each of the themes described in the findings and discussion.

TABLE 2 GENERATING THEMES FOR FINDINGS (EXTRACTED FROM THE CONVERSATIONS WITH PARTICIPANTS)

No.	Name of the themes
Theme 1	High-stakes testing criteria need to be changed.
Theme 2	Destroying mental peace and avoidance towards academic studies.
Theme 3	Impact negatively on the education curriculum, institutions, teachers and parents.

4. Findings and Discussion

4.1 Section one: Students become mentally depressed

High-stakes testing in Bangladesh is always debatable because it has limited positive impacts on students' academic journey. According to Smith and Rottenberg (2001), there are six negative effects of high-stakes testing, and these are (1) reduced time for instruction, (2) minimising curriculum during test construction, (3) assessing lower-order skills, (4) limiting students' learning opportunities, (5) affecting teacher morale, and (6) torturing students. Moreover, According to Elliott (2000), teachers are concerned about the mental repercussions of high-stakes testing, such as excessive stress and worry. Students have to prepare for a long time and in a complicated way before they can take this test. Students at public universities can easily spend hours and hours getting ready for the BCS because they don't have a lot of homework, classes, and presentations to do. Hoque (2023) also says that students who go to public universities come from families that are not financially stable. Most of the time, they are discouraged from studying their favourite subjects to pursue careers of their dream because of the high cost of tuition. As a result, they are now only paying attention to BCS (The Daily Star, February 23, 2023). Whereas private university students have huge loads of academic activities. So, they do not get enough opportunities to prepare for the preliminary test. Moreover, high-stakes exam questions are set up in a way so that students have to do more than just think critically; they also have to remember a set of mathematical formula and data. It makes them less creative and stops them from coming up with new ideas. They are gaining linguistic proficiency instead of communicative competence. Because of this, they couldn't get anywhere and became sad.

4.2 Section two: Teaching environments have been lost

The BCS exam helps some students get a high-ranking job, but it mistreats their 21st-century skills, like creativity, working with others, thinking critically, and talking to people. Many teachers at public universities in Bangladesh tell their students to take the BCS tests. Instructors at public colleges assist their students in preparing for BCS. Most of the time, though, the faculties of private universities strictly follow the American curriculum for all of their courses, students feel stressed and are overwhelmed by tons of ideas and tasks to complete in a semester. It prohibits them to manage time to study for other tests.

Additionally, students attending private universities do not receive additional support or guidance for job studies due to various factors. P2 said, "One of my teachers is a part-time advisor at a coaching centre. He is also a well-respected professor at a reputed public university. He hardly paid attention to the problems and limitations of our courses. Because of this, we failed to follow his instructions correctly and couldn't write the correct answers on our exam scripts. Few of my classmates only go to regular classes and focus on getting ready for the BCS test instead of their paperwork. This has made the teaching environment worse, which has led students to underperform." Nowadays, People have started to lose faith in PSC because it has become corrupted. The reason is that PSC officials leaked a few question papers and embezzled a lot of money (The Daily Star, 2024). Parents today use BCS scores to judge how smart their kids are, not how creative, productive, or good critical thinkers they are. This makes things harder for the students. Since the BCS application requires students to keep a minimum CGPA of 2.70, it's obvious that they skip regular class activities in favour of coaching classes. They don't do brainstorming, working together to do research, or talking to each other to make deals because they rely so much on the BCS guidebooks. Therefore, they don't pass most of their university classes or courses as they do poorly on the midterm and final exams. These situations have long-term effects, like gaps in education, when they don't get the jobs they want, which is what most companies offer.

4.3 Section three: Need for a change

P3 is unhappy with the BCS exam pattern and says, "PSC needs to rethink the civil service exam; I mean, they should think about what we learned in higher-secondary or tertiary education. An engineering student has nothing to do with Bangla, Daily Sciences and Mental Abilities " The test has a negative washback effect on students because it has minimum effects on real-life or advanced teaching and learning. Also, it has lost face validity as the task doesn't relate to the university course materials. It is also unfair in a sense that only students at public universities have enough time to finish the whole BCS syllabus. They can get ready for the test during their second or third year of college. They don't have as many assignments, projects, quizzes, and midterms as students of private universities do. They easily hold their focus on the test, while the others aren't. This isn't considered as an equal judgement. Authority needs to rethink about syllabus distribution, testing and assessment policy so that it takes private university students into account. If not, most talented students won't be able to work for the country as BCS cadres. P1 also added, "The BCS syllabus doesn't match the syllabus of our undergraduate studies, except for special BCS. They can include some of the topics from our regular studies which focus on deep learning, not rote memorisation. The feedback should be continuous rather than one time. Then studying for the test will be a lot easier for us." P4 added that "without giving all students a huge syllabus, they can break it up based on their

discipline or make specific questions for each subject. The assessment policy should be new, ongoing, student-centred and the feedbacks should be different for both public and private university students. This way, students at private universities will be able to attend the exam confidently. If not, neither of our dreams will come true." So, it's clear that the materials of testing need to be authentic and the rules for taking the test and the assessment strategy should be innovative for students. Usually, people who want to get into BCS don't read to think; they memorise random things from school books instead. This has been seen for many years. This traditional practice stops them from being creative. The BCS exam also doesn't teach students skills that are important to survive in the 21st century; these skills are creativity, teamwork, communication, and critical thinking. The only solution could be implementing competency-based assessment, which promotes structured, real life task-based and skill oriented evaluation, not just scores. It also improves learning quality and assessment validity (Datta et al., 2025). That's why the PSC board needs to change the test requirements for all kinds of students so that they can participate equally without minimising academic performance.

5. Conclusion

The Education Board should consider students' problems and give them opportunities to focus on their studies. The authority must reorganize the criteria of high-stakes testing, such as preparing authentic materials, implementing continuous assessment, generating student focused content, and providing ongoing feedback. Otherwise, students will not be able to concentrate on their studies, and rather, they will fall behind in the modern world. The assessment policy should also consider real-life skills and practices so that students achieve specific learning outcomes. However, this study included a small number of participants for interviews; further research can be conducted on a bigger group using the same theory or framework in the future.

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Rubric-Based vs. Traditional Assessment in Programming Courses: A Comparative Study

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Abstract
In programming-based courses, assessment is essential to measuring student learning outcomes. This study evaluates student performance in a Data Structure Lab course by contrasting traditional evaluation versus rubric-based assessment techniques. Ten pupils in all took part in a programming exercise where they had to determine the array's smallest element. Two evaluation methods were used: a rubric-based assessment that used predetermined criteria such as logical correctness, code quality, output accuracy, documentation, and efficiency, and a traditional assessment based on general judgment. Statistical techniques for both descriptive and inferential analysis were applied to the gathered data. The findings demonstrate that, in comparison to the conventional approach ($M = 6.8$, $SD = 1.2$), the rubric-based assessment method yielded a higher mean score ($M = 7.6$, $SD = 0.8$). Additionally, a t-test revealed a statistically significant difference ($p < 0.05$) between the two approaches, indicating that the improvement is significant and not the result of chance. According to the results, rubric-based evaluation reduces subjectivity while increasing uniformity, transparency, and fairness in grading. As a result, it can be regarded as a more successful assessment technique for evaluating programming proficiency in computer science instruction.

***Keywords**:* Rubric Based Assessment, Traditional Methods-Test

1. Introduction

In the modern world, machine learning and artificial intelligence are crucial. Programming courses are essential to the growth of these professions. As a result, one of the main duties for students is now learning programming. Evaluation is a natural consequence of learning. Nonetheless, a lot of educators continue to evaluate pupils using conventional techniques. These traditional methods rely mostly on the instructor's subjective assessment, which may result in irregularities and a lack of openness. Because of this, the evaluation method may vary from student to student, which is unfair and frequently leaves students feeling unsatisfied and unsure about how their work has been evaluated.

Rubric-based assessment has been established as a more structured method of evaluation in order to overcome this problem. It helps teachers and students better understand expectations by offering precise criteria and thorough feedback. This approach guarantees more uniformity and openness in the evaluation procedure. [1]

There is still little research that directly contrasts rubric-based assessment with conventional assessment techniques in programming courses, despite earlier studies highlighting its benefits.

In order to improve fairness, consistency, and students' comprehension in programming education, this study compares traditional and rubric-based assessment techniques.

2. Literature Review

A key component of the teaching-learning process is assessment, particularly in programming courses where it can be difficult to evaluate student work. A rubric is an organized assessment instrument that lists particular standards and performance levels. Rubrics are often divided into two categories: analytical and holistic. Among them, analytical rubrics are better suited for teaching programming since they thoroughly evaluate a variety of factors, including problem-solving logic, code structure, and documentation. [2]

The use of rubrics in enhancing evaluation procedures has been the subject of several research. According to research, rubric-based evaluation improves grading consistency and gives students more lucid, insightful comments (Stevens & Levi, 2013). Instructors can guarantee a more objective evaluation process and lessen subjective bias by depending on predetermined criteria. Additionally, students can improve their learning outcomes by using rubrics to better grasp performance requirements.[3]

To reduce errors and add uniformity to grading systems, academics have particularly suggested standardized rubrics for programming instruction [4]. Additional research demonstrates how organized assessment methods, such as rubric-based grading, can raise student interest in coding assignments and enhance the caliber of feedback. [5]

Many institutions continue to rely on traditional assessment methods that lack precise evaluation criteria in spite of these advantages. These approaches frequently place a strong emphasis on the judgment of individual instructors, which could result in uneven grading and a lack of transparency. Furthermore, even when rubrics are implemented, their efficacy depends on appropriate design and consistent application, which is not always guaranteed.

While earlier studies have highlighted the benefits of rubric-based evaluation, the majority of research focuses on the creation and application of rubrics. In programming classes, there is relatively little research that explicitly compares rubric-based evaluation with conventional grading techniques. Furthermore, integrating student perspective with grading consistency analysis in a single study has received little attention. In order to close this gap, the current study compares traditional and rubric-based assessment techniques to see how well they support equity, consistency, and transparency in programming education.

3. METHODOLOGY

Twenty students participated in this study, which was conducted in City University's Data Structure Lab course. Students were given a challenge to determine the minimum element from a specified array in order to evaluate their programming skills.

Students were assessed using no predetermined standards under the usual evaluation method. Correctness, code structure, and the ability to illustrate the outcome were among the criteria used to assign marks out of ten.

The rubric-based assessment approach, on the other hand, used a clear analytical framework for assessment. Logic, code quality, output accuracy, documentation, and efficiency were among the criteria. To ensure uniformity, distinct marks were given to each category.

In order to compare the two methodologies, data for the study was collected using both conventional and rubric-based assessment techniques.

The aforementioned standards were used to assess each student contribution. This methodical technique made grading transparent and consistent. The aforementioned rubric was used to independently evaluate each student's code. Marks were given according to each criterion's performance, and the overall marks were determined by adding up all of the separate components.

TABLE 1 RUBRIC FOR PROGRAMMING ASSESSMENT

Criteria	Description	Marks
Logic / Algorithm	Correct approach to find the minimum element from the array	3
Code Correctness	Program compiles and produces correct output	3
Loop & Condition	Proper use of `for` loop and `if` condition	2
Initialization	Minimum value is initialized correctly (e.g., first element)	1
Output	Output is clearly displayed and correct	1

TABLE 2 STUDENTS PERFORMANCE BASED ON RUBRIC BASED

Student ID	Logic / Algo-rithm (3)	Code (3)	Loop (2)	Init (1)	Output (1)	Total
S1	3	3	2	1	1	10
S2	3	2	2	1	1	9
S3	2	3	2	1	1	9
S4	3	3	1	1	1	9
S5	2	2	1	1	1	7
S6	3	3	2	0	1	9
S7	2	2	2	1	1	8
S8	3	2	1	1	1	8
S9	3	3	2	1	0	9
S10	2	1	1	1	1	6

A comparison graph between rubric-based evaluation and conventional marking has been included in this research. This graph demonstrates that compared to traditional evaluation methods, rubric-based evaluation offers slightly more marking and is more consistent. Rubric-based assessment adheres to a methodical, transparent, and thorough evaluation procedure. Rubric-based evaluation is more effective for assessing students because it is transparent compared to older methods. Table 2 displays the students' performance using the rubric-based approach. To further highlight the distinctions between the two methods of assessment, a comparison graph has been added.

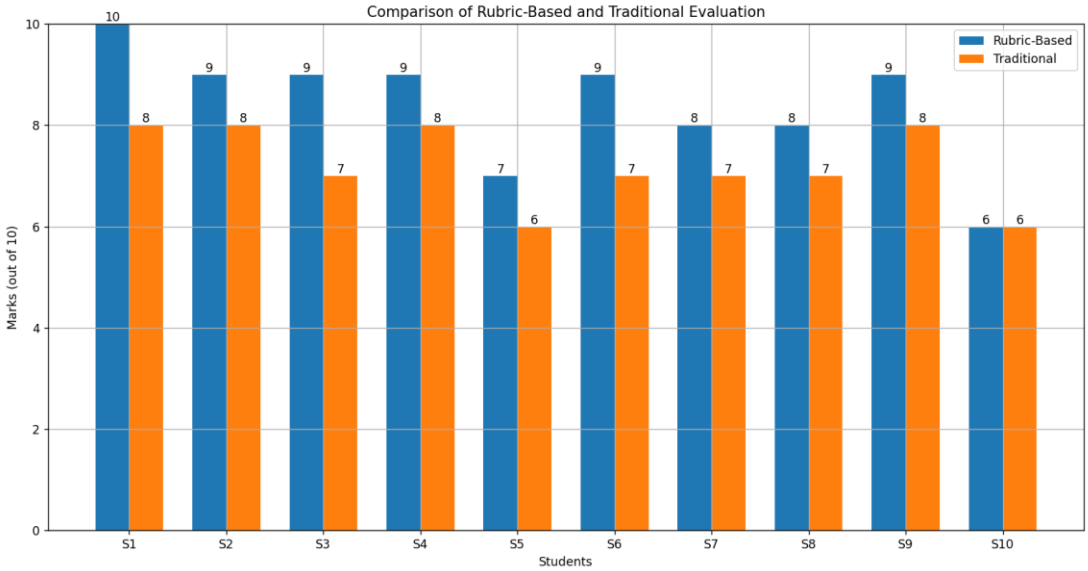


Fig.1 Comparison graph of Rubric-Based and Traditional Evaluation

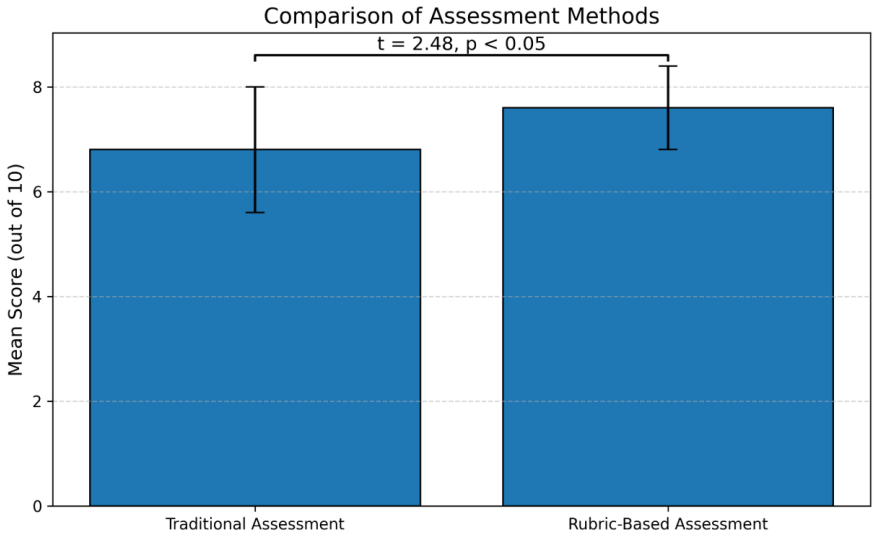


Fig.2 Comparison graph of Assessment Method

The comparison of traditional and rubric-based evaluation techniques is shown in Figure 2. According to the analysis, there is a statistically significant difference between the two approaches because the p-value is less than 0.05. This implies that, in comparison to the conventional approach, rubric-based assessment offers a more accurate evaluation of student achievement.

Overall, the findings show that rubric-based evaluation enhances consistency and fairness in assessing student programming performance, making it a more successful assessment strategy than conventional techniques.

4. Conclusion

This study examined how well 20 students performed in a Data Structure Lab course using both conventional and rubric-based assessment techniques. The findings show that, in comparison to conventional evaluation techniques, rubric-based assessment offers a more organized, reliable, and transparent manner.

Students received a higher mean score under rubric-based assessment (M = 7.6) than under traditional evaluation (M = 6.8), according to descriptive analysis. Furthermore, better consistency and less variation in student performance are indicated by the lower standard deviation in rubric-based scores. The difference between the two approaches is statistically significant ($p < 0.05$), according to the inferential analysis using a t-test, indicating that the observed improvement is not the result of chance.

All things considered, the results show that by precisely defining evaluation criteria, rubric-based assessment improves fairness and objectivity in grading. Additionally, it helps student's better grasp performance objectives and lessens subjectivity in scoring. For programming-based courses in computer science education, rubric-based assessment can therefore be seen as a more successful evaluation strategy.

In order to further evaluate the efficacy of rubric-based evaluation in a variety of learning situations, future research may apply it to bigger sample sizes and various programming assignments.

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The Impact of Educational Determinants on Student Performance: The Moderating Effect of Satisfaction with Future Direction

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Abstract
The study aims to determine the factors influencing classroom participation and students' performance, with a focus on the moderating effect of satisfaction with future direction on their performance. The study collected data from university students of Bangladesh by using a convenience sampling method. We have collected data from 393 participants through a questionnaire designed with a five-point Likert scale. Data were analyzed using IBM SPSS Statistics 27 and SmartPLS 4.1.1.5. The study's findings revealed that assessment-related factors, faculty factors, content-related factors, motivational factors, and student-related factors positively and significantly influence students' classroom participation. Assessment-related factors have the most influence on students' classroom participation. classroom participation. Classroom participation has a significant impact on students' performance, and students' satisfaction with the future direction of the classroom significantly moderates the relationship between classroom participation and their performance. The study assists academics and policymakers in comprehending the classroom participation factors, developing and formulating strategies and policies to ensure a student-friendly environment to engage students in the class and enhance their performance. This is the first study in the education context to examine the five determinants of students' classroom participation and explore satisfaction with future direction as a moderator in the same study.

Keywords: Classroom Participation, Students' Performance, Satisfaction With Future Direction, University Students, Bangladesh.

1. Introduction

Education is a powerful driver that helps lead a quality life and acts as a changemaker, playing an incredible role in enhancing livelihoods, fostering social stability, and improving well-being. At the individual level, it helps by enhancing their skills and opening up more opportunities, both economically and socially (Tadese et al., 2022). On a broader scale, education nurtures a knowledgeable and skilled workforce, which acts as a catalyst for a nation's growth and development (Sothan, 2019). As today's job market becomes increasingly competitive, especially for new job seekers, they often lack essential skills such as problem-solving, critical thinking, and effective communication. So, for producing skilled & human capital through education, institutes have to ensure that students are going through a learning process and developing their problem-solving skills, critical thinking abilities, communication, and networking skills before entering the job market (Bakar et al., 2023). However, the learning journey—acquiring knowledge and developing positive attitudes and skills through education—is not a part of a challenging endeavor. (Tadese et al., 2022). Ensuring the required skills within the students' needs, mostly a campus-oriented mentality and attitudes.

A university campus is not just a place of study; it is a complex and multifaceted ecosystem that supports students in their educational progress, social development, and overall growth in numerous ways. Complex designs, features, and the overall environment work together to create a complete learning experience.
A planned university campus acts as a key spot for sharing ideas and growing as a person. This is the double nature that makes the physical environment of a university as dynamic, as well as designing and succeeding in dealing with a very challenging landscape (Coulson et al., 2014). In Bangladesh, campuses reflect the wider society, bringing together different cultures, academic fields, and social groups. This setting gives students the chance to discover what they're capable of, meet people from all walks of life, and take part in things that shape their education and personal growth.

Classroom participation refers to not just attending the class but also preparing for class beforehand and maintaining consistent attendance. (Hard & RaoShah, 2022), and contributing meaningfully to discussions and activities during the class (Xu & Qiu, 2022). According to Ha et al. (2024) students who attend the class gain the advantage of engaging with instructors and can identify the questions and suggestions that are important for the final exams. These two-way interactions build a positive environment between learners and instructors and allow

students to compare themselves with others. Moreover, implementing mandatory attendance policies and incorporating surprise class tests can further encourage meaningful classroom participation. Numerous empirical studies have consistently shown a strong link between students' attendance and academic performance (Serna et al., 2024). However, other research indicates the strength of the relationship could vary among students, influenced by individual characteristics. For instance, low-performing students have little positive impact on their performances (Westerman et al., 2011).

In Bangladesh, academic performance is measured by cumulative grade point average (CGPA). Students' academic performance is shaped by a range of factors. A study conducted by Suleiman et al. (2024) found that university students highlighted that graduate academic performance is linked to several key determinants, including students' efforts, prior schooling, attitudes, motivations, and more. Other studies suggest that the personal, social, psychological, political, environmental, and economic conditions of a country also play a critical role in contributing to academic outcomes (Alj & Bouayad, 2024). Beyond these practical advantages, academic success is also associated with positive psychological outcomes, such as higher self-esteem and self-confidence, lower levels of anxiety and depression, greater social engagement, and a reduced likelihood of substance abuse, such as alcohol and khat (Lizarte Simón et al., 2024).

The quality of teaching, employment opportunities during their studies, the work of other faculty bodies (such as the library and registry), and future direction all directly correlate with students' satisfaction levels regarding their academic life, which in turn influences their performance. Tentama & Abdillah (2019) have shown that students with strong academic achievements tend to secure higher returns, enjoy better engagement benefits, and have more opportunities for career advancement.
The purpose of this study is threefold. First, to explore the factors that influence students to participate in the class. Second, to analyze how classroom participation brings satisfaction into the students' campus life and how satisfaction enhances their performance. Finally, provide the suggestions to the authorities to implement properly so that they can encourage the students to actively participate in the class and achieve their ultimate goals.

2. Theoretical Framework and Research Hypotheses

2.1 Theoretical Underpinning

The Theory of Student Involvement is widely used for justifying the students' participation in the classroom. Students' involvement indicates the behavioral and psychological efforts students placed to their academic progress (Astin, 1984). According to the theory, students' involvement directly shapes the students' academic performances. Astin's theory proposed that active engagement in the classroom, such as joining in the group discussion, timely submitting assignment, interacting with the teachers greatly contribute in their academic outcomes.

2.2 Hypotheses Development

2.2.1 Assessment - related Factors towards Classroom Participation

The organization's assessment systems significantly impact students' participation in learning activities and class attendance. When attending class is connected to test requirements, students place a higher importance on it (Biggs, 1996). Research shows that when teachers explain that the material they are teaching will be assessed in future tests, students are more likely to attend classes Allen & Webber, 2010). According to Subramaniam et al. (2013), the attendance requirements regarding exam content likely had a beneficial impact on student attendance and were associated with higher exam scores. The way students interact in the classroom changes as exams approach; they both observe that students frequently choose their own study over team tasks and consider classroom activities less important than revision resources (Allen & Webber, 2010). Therefore, whether students will engage in class or study on their own to prepare for tests ultimately depends on how well instructional techniques align with evaluation strategies.
H1: Assessment-related factors positively influence Students' classroom participation.

2.2.2 Faculty Factors towards Classroom Participation

Educators play a significant role in facilitating student attendance and engagement. Research has shown that a teacher's teaching style, level of knowledge about the subject, and enthusiasm for teaching, as well as the provision of constructive feedback, affect the students' attitudes toward learning and engagement (Yasmin et al., 2026). For instance, when teachers are active, enthusiastic, and show care for their students, supportive behaviors toward them are likely to make them feel capable and engaged in the learning process (Rugambuka & Mazzuki, 2023). This is even more clearly communicated when teachers provide opportunities for engagement, such as working

collaboratively and learning through active participation, offering clear guidelines, and providing emotional support, as it gives students a sense of being part of the overall learning objectives (Erickson et al., 2025).
H2: Faculty factors significantly influence Students' classroom participation.

2.2.3 Content-related Factors towards Classroom Participation
Content-related factors include clarity, contextual relevance, cognitive challenge, and cultural responsiveness, which are core in influencing the classroom interaction and academic orientation of students. According to (Kahu, 2013; Zepke & Leach, 2010), students engage more emotionally and cognitively with the well-structured, relevant, and thought-provoking content. Homework-related content and differences in content culture have a significant influence on students' participation patterns (Anyichie & Butler, 2023; Mundt & Hänze, 2023)**.** According to Du et al. (2025)**,** the relevance and clarity of the content to the courses strongly influence students' engagement patterns. Additionally, multimedia- and interaction-supported content is effective in increasing student engagement and motivation in technology-enhanced educational spaces (Martin et al., 2018; Mundt & Hänze, 2023). Ma (2026) found in his study that when students get emotional support or hindrance from the contents, it may influence their classroom participation.
H3: Content-related factors have a strong influence on students' classroom participation.

2.2.4 Motivational Factors towards Classroom Participation
Motivation, which encompasses a wide range of internal and external factors, has a significant influence on class participation. Self-Determination Theory (SDT) suggests that student motivation can be either intrinsic, centered on a sincere desire for learning, interesting or enjoyable personal growth, or extrinsic, motivated by the need to follow institutional standards or avoid the penalties of failure (Ryan & Deci, 2000). In education, outcomes that are influenced by external factors, such as attendance, test scores, or tuition fees, are likely to be classified as external regulations, as students act to satisfy needs or expectations that they believe to be personally important (Hollett et al., 2020; Sloan et al., 2020). These forms of encouragement have been demonstrated to have a good impact on classroom involvement and attendance, despite their partial autonomy. On the other hand, intrinsic motivation promotes determination, more academic adaptability, and deeper cognitive engagement. It reflects the desire to master the topic and achieve long-term academic success (Shin et al., 2024).
H4: Motivational factors have a strong influence in shaping students' classroom participation.

2.2.5 Student-related Factors towards Classroom Participation
Attendance and participation in class are significantly influenced by situational and personal factors related to the student. According to Alrashidi and Alshammari (2025) and Prananto et al. (2025), students' self-efficacy and optimistic academic passions strongly affect their intention to engage in the classroom. A student is more willing to attend a class if they believe that the in-class activities will help them grasp key concepts for tests or if they are academically prepared (Credé et al., 2010). The influence of batchmates affects perceptions of academic value and the overall quality of instruction, which in turn affects attendance. This is especially true when students provide positive feedback or praise regarding a course or an educator. Individual challenges, such as attempting to avoid completing the assignment or experiencing certain mental health conditions like stress and anxiety, may lower motivation and lead to absenteeism (Finning et al., 2019; Zhao et al., 2023).
H5: Student-related factors have a strong influence on determining students' classroom participation.

2.2.6 Classroom Participation and Student Performance
Student performance is indicated by their continuous progress in the academic and beyond academic performance. To ensure the students' progress in their career, their performance within and beyond the classroom need to be enhance. Classroom participation is the key factors which strongly influence students' academic performance (Xerri et al., 2018). According to Schaufeli et al. (2002), classroom engagement is the outcome of students' positive enthusiasms that determine their performance. Research conducted on American university found that students' enthusiastic engagement toward their academic is the key determinants of the success (Yunhee Bae & Sunyoung Han, 2019). Similarly, Krause and Coates suggested high-performance highly relates to the students' engagement (Krause & Coates, 2008). However, Johnson and Stage's, (2018) findings found that students' classroom participation has no strong relationship in enhancing their performance. Meng and Zhang (2023) found that higher classroom engagement increases students' academic performance.
H6: Student-classroom participation has a strong connection in influencing their academic performance.

2.2.7 Moderation Effects
Students' future direction indicates the need for timely guidelines from teachers, seniors, and authorities to prepare them for their target position. It greatly shaped their academic and professional preparation for the future.

Academic counseling, skill-boosting workshop, and sessions constructively guide students' preparation and ultimately their performances. According to Liu et al. (2024), future orientation significantly moderates the guardian's parenting style and students' academic engagement. Similarly, future direction meaningfully moderates the relationship between students' classroom environment and their learning behaviors, as well as moderates the relationship between professional identity and their learning behaviors (Shaojie, 2025). There is no existing literature that supports a direct moderate relationship between students' classroom participation and their performance. But considering its moderator roles in the literature and Bangladeshi university students' perception towards it, we proposed the following hypothesis.

H7**:** Satisfaction with Future Direction moderate the relationship between classroom participation and students' performance.

3. Research Methodology

3.1 Research design

Grounded on the Theory of Student Involvement, the study adopts a cross-sectional design. Besides, the study was conducted based on quantitative approach to investigate the proposed results.

3.2 Sampling and data collection

The study was focused on collecting data from the undergraduate and graduate university students of Bangladesh. To collect data from the target respondents, a closed-ended structured questionnaire was developed using five-point Likert scale, ranging 1 for "Strongly Agree" to 5 for "Strongly Disagree". According to Revilla et al. (2014), five-point Likert scale is widely renowned and acceptable to the respondents and it increases the response rate. According to Lopes et al. (2020), convenience sampling is largely used for data collection from the university students. Hence, we adopt convenience sampling method for collecting data to conduct the study. We used both online and offline platforms to collect data from the target respondents. We designed the questionnaire in the google form and share the URL to the among the 195 students. We collect 162 positive responses from them with a success rate of 83%. To collect offline data, we distributed 250 hardcopies of questionnaire, and got 231 responses with a success rate. of 92%. In total, we collected 393 responses from the students, representing a population size of 725,971 (BES, 2023). According to Saunders et al. (2023), a sample size of 384 is a suitable number when the population exceeds 1,000,000, with a 5% margin of error. Sample size should be 5 to 10 times the number of variables used in the constructs (Hill, 1998). The ten-times rule suggests the sample size should exceed 10 times the largest path of the inner or outer model of the constructs. Hence, our sample size of 393 fulfills all the recommended minimums that enhance the reliability of the study.

3.3 Survey Instruments and Data Analysis Tools

To analyze the respondents' demographic information, we used IBM SPSS Statistics 27, and SmartPLS 4.1.1.5 was applied to measure the relationship among the variables of the constructs.

4. Results

4.1 Respondents' demographic characteristics

We collected 393 valid responses. The study comprised 53.9% male respondents and 46.1% female respondents (Table 1). Regarding their age group, most of the respondents, 77.6%, belonged to the 20-25 age group, and 15.6% and 7.1% belonged to the under 20 and above 25 age groups, respectively. Additionally, 57.5% respondents were from public university students, and the remaining 42.5% were from private universities. Moreover, the majority of our respondents, 62.9%, are still pursuing their graduation (undergraduates), and the remaining 37.1% have completed their graduation (graduates).

TABLE 1 RESPONDENTS' DEMOGRAPHIC CHARACTERISTICS

Demographics	Classification	Number	Percentage (%)	Cumulative Percentage (%)
Gender	Male	212	53.9	53.9
	Female	181	46.1	100.0
Age Group	Under 20	60	15.3	15.3
	20–25	305	77.6	92.9
	Above 25	28	7.1	100.0
University Type	Public	226	57.5	57.5
	Private	167	42.5	100.0

Study Level	Undergraduate	247	62.9	62.9
	Graduate	146	37.1	100.0

4.2 Measurement model

4.2.1 Indicator reliability and convergent validity

Indicator reliability indicates the intended measurement capacity of the study's items. In our study, we examined the composite reliability (CR) to determine the reliability. According to Hair et al. (2021), CR values between 0.700 to 0.950 indicate satisfactory to good results. The CR values in our study ranged from 0.902 to 0.947, which remains within the prescribed range (Table 2). Again, convergent validity posits the explanatory power of different measurement scales. Average Variance Extracted (AVE) is used to calculate convergent validity in a study, and its value must exceed 0.50 (Hair et al., 2021). Table 2 shows that AVE surpasses 0.50, which confirms the validity of the study. Reliability refers to the consistency among the different measurement scales within the same construct.

4.2.2 Discriminant validity (Heterotrait-Monotrait)

Discriminant validity states that the different measurement tools remain conceptually distinct within the same research model. It ensures the low correlation among the variables of the construct (Kline, 2023). According to Henseler et al. (2015), the Heterotrait-Monotrait (HTMT) ratio is a good metric for evaluating discriminant validity, and the threshold for the HTMT ratio is 0.85. Table 2 shows that all the HTMT ratio values are within the threshold, which satisfies the construct's discriminant validity.

TABLE 2 HETEROTRAIT-MONOTRAIT (HTMT)

	ASF	CP	CRF	FF	MF	SFD	SP	SRF	SFD x CP
ASF									
CP	0.451								
CRF	0.063	0.159							
FF	0.059	0.375	0.125						
MF	0.022	0.233	0.045	0.073					
SFD	0.058	0.026	0.044	0.048	0.031				
SP	0.161	0.380	0.072	0.198	0.050	0.331			
SRF	0.060	0.113	0.031	0.043	0.030	0.035	0.042		
SFD x CP	0.123	0.064	0.037	0.092	0.03	0.018	0.138	0.052	
CR	0.942	0.926	0.947	0.938	0.934	0.944	0.902	0.947	
AVE	0.852	0.819	0.863	0.842	0.834	0.856	0.772	0.863	

4.3 Structural model

4.3.1 Structural model evaluation

Inner model assessment evaluates the predictive power of the structured model and the degree to which latent variables align with each other. The β values are demonstrated in Table 3 and Figure 2, and R^2 values of our study are shown in Figure 3. Hypothesis 1 assumed that faculty factors positively influence students' participation in the classroom. The study's result shows that the relationship is significant (β = 0.338, CR = 7.892, p = .000). Hence, H1 of our study is supported. Similarly, we examined the other hypothesis of our study and found that H2 (β = 0.172, CR = 3.984, p = .000), H3 (β = 0.404, CR = 9.860, p = .000), H4 (β = 0.207, CR = 5.006, p = .000), H5 (β = 0.135, CR = 3.108, p = .002), and H6 (β = 0.344, CR = 7.709, p = .000). Hence, H2, H3, H4, H5 and H6 are supported. The moderation result, H7 (β = 0.109, CR = 2.344, p = .047), also shows that SFD has a substantial role in the relationship between CP and SP. R^2 values for CP (0.374) and for SP (0.228) indicate a moderate to strong explanatory power for a model in the social science domain (Henseler et al., 2009).

TABLE 3 ESTIMATES ON DIRECT EFFECTS.

Hypothesis	Path Relations	β	Critical Ration (CR)	P value	Decision
H1	FF → CP	0.338	7.892	***	Supported
H2	CRF → CP	0.172	3.984	***	Supported
H3	ASF → CP	0.404	9.860	***	Supported

H4	MF → CP	0.207	5.006	***	Supported
H5	SRF → CP	0.135	3.108	0.002	Supported
H6	CP → SP	0.344	7.709	***	Supported
H7	SFD x CP → SP	0.109	2.344	0.047	Supported

Source**:** Authors' own work, 2026
Note: p-value: ***p<0.005.

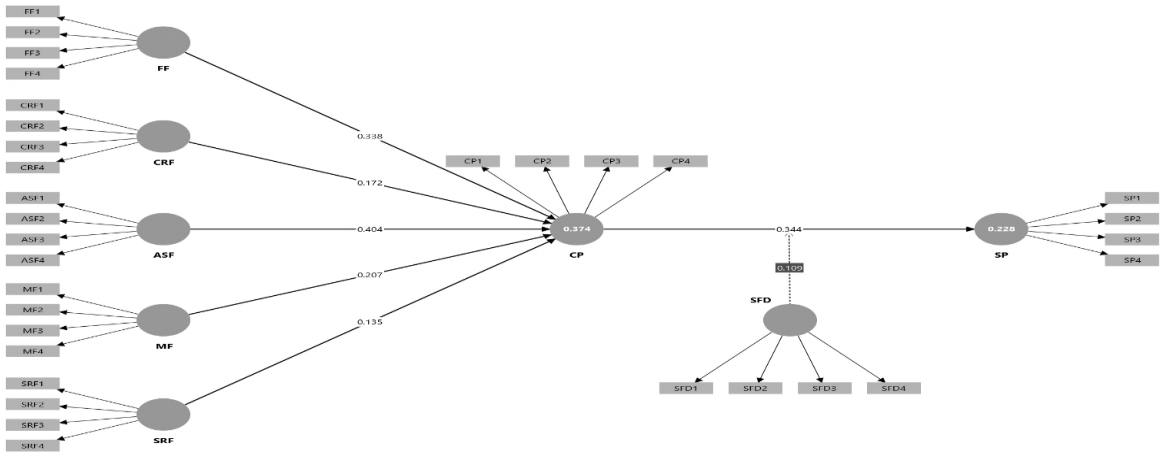


Fig.1 Structural equation model.

5. Conclusion

The students' performance is widely influenced by their classroom participation and getting proper guidance about their career opportunities. The study's findings suggested that teachers' expertise, knowledge, wisdom, support, and their lecture contents strongly motivate their classroom engagement. Besides, individual students' personal factors and motivation to attend classes also shape their intention to participate in the class. Again, the study's findings suggest that classroom participation largely increased students' critical thinking, reduced their fear of questioning, and enhanced their overall performance.

The moderation analysis of the study reveals a strong connection between students' classroom engagement and their performance. Satisfied students with clear career directions are performing better comparatively than those who lack a clear understanding of their careers and suffer from a lack of clarity. This finding considers the importance of it toward boosting students' performance. In conclusion, students' performance is shaped by both educational determinants and their behavioral engagement and future-oriented satisfaction. To ensure the success of the students, the university authority should implement student orientation strategies to engage them in the classroom. Developing a friendly and supportive environment within the classroom and campus is also essential.

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Institutional Accreditation and Quality Assurance: A Mathematical Perspective

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Abstract
Because it upholds academic standards, fosters public trust, improves the institution's reputation, and guarantees that graduates have the skills needed in a cutthroat global economy, institutional quality assurance and accreditation are essential for higher education. These are methodical internal processes intended to track, assess, and enhance the caliber of academic programs and the overall performance of an academic institution. Important aspects include strong internal course approval procedures, uniform policies to uphold academic integrity, procedures for frequent evaluation and enhancement, and efficient governance to attain transparency and accountability. To accomplish these, a strong and widely recognized framework is needed. Therefore, from a mathematical standpoint, we propose the institutional Quality Assurance Assessment Framework (QAAF) for accreditation of higher education institutions to ensure reliability and incremental improvements in academic quality. The results of this QAAF framework help with accreditation and quality improvement by highlighting an institution's strengths and weaknesses. In accordance with UNESCO's Open Educational Resources (OER) concept, we propose a digital platform that makes this QAAF framework available to everyone globally through state-of-the-art computer analysis and information technology. This will ensure accountability and transparency for all parties involved, preserving institutional standards and recognition.

***Keywords**:* Institutional Quality Assuarance, Institutional Accreditation, Outcomes-Based Education (OBE), Open Educational Resources (OERs), SMART framework, Lifelong Learning, Higher Education.

1. Introduction

An independent body's assurance of academic quality is known as accreditation. There are various forms of accreditation, including departmental, programmatic, course, institutional, and others. According to Hemmings (2025), while departmental accreditation offers accreditation to all of the programs in an academic department, including the department building, faculty, and each program that will be examined in this type of accreditation, institutional accreditation examines an institution as a whole, looking at a number of factors to ensure that the information, opportunities, and facilities offered are up to standard. Programmatic accreditation is a type of specialized accreditation that examines a single program. It is most frequently found in fields where students may need to apply for a license or charter in order to work, such as law, medicine, business, or engineering. Programmatic accreditation makes it simple for licensing companies to verify that applicants have the necessary education.

Recognized accrediting agencies worldwide play a vital role in ensuring educational quality and international recognition. These agencies evaluate and accredit institutions and programs based on established standards, fostering trust and confidence in the education sector. Through encouraging excellence, accountability, and transparency, accrediting organizations support the ongoing development of educational systems across the Americas, Europe, Asia, and Africa. By upholding rigorous standards and conducting thorough evaluations, recognized accrediting agencies serve as guardians of quality education and facilitate international mobility and recognition of academic qualifications.

The Bangladesh Accreditation Council (BAC) Act (No. IX of 2017) (2021) was created with the intention of guaranteeing quality assurance in Bangladesh's higher education. In accordance with this Act, the Accreditation Rules, 2022, which comprise two Schedules and four chapters, were published on June 4, 2022. Chapter 2 provides an explanation of the accreditation terms and conditions, procedure, duration, etc. Six requirements must be met in order to apply for BAC's accreditation certificate. These include having a permanent Institutional Quality Assurance Cell (IQAC), approved curricula, and at least one batch of students having completed their graduation requirements at least two years before the accreditation application date. Furthermore, in the case of institutional

accreditation, at least 20% of all academic programs must be accredited, provided that there are at least three accredited programs, that the programs have quality assurance, infrastructure with modern facilities, trained human resources, financial solvency, and a strategic plan as determined by the Council, and that the academic program or education institution has been approved by the appropriate authority. Earned scores of 60% to less than 70% are required for the Certificate of Confidence, while scores of 70% or higher are required for the Certificate of Accreditation. Furthermore, less than 60% does not qualify for a certificate. However, the accreditation requirements set forth by BAC are unclear and vague. It doesn't go into detail about how the criteria can be scored. These could have an impact on educational institutions' accreditation and quality control. Therefore, we provide the institutional Quality Assurance Assessment Framework (QAAF) for accreditation, which includes scoring methodologies and SMART (specific, measurable, achievable, relevant, and time-bound) criteria from a mathematical perspective. This framework will facilitate the shift to an actual accreditation assessment for institutional quality assurance.

2. Quality Assurance Assessment Framework (QAAF)

Accreditation criteria are a set of standards used by approved accreditation bodies to evaluate the effectiveness and caliber of a program or academic institution. Governance, curriculum, faculty, funding, facilities, student support, research, dedication to ongoing improvement, and other areas are usually covered by these standards (Accreditation Rules, 2022; BAC 2021, Pabrekar, 2015). Suppose that after evaluation by an accreditation body, the scores of various criteria are $x_1, x_2, x_3, \dots\dots, x_n$, with their respective weights $w_1, w_2, w_3, \dots\dots w_n$. Let's also consider a multiplicative element that might serve as a mandatory accreditation prerequisite. For instance, the Accreditation Rules (2022) mandate that a permanent IQAC be established in order to manage quality assurance. This multiplicative factor "f" can therefore be 1 if an institution have IQAC, and 0 otherwise. The percentage of score can then be computed using the formula in equation (1).

$$Percentages\ of\ score\ = \frac{(\sum_{i=1}^{n} w_i x_i) f}{Maximum\ possible\ score} \times 100 \dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1)$$

Approved Curriculum (C), Infrastructure Facilities (IF), Teacher-Student Ratio (TSR), University Governance (UG), Teacher Qualification and Efficiency (TQE), and Internal and External Strengths (IES) are all required when an academic institution applies for approval of a new program from a government body, such as the Ministry of Education or the UGC in Bangladesh. Additionally, these are mandated by national laws, such as the Bangladesh Private Universities Act, 2010. According to our proposal, these requirements can also meet the accreditation body's "Accreditation Criteria". Therefore, it is necessary to consider how each criterion supports a university's primary missions of teaching, research, and community involvement in order to assess the relative importance of these standards for institutional quality. Primary factors that directly affect learning outcomes are Teacher Qualification and Efficiency (TQE) and Curriculum (C) design, while University Governance (UG) offers the foundation for success. These fundamental components are supported by Infrastructure Facilities (IF), individualized attention is impacted by the Teacher-Student Ratio (TSR), and opportunities and resources are provided by Internal and External Strengths (IES), forming a comprehensive ecosystem where all components are necessary for strong institutional quality. Since assessing higher education institutions for accreditation is our primary goal, we give each of these criteria equal weights in equation (1), assigning each a score, for instance, on a scale of 0 to 100. Additionally, equation (1) makes use of the SMART framework (Doran, 1981, Ahmed et al. 2025). To improve transparency and engagement and to produce measurable, data-driven analysis, these specific, attainable, and relevant requirements are mathematically expressed as follows:

$$Percentages\ of\ score = \frac{\left(x_{TQE} + x_C + x_{UG} + x_{IF} + x_{TSR} + x_{IES}\right) f}{Maximum\ possible\ score} \times 100 \quad \dots\dots (2)$$

In this instance, "x_{TQE}" represents the Teacher Qualification and Efficiency score, "x_C" the Curriculum score, "x_{UG}" the University Governance score, "x_{IF}" the Infrastructure Facilities score, "x_{TSR}" the Teacher-Student Ratio score, and "x_{IES}" the Internal and External Strengths score.

Qualified and effective teachers in higher education must possess advanced degrees, such as master's or doctoral degrees, specialized certifications, and in-depth subject-matter expertise. The effectiveness of teachers is demonstrated by their capacity to manage classrooms, implement a variety of teaching strategies, use technology and communication effectively, encourage a love of lifelong learning, and establish a nurturing, growth-oriented environment for their students. Promoting student success and raising the standard of education generally depend heavily on both qualifications and efficiency. Teachers are the front-line educators who have a direct influence on

students' success, comprehension, and engagement. The formula below can be used to compute the score x_{TQE} of Teacher Qualification and Efficiency numerically in accordance with the SMART framework.

$$x_{TQE} = \frac{100}{T} \times M + A\left\{\frac{T-M}{T}\right\}, \qquad where\ T \geq M, T \in Z+ \ and\ M \in Z+ \quad \ldots\ldots\ldots(3)$$

where "T" is the total number of efficient and qualified faculty members needed for an organization to run its programs. While "M" teachers are effective and meet the requirements, "$T-M$" teachers are less qualified. We assume that a doctorate and two years of successful teaching experience with high student evaluations, or an MPhil (or master's) and five years of successful teaching experience with high student evaluations, are prerequisites for being considered qualified and effective. However, finding teachers who meet the high standards is difficult from Bangladesh's perspective. When we enter $M = 0$, it means that there are no teachers who meet the requirements. Equation (3) yields $TQF = A$. The institutions must continue to operate without the necessary efficiency and qualifications due to a lack of qualified teachers. Therefore, since the institution still needs to run the academic process, the accrediting body should set a minimum score of "A" for the less qualified teachers.

The fundamental goals of education are based on curriculum and teacher quality. A well-crafted curriculum guarantees that students are taught comprehensive, up-to-date, and pertinent knowledge and skills. In addition to meeting institutional goals, a high-quality curriculum equips students for future challenges and careers. According to the outcome-based curriculum (OBE) template (UGC, 2022), the curriculum is divided into four parts: Part A, Part B, Part C, and Part D. The programs, mission, vision, quality policy, Program Educational Objectives (PEO), Program Learning Outcomes (PLO), Mapping of PEO vs. PLO, and University's Mission vs. PEO are all represented in Part A. Curriculum Structure and Semester, Term, Year, and Level-wise Courses are covered in Part B. In Part C, all of the program's courses and subjects are described, including PLO vs. Course Learning Outcome (CLO) mapping, teaching strategies, course mapping vs. teaching strategy, and assessment or evaluation procedures. Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), course withdrawal, incomplete courses, retake, grade improvement, and course dropout are all represented in Part D. We suggest that each part, from A to D, have a maximum score of 25. The academic institution offers a variety of programs. Therefore, various curricula need to be approved by the government agency in order to run the institution. The OBE curricula of the different programs at an institution with n programs are represented by the scores $x_{C_1}, x_{C_2}, \ldots, x_{C_n}$. In order to determine the numerical value, we propose using the following formula.

$$\text{Score of } Curriculum = x_C = \frac{\sum_{i=1}^{n} x_{C_i}}{n}, \qquad where\ 0 \leq x_{C_i} \leq 100\ and\ n \in Z+ \quad \ldots\ldots\ldots(4)$$

The framework of procedures, regulations, and structures used to guide, oversee, and manage a university in order to guarantee its efficacy, accountability, and strategic alignment with its mission is known as University Governance (UG). Effective university governance enhances productivity, sustainability, and overall institutional performance through inclusive and transparent decision-making, prudent financial management, strong academic quality assurance, and active stakeholder participation. Here, the term "UG" refers to the administrations (Chancellor-appointed vice-chancellor (VC), Pro-Vice Chancellor (PVC) and Treasurer (TR)), the effective Academic Council (AC), the effective Faculty Council (FC), and the effective Syndicate (S). Assume that the scores for VC, PVC, TR, S, AC, and FC are $x_{VC}, x_{PVC}, x_{TR}, x_S, x_{AC}$, and x_{FC} respectively. These basic parts can be used to create a mathematical equation for our purposes.

$$Score\ of\ university\ governance = x_{UG} = P\{x_S + x_{AC} + x_{FC}\} + x_{VC} + x_{PVC} + x_{TR} \quad \ldots\ldots(5)$$

where, if a chancellor-appointed VC is present, $P = 1$; if not, $P = 0$. We propose that the scores in equation (5) for the presence of chancellor-appointed personnel, such as x_{VC}, x_{PVC}, and x_{TR}, should be 10 each. Additionally, scores, or x_{FC}, x_{AC}, and x_S, range from 0 to 15, 0 to 25, and 0 to 30 for the Faculty Council (FC), Academic Council (AC), and Syndicate (S) meetings, respectively. The term "effective" here refers to the regular, active participation of stakeholders, the chancellor-appointed VC, and government-appointed staff when needed. The governing rules of the particular syndicate determine how frequently meetings are held; many require at least one annual general meeting, while others have extra requirements for more frequent meetings. We suggest holding one syndicate meeting every semester. During an academic year, the Academic Council will meet at least twice and as frequently as needed. Depending on the particular faculty and university, faculty council meetings can take place more or less frequently, but they usually take place once a month during the academic year.

Nepal, B. (2016) asserts that there is a strong linear correlation between an institution's infrastructure and learning outcomes. The physical setting that supports instruction and learning is known as adequate infrastructure facilities. Its effects include fostering academic inquiry, innovative ideas, and a positive learning environment through the use of contemporary classrooms, labs, libraries, and technological resources. It is necessary to specify and measure the score numerically for the infrastructure facilities (IF) that are achievable and required in Bangladesh. Higher education infrastructure comprises both digital (such as high-speed internet, e-learning systems that facilitate innovative forms of lifelong learning, and IT support) and physical (such as well-maintained buildings, state-of-the-art labs, libraries, sports facilities, and health-safety facilities) resources. These resources are essential for developing appropriate learning environments, assisting with research and teaching, improving the success of faculty and students, and cultivating a lively campus community. The following are the score of IF's constituent parts.

$$Score\ of\ Infrastructure\ Facilities = x_{IF} = \sum [x_{Physical} + x_{Digital}] \dots\dots\dots\dots\dots\dots\dots (6)$$

We suggest that the digital infrastructure score $x_{Digital}$ be on a scale of 0 to 30 and the physical infrastructure score $x_{Physical}$ be on a scale of 0 to 70.

Teacher-Student Ratio (TSR) is calculated by dividing the number of teachers at a particular level of education by the number of students at the same level. Student-teacher interaction and individualized attention are made possible by a manageable TSR. Better learning outcomes are a result of its impact, which enables teachers to effectively facilitate discussions, respond to the needs of each individual student, and give timely feedback. Actual and recommended TSR differ greatly by nation and even within different kinds of institutions, such as private versus public universities. According to a report (Alamgir, 2023) in Bangladesh, the TSR in some public universities can reach 1:42, which is significantly higher than the suggested ratio of 1:24 for general universities and 1:16 for universities that study science, engineering, and agriculture. More individualized attention and improved teacher-student interaction are necessary for higher quality education. Therefore, if a teacher could oversee a manageable number of students, the quality of education would be enhanced. For all programs in Bangladesh, we suggest an average TSR of 1:20. Therefore, in equation (7), 100 points in place of TSR correspond to a teacher-to-student ratio of 1:1 to 1:20. However, as shown in following equation (7), the TSR points drop if the number of students exceeds the suggested threshold. This can be computed in the following way:

$$Score\ of\ TSR = x_{TSR} = \begin{cases} 100, & if\ TSR = 1{:}1\ to\ 1{:}20 \\ \left(\frac{100}{N_i}\right) \times B, & if\ TSR = 1{:}N_i, \quad N_i > 20\ and\ N_i \in Z+ \end{cases} \dots (7)$$

If multiplication factor $B = 21$ then $x_{TSR} = 100$, but this is not reasonable. Therefore, "B" must be less than 21 or may be on a scale of 1 to 20. The accreditation body can determine this factor's numerical value.

The timely examination, results publication, and convocation, industry partnerships, community support, research funding, research paper publication, seminar symposium arrangements, and alumni engagement are examples of Internal and External Strengths (IES) that offer strenths, opportunities and resources. The institution's capacity to innovate, carry out significant research, offer hands-on experiences, and cultivate a broader network of support for its faculty and students is bolstered by these strengths. In response to the SMART framework, we take into consideration a few IES elements. Publication, Seminar-symposium, and Workshop (PSW), Research Facilities and Funding (RFF), Diverse Subject Offerings (DSO), Timely Examination-results and Convocation (ERC), and strong Community-Industry Partnerships (CIP) are examples of Internal and External Strengths (IES), which are elements that support institution's success. Assume that $x_{PSW}, x_{RFF}, x_{DSO}, x_{ERC}, and\ x_{CIP}$ are the respective scores for PSW, RFF, DSO, ERC, and CIP. The formula below, can be used to calculate the score x_{IES} of the IES.

$$Score\ of\ IES = x_{IES} = x_{\mathrm{PSW}} + x_{\mathrm{RFF}} + x_{\mathrm{DSO}} + x_{\mathrm{ERC}} + x_{\mathrm{CIP}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (8)$$

We suggest that the IES elements' scores be assigned on a scale of 0 to 20.

One can use equations (3) through (8) to calculate the numerical value of each accreditation criterion separately. These numbers can be entered into equation (2) to determine the accreditation's final score. In order to develop a strategy for achieving and maintaining accreditation, a SWOT analysis for accreditation comprises evaluating an

institution's internal strengths and weaknesses in addition to its external opportunities and threats. Enhancing the accreditation process and outcomes requires taking advantage of external trends, addressing issues such as insufficient teacher training, utilizing internal resources, and lowering risks from competitors or changing regulations.

Following evaluation by representatives of the accreditation body, the higher education institution may be given a score ranging from 0% to 100%. We suggest a failing score of 60% or less. B grades fall between 61% and 80%, while A grades fall between 81% and 100%. A self-evaluation must be carried out by the higher education institution itself. If the institute has any concerns about the external assessment, they can submit a self-evaluation to the accreditation body. To increase transparency for all parties involved, web-based tools can be employed.

We propose two accreditation license levels—Basic and Advance—to address the "time-bound-level-dependent" term. Certifications of “Basic Level” and “Advance Level” can be obtained by an institution after evaluation by the accreditation body. The duration of each of these accreditation licenses is five years. The evaluation for basic-level accreditation requires five years of experience operating as a higher education institution. For the final level of accreditation evaluation, a basic-level accreditation license, a permanent license from government authorities as a higher education institution following transfer to a permanent establishment, and ten years of successful operation as a higher education institution are required. If higher education institutions are prepared to meet the accreditation requirements, they may submit an application for the basic level certificate to the accreditation body first. The prerequisites and threshold value for "Basic Level" and "Advance Level" accreditation licenses are explained in Table 1.

TABLE 1 AN EXPLANATION OF THE PREREQUISITES AND THRESHOLD VALUE FOR ACCREDITATION LICENSES.

SR	Accreditation Licenses		An explanation of the requirements for accreditation licenses	Threshold value
1	“Basic Level” license	1.	Have more than five years of successful operations?	Yes
		2.	Total scores in percentage.	≥ 60% ≥ 50%
		3.	Individual scores for each criterion.	
2	“Advance Level” license	1.	Is the institution licensed for "basic-level" accreditation?	Yes
		2.	Does it hold a permanent license from government authorities as a higher education institution?	Yes
		3.	Have more than ten years of successful operations?	Yes
		4.	Total scores in percentage.	≥ 80%
		5.	Individual scores for each criterion.	≥ 70%

3. Result of QAAF

Here, our objective is to ensure that the proposed QAAF framework is stable, reliable, and appropriate for its intended use. Thus, we conducted a survey and gathered information from a university's website portal. For the time being, the name of this university is kept confidential. The accreditation criteria, the criteria-based questionnaire, and the responses to the questionnaire are shown in Table 2's first, second, and third columns, respectively. The QAAF framework's equations (3) through (8) use the responses in the third column to calculate the criteria-based final earned score, which is displayed in the fifth column of Table 2. As can be seen in the final row of Table 2, equation (2) is utilized to determine the final score of 45%. The final score of 45%, as determined in Table 2, shows that the evaluating institution does not obtain any accreditation license in accordance with the criteria listed in Table 1.

TABLE 2 THE REQUIREMENTS FOR ACCREDITATION, THE CRITERIA-BASED SURVEY, THE QUESTIONNAIRE ANSWERS, AND THE OBTAINED SCORES.

Criteria	Questions for the QAAF framework	Answer*	QAAF framework	Earned Score
TQE	How many qualified and effective teachers are needed?	190		20
	How many qualified and effective teachers are present?	20	Eq. (3)	
C	How many programs have been approved overall?	11		80
	Total number of curriculums that have been approved?	11	Eq. (4)	
UG	1. Is the chancellor-appointed VC present?	Yes		85
	2. Is the chancellor-appointed Pro-VC present?	Yes		
	3. Is the chancellor's appointed treasurer present?	Yes	Eq. (5)	
	4. Is the Academic Council (AC) meeting productive?	Yes		
	5. Is the Faculty Council (FC) meeting productive?	No		
	6. Is the Syndicate (S) meeting effective?	Yes		

IF	Score each of the following from 0 to 10. – high-speed internet. – e-learning that facilitate lifelong learning. – the availability of IT support. – the buildings' level of maintenance. – cutting-edge labs. – state-of-the-art libraries. – sports facilities. – health-safety facilities. – permanent establishment. – emergency services.	 8 2 2 6 2 2 1 5 0 0	Eq. (6)	30
TSR	Total number of students enrolled? Total number of teacher?	4000 50	Eq. (7)	13
IES	Score each of the following from 0 to 20. – diverse subject offerings (DSO). – research facilities and funding (RFF). – publication, seminar, and workshop (PSW). – timely examination-results-convocation (ERC). – community-industry partnerships (CIP).	 10 5 5 10 10	Eq. (8)	40
Total score in %	$Score\ in\ \% = \frac{(x_{TQE} + x_C + x_{UG} + x_{IF} + x_{TSR} + x_{IES})f}{Maximum\ possible\ score\ (600)} \times 100$ $= \frac{(20 + 80 + 85 + 30 + 13 + 40)1}{600} \times 100 = \frac{268}{600} \times 100$			45% (There is IQAC)

* Answer from a university's website in Barishal.

4. Open Educational Resources (OERs)

Open Educational Resources (OERs) are teaching, learning, and research materials that should be freely available to everyone, according to UNESCO (2024). In response to OERs of UNESCO, we created a digital platform at https://bloomschecker.ugv.edu.bd/index.php that interprets the various learning levels using Bloom's taxonomy (Ahmed et al., 2025). A new platform for the institutional Quality Assurance Assessment Framework (QAAF) for accreditation is being developed here as an addition to that strategy. Everyone will be able to use this platform. Both institutional quality control and accreditation evaluation will benefit from this tool. Fig. 1 displays the flowchart diagram for our attempt to use the QAAF framework in computer programming on the webpage. Usually used by managers and analysts, a system flowchart illustrates the data and process flow throughout a system, including its inputs, outputs, and overall workflow. A program flowchart, on the other hand, serves as a roadmap for programmers as they plan and write code by showing the precise order of operations and logical steps inside a single computer program. This is a diverse approach to learning as well. The implementation of diverse learning approaches that facilitate lifelong learning can help faculty members better understand the university's accepted norms and values, negotiate flexible schedules and appropriate learning modes with their department administrators, and place their learning needs along the various lifelong learning modes (Owusu-Agyeman, 2024).

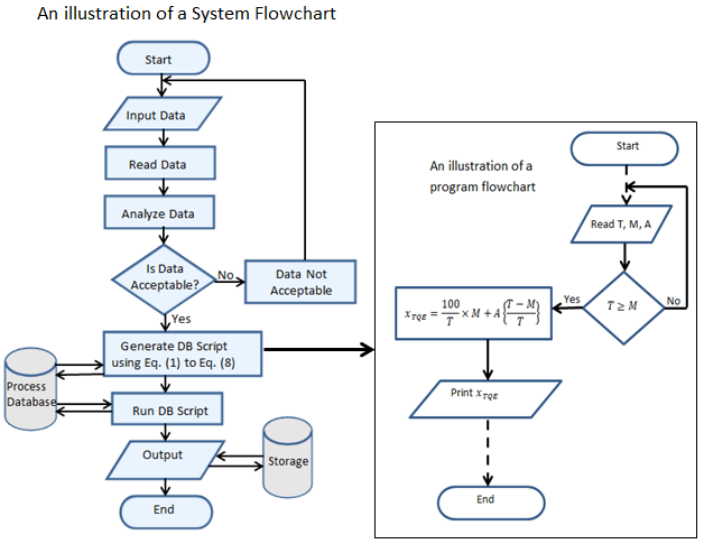


Fig.1 An illustration of a system flowchart and program flowchart.

5. Discussion

As part of the higher education accreditation process, independent organizations assess institutions according to quality standards to ensure academic credibility and excellence. For this reason, we aim to develop a timely, widely recognized, comprehensible, and accurate framework for self-assessment that educational institutions can utilize to enhance their quality. Additionally, this framework can be used to assess institutions and grant accreditation for licenses by an unbiased accrediting body. Mathematics was used to create the current framework for institutional accreditation and quality assurance. Some studies (Doran, 1981; Ahmed et al., 2025) claim that SMART principles can improve the effectiveness of the framework. As a result, we developed the framework using this principle. This new framework reflects the paradigmatic principles used in the evaluation of the educational core values. The Bangladesh Accreditation Council (Accreditation Rules, 2022; BAC Act (No. IX of 2017), 2021; IQAC Operations Manual, 2015), the National Assessment and Accreditation Council (NAAC) of India (Pabrekar, 2015), and other accreditation criteria are used to parameterize equations (1) through (8) of the QAAF framework. We highlight how this framework can support the quality assurance evaluation needed for higher education institutions to receive accreditation. We create computer code using mathematical equations (1) through (8) in order to create a web-based system that will be accessible to all parties worldwide. We used the new QAAF framework for a university's quality assurance and accreditation process to test the accuracy. According to our findings, the QAAF framework is fully capable of meeting the demands of quality assurance and accreditation in the twenty-first century. Here, we employ this framework for accreditation and institutional quality assurance. It can be used for program or departmental quality assurance and accreditation if desired.

6. Conclusion

Accurate evaluations of institutions are essential for accreditation and institutional quality assurance. This calls for a stringent assessment framework to be used by an independent body. To evaluate academic institutions for accreditation and quality control, we develop a rigorous mathematical QAAF framework. This framework was used to analyze information obtained from an unidentified university's website portal. The outcome matches what we had anticipated. The framework can be used to evaluate a university's strengths and weaknesses before moving forward with accreditation. Furthermore, we would like to perform this important assessment of academic institutions using cutting-edge computer analysis and information technology. This will undoubtedly contribute to improve the real quality of education. In light of UNESCO's Open Educational Resources concept, we suggest a digital platform to make this framework accessible to all people worldwide. As we all desire, this will guarantee accountability and transparency for all stakeholders in order to maintain institutional standards and recognition. In developing countries like Bangladesh, where the accreditation process is still relatively new and facing transitional challenges, this QAAF framework would be a useful tool to implement accreditation in all higher education institutions.

Acknowledgements

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A Survey on the Proposed AMIC Accreditation Services (AAS): Member Responses and Moving Forward

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Abstract
The Asian Media Information and Communication Centre (AMIC) has initiated the development of the AMIC Accreditation Service (AAS) to address the absence of a regionally grounded accreditation system for journalism and communication education in Asia. This paper presents the findings of a regional survey conducted from August to September 2025 involving 30 stakeholders across Asia. The survey explored perceptions of accreditation, expectations from AAS, and key considerations for its implementation. Results indicate strong support for accreditation, preference for a cost-effective and simplified process, and a clear demand for an Asian-centered framework that balances global standards with regional realities. Respondents emphasized credibility, qualified accreditors, and continuous improvement rather than compliance-driven evaluation. The study concludes by outlining strategic directions for AAS, including participatory framework development, hybrid accreditation models, and capacity-building initiatives. The findings reinforce the importance of collaborative, context-sensitive accreditation systems in strengthening journalism and communication education in the region.

***Keywords**:* Accreditation in Higher Education, Journalism and Communication Education, Quality Assurance in Asia, AMIC Accreditation Service (AAS), Regional Accreditation Frameworks, Stakeholder Perceptions and Survey Analysis

1. Introduction

Accreditation has long been recognized as a critical mechanism for ensuring quality assurance, accountability, and continuous improvement in higher education (Eaton, 2012; Harvey & Green, 1993). In disciplines such as business and engineering, well-established accreditation systems have created global benchmarks for institutional excellence and professional mobility. However, in journalism, media, and communication education—particularly within Asia—there remains a notable absence of a regionally grounded accreditation framework that reflects both global standards and local realities.

The Asian Media Information and Communication Centre (AMIC) provides an important institutional foundation for addressing this gap. Established in 1971 and based in Manila, Philippines, AMIC is an international, non-profit, non-government organization that serves as a regional research and resource hub for media and communication development in the Asia-Pacific. AMIC was founded with the objective of promoting ethical and socially responsible media systems that support democratic participation and development. Over more than five decades, it has evolved into a key platform for advancing communication research, education, and professional practice across Asia. Its work spans multiple domains: as a research centre examining critical media issues, as a resource centre providing training and capacity-building programs, and as a convenor that brings together academia, industry, government, and civil society to foster dialogue and collaboration. The organization envisions itself as a premier Asia-centered institution for media and communication education, research, and professional development. Its mission emphasizes nurturing research, facilitating knowledge exchange, and strengthening capacity-building initiatives while promoting communication models that reflect distinct Asian perspectives alongside global frameworks.

Within this context, the AMIC Accreditation Service (AAS) emerged as a strategic initiative to address the lack of a credible, regionally relevant accreditation system for journalism and communication programs in Asia. Initiated in June 2025 under the leadership of AMIC Secretary General Ramon Tuazon, the AAS seeks to develop an accreditation framework that is inclusive, development-oriented, and reflective of Asian contexts while maintaining alignment with international standards of academic and professional excellence. To operationalize this vision, AMIC established a Technical Working Group (TWG) composed of academic leaders and industry

practitioners. The TWG was tasked with conceptualizing the accreditation framework, ensuring that it bridges theory and practice—an approach consistent with AMIC's long-standing institutional philosophy. As part of a consultative and participatory process, a regional survey was conducted among stakeholders to gather insights, expectations, and recommendations for the proposed AAS. This paper presents the findings of that survey and discusses their implications for the development and future direction of the AMIC Accreditation Service.

2. Study Objectives

This study aims to:

1. Assess stakeholder awareness and perceptions of accreditation in journalism and communication education.
2. Examine the level of support for the proposed AMIC Accreditation Service.
3. Identify key expectations regarding the structure, cost, and implementation of AAS.
4. Analyze stakeholder recommendations for ensuring credibility, relevance, and sustainability.
5. Provide strategic directions for the development and operationalization of AAS.

3. Study Framework

The study is anchored on a participatory and developmental accreditation framework, which emphasizes:

- Quality Assurance and Continuous Improvement: Accreditation as an ongoing process rather than a one-time evaluation.
- Contextual Relevance: Incorporating Asian media systems, cultural values, and institutional realities.
- Stakeholder Engagement: Inclusion of academics, practitioners, and institutions in shaping standards.
- Accessibility and Equity: Ensuring affordability and inclusivity, particularly for smaller institutions.
- Global Alignment with Regional Adaptation: Balancing international benchmarks with local needs.

This framework aligns with AMIC's broader mission of fostering collaboration, capacity-building, and academic excellence in media and communication education.

4. Methodology

The study employed a descriptive survey design. Data were collected through an online questionnaire administered from August to September 2025.

4.1 Participants

A total of 30 respondents participated, representing diverse geographic and institutional backgrounds:

- Countries: Bangladesh, Philippines, India, Malaysia, Indonesia, Kazakhstan, Sri Lanka, Thailand, Bhutan, Fiji, and Turkey.
- Institutions: Public universities (50%), private universities (33%), institutes, and training centers.

4.2 Data Collection

The survey included both quantitative and qualitative items, covering:

- Awareness and perceptions of accreditation
- Institutional profiles and program offerings
- Preferences for accreditation models and costs
- Expectations and recommendations for AAS

4.3 Data Analysis

Quantitative data were analyzed using descriptive statistics (frequencies and percentages), while qualitative responses were thematically analyzed to identify recurring patterns and insights.

5. Findings from Quantitative Responses

5.1 Awareness and Perceived Importance of Accreditation

The survey revealed that 86.7% of respondents were either very or somewhat familiar with accreditation. Similarly, 86.7% considered accreditation important to very important, underscoring strong recognition of its value in ensuring quality and credibility.

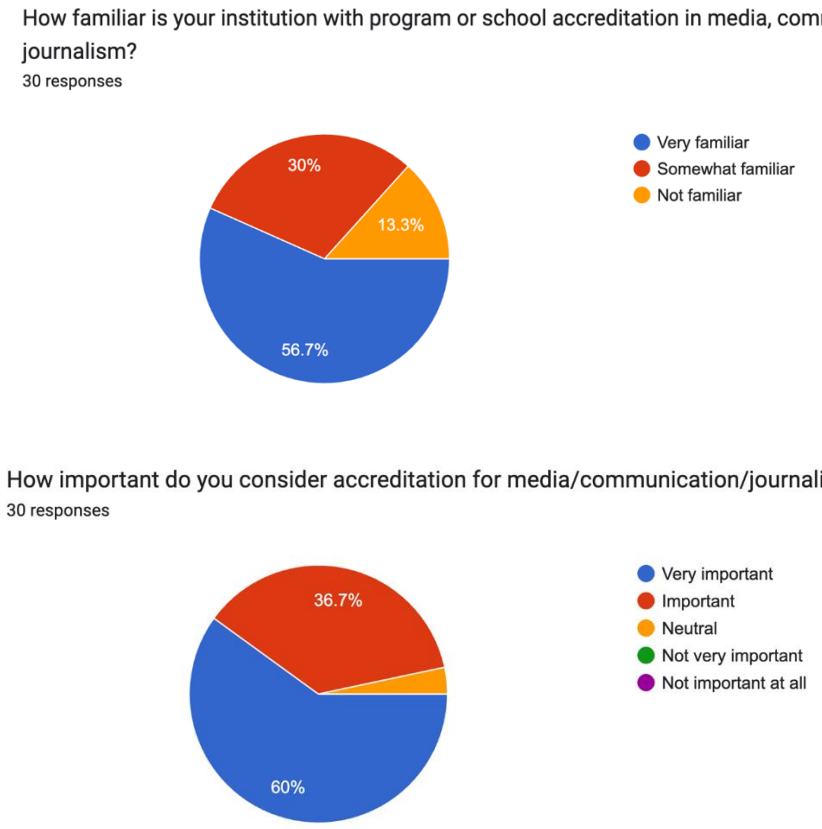


Fig. 1 Awareness about accreditation

5.2 Institutional Readiness and Diversity

Most institutions offered undergraduate and postgraduate programs, with 70% offering bachelor's and master's programs, and nearly half offering PhDs. Notably, 76.6% of institutions had 500 students or fewer, highlighting the need for scalable and accessible accreditation systems.

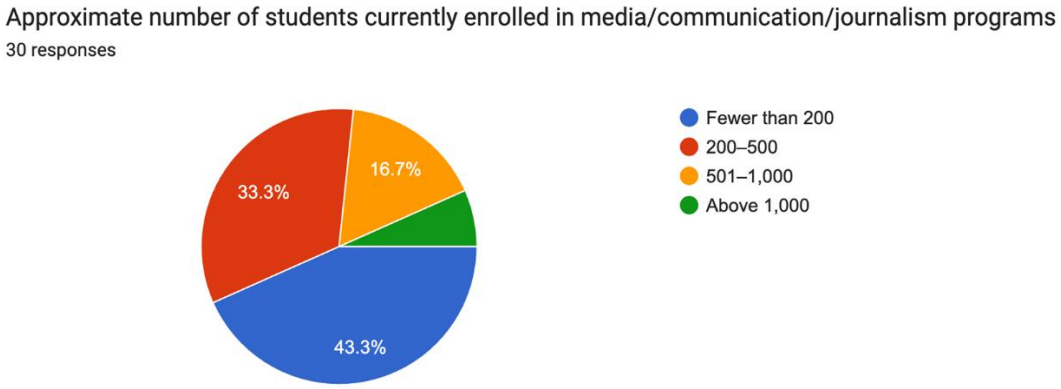


Fig. 2 Number of students enrolled in media/communication/journalism programs

5.3 Preference for Accreditation Models

About 70% of respondents supported either mission-driven or principle-based accreditation, suggesting openness to flexible frameworks that accommodate institutional diversity.

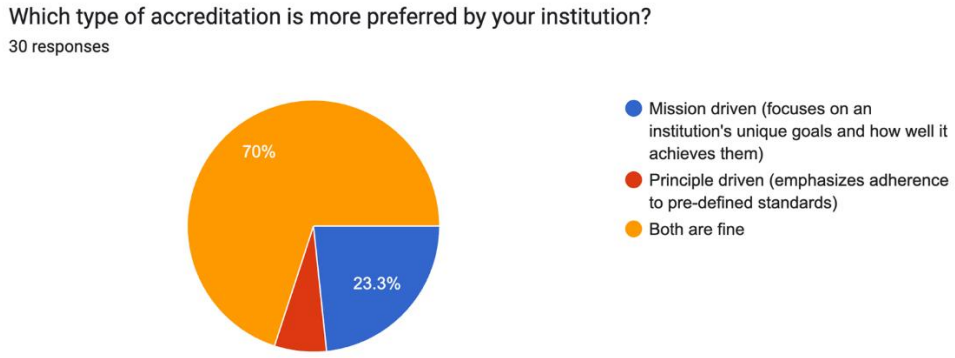


Fig. 3 Preference for accreditation models

5.4 Cost Sensitivity and Accessibility

Cost emerged as a critical factor:

- 46.7% preferred accreditation fees below USD 1,000
- 63.3% preferred annual fees of USD 300 or less

These findings emphasize the importance of affordability, especially for institutions in developing contexts.

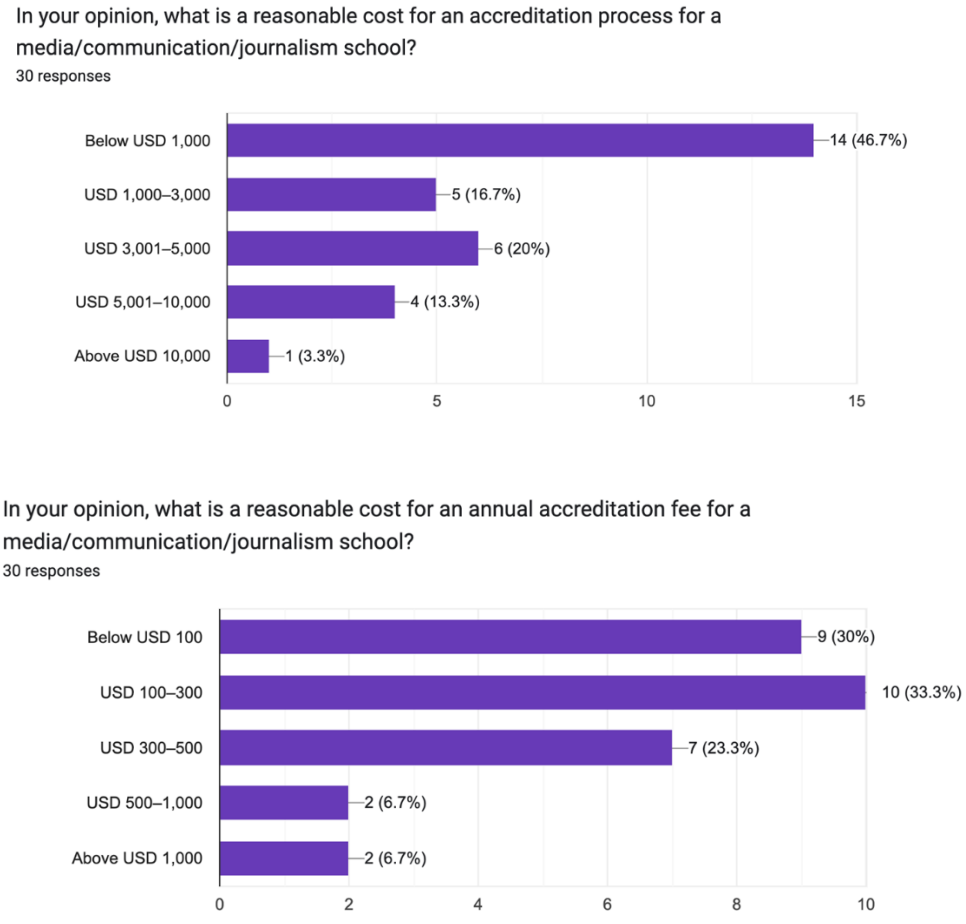


Fig. 4 Cost and annual fee preferences

5.5 Credibility of AMIC

A strong majority (73.3%) considered AMIC credible as an accrediting body, with an additional 20% somewhat agreeing. However, qualitative responses indicated the need for AMIC to further establish authority and visibility.

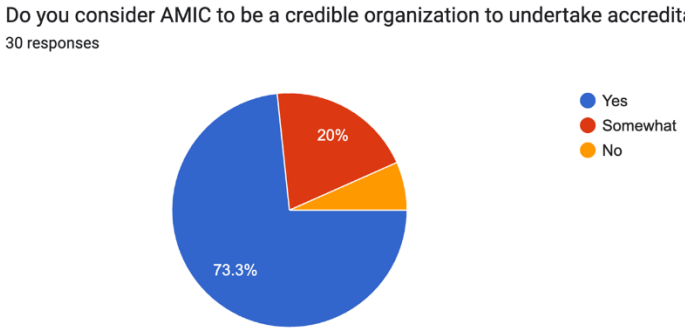


Fig. 5 Credibility of AMIC

5.6 Preference for Accreditation Modes

Approximately 80% of respondents supported hybrid accreditation, combining online and onsite evaluation. This reflects both technological adaptability and cost-efficiency considerations.

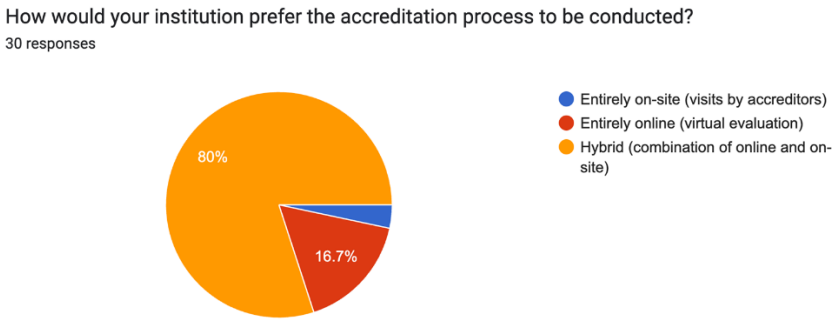


Fig. Accreditation mode preference

6. Key Themes from Qualitative Responses

a. Simplicity and Efficiency

Respondents emphasized the need for a streamlined accreditation process, avoiding excessive paperwork and administrative burden.

b. Asian-Centered Framework

There was a strong call for incorporating Asian perspectives, media systems, and values, ensuring contextual relevance.

c. Capacity Building and Support

Stakeholders highlighted the importance of guidance, training, and "handholding", especially for newer or resource-constrained institutions.

d. Qualified Accreditors

The credibility of AAS depends on the expertise and reputation of accreditors, including both academics and practitioners.

e. Continuous Improvement Orientation

Respondents stressed that accreditation should be developmental rather than compliance-driven, fostering long-term institutional growth.

f. Transparency and Collaboration

Suggestions included sharing evaluation reports, developing clear manuals, and engaging stakeholders in ongoing dialogue.

7. Conclusion

The survey findings demonstrate strong regional support for the establishment of the AMIC Accreditation Service. Stakeholders recognize accreditation as essential for enhancing quality, credibility, and global competitiveness in journalism and communication education.

However, the success of AAS will depend on its ability to address key expectations: affordability, simplicity, credibility, and contextual relevance. The preference for hybrid models and continuous improvement frameworks indicates a shift toward more flexible and developmental approaches to accreditation.

Moving forward, AMIC should focus on:

i. Developing a consultative and transparent accreditation framework
ii. Ensuring affordability and accessibility for diverse institutions
iii. Strengthening institutional credibility through qualified accreditors
iv. Promoting capacity-building and stakeholder engagement
v. Embedding Asian perspectives within globally aligned standards

By doing so, AAS has the potential to fill a critical gap in the region and become a transformative force in advancing media, journalism, and communication education across Asia.

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Governance–Capacity Decoupling in IQAC Implementation: A Systematic Literature Review of Post-2000 Private Universities in Bangladesh

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Abstract
This study examines the structural dynamics shaping the implementation of Institutional Quality Assurance Cells (IQAC) in private universities in Bangladesh established after 2000. Despite formal adoption within national quality assurance frameworks, implementation outcomes remain inconsistent and largely symbolic. Existing research has identified operational challenges but lacks a theoretically grounded explanation for persistent policy–practice gaps. Drawing on a PRISMA-guided systematic literature review of 34 peer-reviewed articles, policy documents, and institutional reports published between 2005 and 2025, this study employs thematic synthesis to analyze recurring patterns across governance structures, administrative capacity, financial dependency, and technological infrastructure. The findings reveal that IQAC implementation is constrained by interdependent structural factors, including tuition-driven financial models, excessive faculty workload, weak ICT systems, limited professional development, and fragmented governance arrangements. These constraints collectively produce a condition conceptualized as governance–capacity decoupling, whereby institutions achieve formal regulatory compliance without substantive transformation. Grounded in Institutional Theory and Resource Dependency Theory, this study develops a Governance–Capacity Decoupling Framework to explain how external regulatory pressures interact with internal capacity limitations. The study contributes to higher education governance literature by reconceptualizing institutional decoupling as a capacity-contingent phenomenon in resource-constrained contexts. Policy implications emphasize capacity strengthening, governance alignment, and sustainable financing for effective quality assurance implementation.

Keywords: IQAC; Governance–Capacity Decoupling; Administrative Capacity; Higher Education; Bangladesh; Quality Assurance; Institutional Theory

1. Introduction

1.1 Background

Quality assurance (QA) has emerged as a central mechanism for ensuring accountability, transparency, and continuous improvement in higher education systems worldwide. Universities are increasingly required to demonstrate measurable learning outcomes, institutional effectiveness, and governance performance. In developing countries, QA systems are often introduced through regulatory reforms aimed at aligning higher education with global standards.

In Bangladesh, the Institutional Quality Assurance Cell (IQAC) was introduced as part of a broader national quality assurance agenda aligned with accreditation systems and qualifications frameworks. The initiative aims to institutionalize internal quality assurance mechanisms and promote outcome-based education practices. However, despite widespread adoption, implementation outcomes remain uneven—particularly in private universities established after 2000.

1.2 Problem Statement

Private universities established after 2000 operate under distinct structural constraints, including heavy reliance on tuition fees, high teaching workloads, limited administrative capacity, and underdeveloped technological infrastructure. Consequently, a persistent gap emerges between formal policy adoption and actual implementation practices.

1.3 Research Gap

Existing studies primarily focus on operational challenges and descriptive policy analysis but lack a theoretically grounded explanation for persistent implementation failure.

1.4 Research Question
Why do formally adopted IQAC systems fail to produce substantive quality improvement in resource-constrained private universities in Bangladesh?

1.5 Research Objective
The study aims to develop a theoretically grounded explanation of IQAC implementation dynamics through systematic synthesis of existing literature.

2. Methodology

2.1 Research Design
This study adopts a PRISMA-guided systematic literature review combined with thematic synthesis. This approach ensures transparency in study selection while enabling theory development.

2.2 Data Sources
Literature was systematically collected from Scopus, Web of Science and ERIC. Supplementary sources included national policy documents, accreditation guidelines, and institutional reports.

2.3 Inclusion Criteria
Studies were included if they:

- were published between 2005 and 2025
- were peer-reviewed articles or official reports
- addressed higher education quality assurance
- focused on developing or resource-constrained contexts

2.4 Quality Assessment
A structured quality appraisal approach was applied to ensure methodological rigor. Studies were evaluated based on clarity, methodological validity, and relevance.

2.5 Search Strategy
Search terms included combinations of:

- "IQAC implementation Bangladesh"
- "Higher education quality assurance"
- "University governance"
- "Administrative capacity higher education"
- "Outcome-based education (OBE)"

2.6 PRISMA Screening Process
The study selection process followed a PRISMA-informed protocol. The screening stages and study selection process are presented in Figure 1, while the characteristics of the included studies are summarized in Table 1.

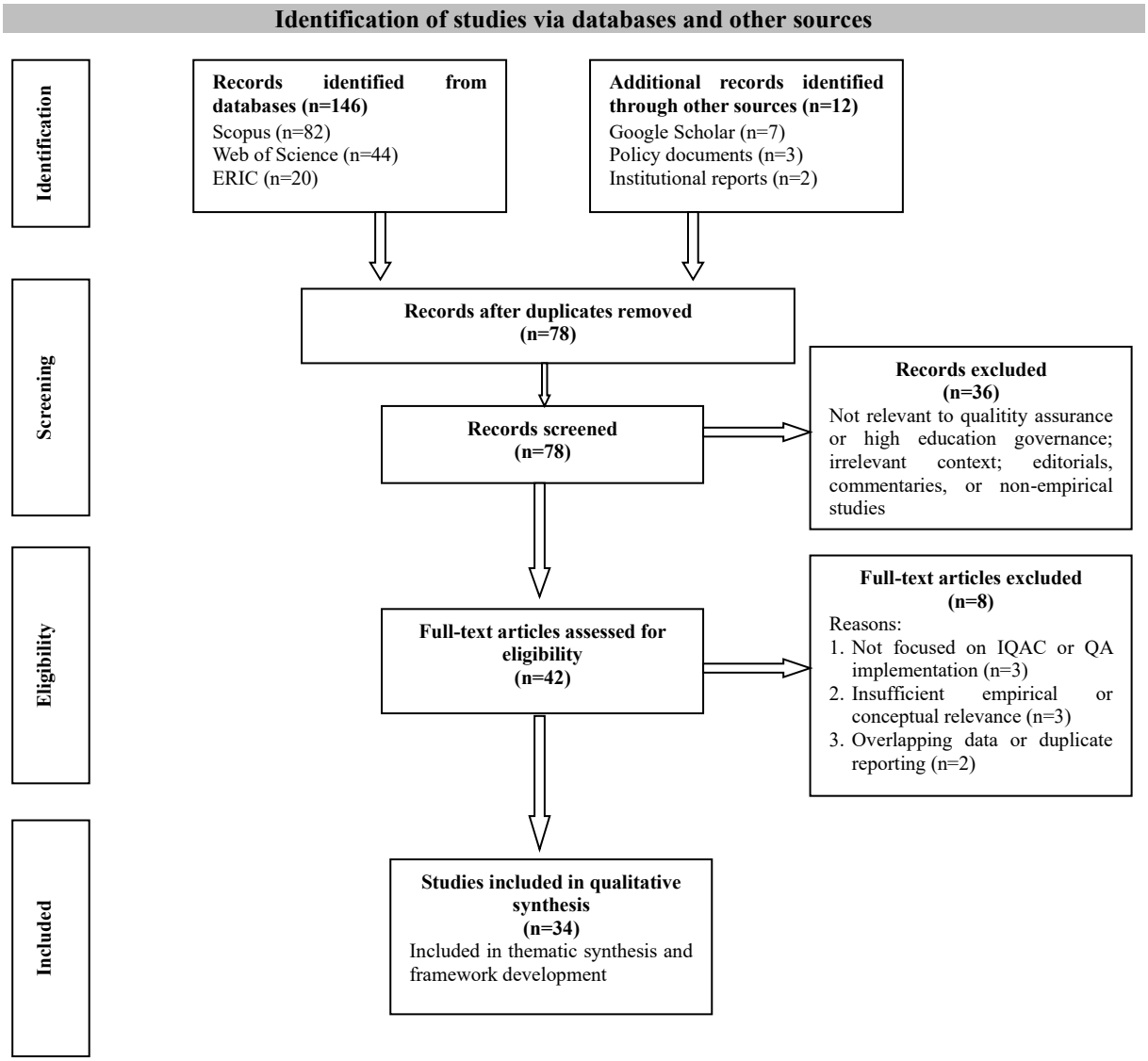


Fig.1 PRISMA flow diagram of study selection process.

The PRISMA flow diagram illustrates the systematic study selection process. A total of 158 records were initially identified from major academic databases and supplementary sources. After removing 80 duplicate records, 78 studies remained for title and abstract screening. Following the exclusion of 36 irrelevant or non-empirical studies, 42 full-text articles were assessed for eligibility. Finally, 34 studies met the inclusion criteria and were incorporated into the thematic synthesis and framework development.

TABLE 1. SUMMARY OF CHARACTERISTICS AND KEY FINDINGS OF INCLUDED STUDIES.

Author(s)	Year	Context	Study Type	Focus Area	Key Findings
Ahmed & Hossain	2020	Bangladesh	Empirical	QA practices	Weak institutional QA implementation
Aminuzzaman	2011	Bangladesh	Conceptual	QA policy	Persistent policy–practice gap
Asma & Rahman	2019	Bangladesh	Case study	IQAC	Structural implementation barriers
Beerkens	2015	Global	Review	QA systems	Shift toward accountability-based QA
Bhuiyan	2018	Bangladesh	Qualitative	Governance	Fragmented governance structures
Blackmur	2008	Global	Critical review	QA	Compliance-driven QA systems
Chowdhury	2019	Bangladesh	Empirical	OBE	Implementation challenges

Deem et al.	2007	Global	Theoretical	Managerialism	QA linked to control and audit culture
Elassy	2018	Global	Conceptual	QA concepts	Distinction between QA and enhancement
Harvey & Green	1993	Global	Conceptual	Quality theory	Multiple definitions of quality
Islam & Haque	2021	Bangladesh	Empirical	ICT	Low institutional ICT readiness
Khan & Rahman	2020	Bangladesh	Survey	Workload	Faculty workload limits QA
Kis	2005	OECD	Policy review	QA	Need for institutional capacity
Mahmud & Das	2022	Developing	Comparative	Capacity	Administrative limitations
Marginson	2016	Global	Theoretical	HE system	Global pressure on QA systems
Martin & Stella	2007	Global	Policy	Accreditation	External QA significance
Meyer & Rowan	1977	Global	Theory	Institutional theory	Decoupling concept
Mintzberg	1983	Global	Theory	Organization	Governance structure importance
Mok	2010	Asia	Comparative	QA	Globalization impact
Newton	2002	UK	Case study	QA barriers	Organizational resistance
Pfeffer & Salancik	1978	Global	Theory	Resource dependency	External constraints
Rahman	2021	Bangladesh	Empirical	Governance	Weak accountability
Rahnuma	2020	Bangladesh	Review	QA context	Implementation gaps
Sanyal & Martin	2007	Global	Policy	QA	Accreditation frameworks
Shah & Nair	2013	Global	Empirical	QA audit	External pressure influence
Tam	2001	Global	Conceptual	QA measurement	Measurement complexity
Trow	2006	Global	Theory	HE expansion	Massification challenges
UGC	2018	Bangladesh	Policy	IQAC	Operational guidelines
UGC	2021	Bangladesh	Report	QA	Limited progress
BAC	2020	Bangladesh	Policy	Accreditation	Standardization
BNQF	2021	Bangladesh	Policy	Qualification	Framework alignment
World Bank	2019	Bangladesh	Report	HE quality	Structural constraints
Yusuf &Alam	2020	Developing	Empirical	QA	Resource limitations
Zubair & Karim	2022	Bangladesh	Empirical	Capacity	Governance–capacity linkage

2.7 Data Analysis

A three-stage thematic synthesis was conducted:

1. Open coding
2. Axial coding
3. Selective coding

The analysis focused on:

- governance structure
- administrative capacity
- financial dependency
- ICT infrastructure
- policy–practice gap mechanisms

3. Theoretical Framework

3.1 Institutional Theory

Institutional Theory explains how organizations adopt formal structures to gain legitimacy within their institutional environment. Such adoption often results in decoupling, where formal compliance exists without corresponding changes in actual practices.

3.2 Resource Dependency Theory

Resource Dependency Theory posits that organizational behavior is shaped by external resource constraints. In higher education, financial limitations, infrastructural deficits, and human resource shortages significantly influence institutional capacity.

3.3 Integrative Perspective
This study integrates both perspectives to argue that institutional pressures drive formal adoption, while resource constraints limit implementation, producing governance–capacity decoupling.

4. LITERATURE REVIEW SYNTHESIS

4.1 Quality Assurance in Higher Education
Quality assurance has evolved from compliance-oriented systems to continuous improvement models. However, effective implementation depends on institutional readiness, governance capacity, and organizational culture.

4.2 IQAC Implementation Challenges
Studies consistently highlight that IQAC systems require strong leadership, integrated data systems and institutional commitment. In developing contexts, structural constraints often limit implementation.

4.3 Administrative Capacity Constraints
Across the reviewed literature, administrative capacity emerges as a critical constraint, characterized by high faculty workload, limited financial resources, inadequate QA training and weak organizational coordination.

4.4 Governance Limitations
Governance structures in many private universities are fragmented. IQAC roles are frequently assigned as additional responsibilities rather than institutionalized positions, resulting in weak accountability and coordination.

5. CONCEPTUAL FRAMEWORK

The Governance–Capacity Decoupling Framework conceptualizes IQAC implementation as a multi-stage process. External regulatory pressure acts as the primary input, while administrative capacity, financial dependency, governance structure, and ICT infrastructure function as mediating factors. These mediators interact to generate a core mechanism termed governance–capacity decoupling, which results in symbolic compliance and limited substantive implementation

6. FINDINGS: MECHANISM OF DECOUPLING

The synthesis identifies four interrelated mechanisms:

6.1 Workload–Policy Conflict
Increased QA requirements add administrative burden, reducing faculty engagement in meaningful quality processes.

6.2 Financial Constraint Mechanism
Dependence on tuition revenue restricts investment in QA systems and infrastructure.

6.3 ICT Deficiency Mechanism
Weak digital infrastructure limits data-driven monitoring and continuous improvement processes.

6.4 Governance Fragmentation Mechanism
Overlapping regulatory frameworks create ambiguity and reduce institutional coherence.

Core Insight
These constraints collectively produce Governance–Capacity Decoupling, where formal adoption of IQAC does not translate into effective implementation.

7. DISCUSSION

These findings provide empirical support for institutional theory by demonstrating how legitimacy-driven compliance leads to symbolic adoption, while resource dependency constraints limit substantive implementation. This results in:

✓ Symbolic compliance
✓ Weak feedback systems
✓ Limited institutional learning

Unlike quality assurance systems in OECD contexts, where institutional autonomy and administrative capacity often facilitate continuous improvement, the findings of this study suggest that resource-constrained environments fundamentally reshape the operational logic of quality assurance implementation. In such contexts, compliance-oriented behavior emerges not merely from institutional resistance but from structural limitations embedded within governance and financing systems.

The study reconceptualizes decoupling as a capacity-contingent phenomenon, emphasizing the role of resource constraints in shaping institutional behavior.

8. THEORETICAL CONTRIBUTION

This study makes three key contributions:

✓ Reconceptualizes institutional decoupling within higher education QA systems
✓ Integrates Institutional Theory with Resource Dependency Theory
✓ Introduces a Governance–Capacity Decoupling Framework applicable to resource-constrained contexts

9. POLICY IMPLICATIONS

The study suggests:

✓ Institutionalization of dedicated IQAC leadership roles
✓ Investment in integrated digital QA systems
✓ Rationalization for faculty workload
✓ Development of sustainable QA financing models
✓ Alignment of regulatory framework
✓ Continuous QA and OBE training programs

10. LIMITATIONS

This study has several limitations. First, the analysis relies on secondary data, which may introduce publication bias. Second, the study focuses primarily on Bangladesh, limiting generalizability to other contexts. Third, the absence of quantitative meta-analysis restricts the ability to assess statistical relationships among variables.

11. CONCLUSION

IQAC implementation in post-2000 private universities in Bangladesh is shaped by structural constraints that produce governance–capacity decoupling. Addressing these constraints requires coordinated efforts to strengthen administrative capacity, align governance structures, and ensure sustainable resource allocation. Without such reforms, quality assurance systems risk remaining symbolic rather than transformative.

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Bridging the Gap Between Ethical Beliefs and AI Usage: A Study on Academic Integrity and Disclosure in Higher Education

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Abstract
The integration of AI tools has significantly transformed every sector of education, such as research, analysis, and implementation of complex research topics. Although students rely on generative AI, a mismatch has been found between ethical beliefs and their activity in using AI. This study shows this gap using primary data collected from 82 undergraduate students. This analysis shows the student use of AI, their beliefs about academic misconduct and whether they will disclose the AI assistance or not. Results show that students believe undisclosed AI is unethical, but they engaged in such activities. Based on these findings, this paper presents AI disclosure to ensure transparency. This study contributes to understanding student behaviour using AI assistant tools and a policy-level framework to counter this problem.

Keywords*:* Academic Integrity, Artificial Intelligence, AI Disclosure, Higher Education, Student, Behaviour, Ethics.

1. Introduction

The adoption of AI has completely changed the sector of higher education. Tools like ChatGPT, Gemini, and Claude help students in every aspect of the education sector, like writing, coding, and many more. But the fact that teachers are facing challenges in detecting whether the assignments, exams, and others are done by humans(students) or generated by AI.

A traditional plagiarism detector cannot detect AI-detected content, and other AI-detected software cannot detect it. As a result institution and teachers face challenges to evaluate students' assignments. While students acknowledge that unethical use should be stopped, their action differs from their acknowledgement.

The study shows how contradictory students' beliefs and action in terms of AI usage. The research addresses:

(i) AI usage patterns among students
(ii) Ethical perception of AI use
(iii) The mismatch between beliefs and action
(iv) Willingness to disclose AI usage

2. Literature Review

The rapid usage of AI introduced new academic integrity challenges. AI tools enable students to learn content in a personalised way, but the challenge is to detect genuine authorship and originality of content [1],[2]. Existing Detection-based approaches remain unreliable and face inaccuracies [6]. This problem can be countered by evolving toward ethical frameworks.

Research indicates an inconsistency between students' ethical perceptions and actual behaviours. While many students acknowledge that using AI is unethical, a significant portion engage in such activities [3][5]. Studies also show that ethical education can improve responsible AI usage [4].

Many policymakers suggest transparency-based approaches in AI usage disclosure. An AI disclosure system can be more effective for evaluation compared to detection alone [6].

However, clear guidelines are still unavailable, which creates ambiguity among students [7]. This research shows a critical gap between ethical beliefs and actual AI usage behaviour, and AI usage disclosure can be a potential solution to this problem. So, this study addresses the disclosure framework.

3. Methodology

3.1 Data Collection

A structured online survey has been conducted via Google Forms among undergraduate students. Using the convenience sampling technique, a total of 82 valid responses were collected.

3.2 Data Analysis Techniques

The study used a combination of descriptive and inferential statistical techniques to analyse data and test the proposed hypotheses.

3.3 Questionnaire Design

The questions asked on Google forms designed to understand academic integrity and AI usage, which covered multiple sections.

(i) Demographic Information (ii) AI usage frequency (iii) Ethical Beliefs (iv) Academic pressure (v) Intended and actual disclosure behaviour (vi) Attitudes toward AI disclosure policies

3.4 Data Preprocessing

The collected data were cleaned to ensure accuracy. Incomplete responses were removed to maintain consistency. Categorial variables were encoded into numerical formats for statistical analysis.

3.5 Hypothesis development

H1: Ethical score significantly impacts Actual Disclosure behaviour.
H2: Academic Pressure is significantly connected with the Ethical score.
H3: Intended disclosure behaviour is significantly associated with Actual Disclosure Behaviour.
H4:AI Diclosure Policy Impacts Actual Disclosure Behaviour.

3.6 Model specification

A logistic regression model was used.

$$P(Disclosure) = 1 \,/\, (1 + \exp(-(\beta 0 + \beta 1 * Ethics + \beta 2 * Pressure + \beta 3 * PolicySupport + \beta 4 * IntendedDisclose + \beta 5 * UsageFrequency)))$$

where, P(Disclosure) represents the probability of a student disclosing AI β coeffiients represent the impacts of each independent variable

3.7 Analysis Techniques

(i) Descriptive Statistics: Descriptive statistics were used to understand the dataset through statistical operations and graphical representations such as bar charts and pie charts.

(ii) Correlation Analysis: Correlation analysis is used to analyse relationships between key variables, including ethical belief, academic pressure, and disclosure behaviour.

(iii) Inferential Analysis (Logistic Regression): Logistic regression were used to analyse independent variables on the binary outcome variable (actual disclosure behaviour). The results were interpreted using regression coefficients.

3.8 Tools and Software

All analysis was done using Python libraries such as numpy, pandas,matplotlib, and scikit-learn.

4. Results

4.1 AI usage -93.9% student AI, and 6.1 don’t use AI.

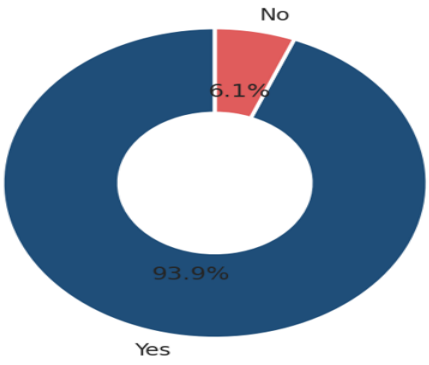


Fig.1 AI usage percentage

4.2 Usage Frequency

(i) Daily: 29% (ii) Weekly: 30% (iii) Rarely:10% (iv) Never: 13%

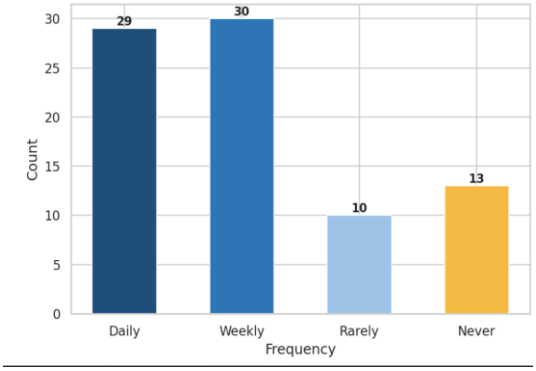


Fig. 2 Frequency of AI usage

4.3 Purpose of AI usage

Results show that mostly students use AI assistants for study explanation, and others for code writing, and assignment writing consecutively.

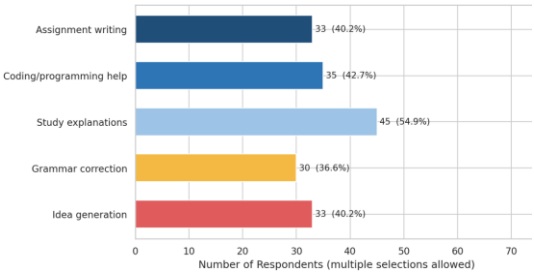


Fig.3 Purpose of AI usage

4.4 Reasons for AI usage

Students mostly use AI assistant for understand complex topics, Academic pressure, and save time.

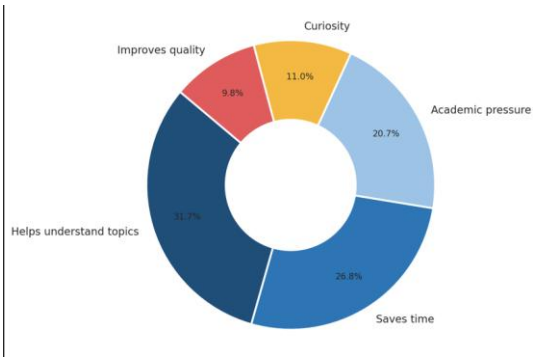


Fig.4 Reasons for AI usage

4.5 Unacknowledged AI misconduct or not (students view)

Mostly (50%) student agrees that unacknowledged AI as misconduct.

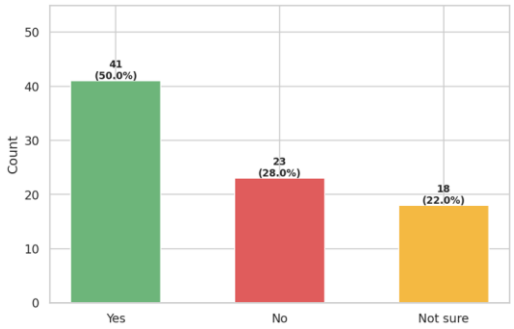


Fig.5 Unacknowledged AI misconduct or not

4.6 Unfair Scenario of AI usage

A large number of students submit AI generated assignment without acknowledgement, and also another large portion uses AI during exam time.

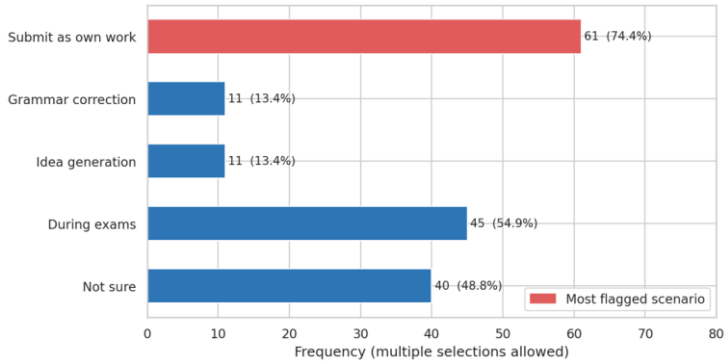


Fig.6 Unfair Scenario of AI usage

4.7 Actual vs Intended AI Disclosure

Behaviour Data shows that most students use AI without acknowledgement, but they also agree to disclose that if required.

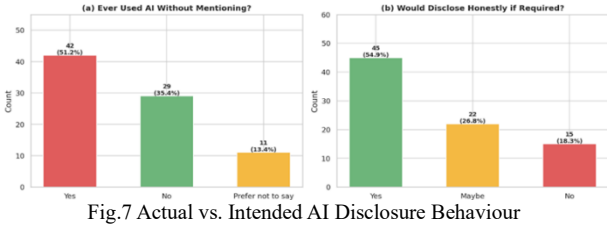


Fig.7 Actual vs. Intended AI Disclosure Behaviour

4.8 Disclosure Willingness

Most Students (59.8%) support disclosure policy to ensure academic integrity.

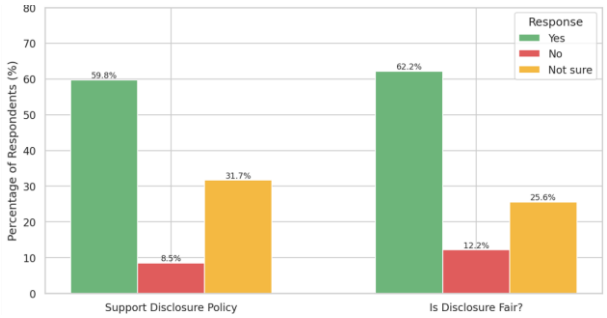


Fig.8 Disclosure Willingness

4.9 Hypothesis Testing

TABLE 1 HYPOTHESIS TESTING

Hypothesis	Relationship	Test Statistic	p-value	Decision	Significant
H_1	Ethical Score → Actual Disclose	r=0.007	0.952	Fail to Reject H0	❌ No
H_2	Academic Pressure → Ethical Score	r=−0.019	0.8684	Fail to Reject H0	❌ No
H_3	Intended ↔ Actual Disclose	$\chi 2$=1.882	0.1701	Fail to Reject H0	❌ No
H_4	Support Policy → Actual Disclose	r=0.148	0.1842	Fail to Reject H0	❌ No

4.10 Correlation Heatmap

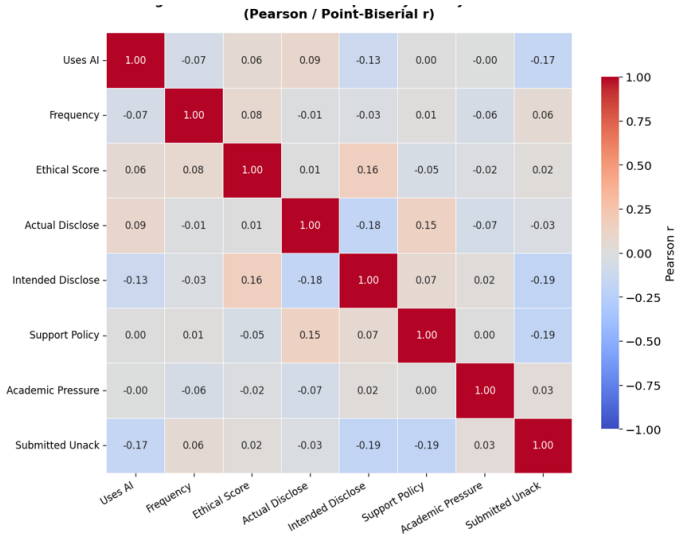


Fig.9 Correlation Heatmap

4.11 Logistic regression Coefficient

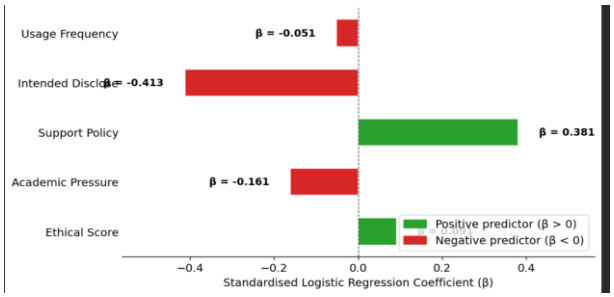


Fig.10 Logistic Regression Coefficient

5. Discussion & Conclusion

TABLE 2 LOGISTIC REGRESSION COEFFICIENT AND INTERPRETATION

Predictor	Std β	Odds Ratio	p-value	Direction	Interpretation
Ethical Score	0.091	1.095	0.425	Positive ↑	Higher ethics may influence AI disclosure.
Academic Pressure	-0.1613	0.851	0.238	Negative ↓	Academic pressure may negatively impact AI disclosure.
Support Policy	0.3806	1.463	0.108	Positive ↑	Support policy influences students to disclose more AI Acknowledgement.
Intended Disclose	-0.4128	0.662	0.092	Negative ↓	Action and intented has a significant gap.
Usage Frequency	-0.0513	0.95	0.684	Negative ↓	Higher frequency user less likely to disclose.

TABLE 3 KEY FINDINGS FROM THE DATASET

Finding	Value	Implication
AI Adoption Rate	93.90%	Almost everyone uses AI.
Daily + Weekly Users	59%	Student use AI in their day-to-day life.
View Undisclosed AI as Misconduct	50% agree	The student is aware of the ethical uses of AI.
Submitted AI Without Disclosure	55%	Behaviour contradicts beliefs.
Actual Disclosure	30%	Many students use Unacknowledged AI.
Intended Disclosure (if mandated)	72%	Many students comply with institutional policy
Disclosure Gap	42 pp	Core finding of this study.
Support Mandatory Policy	59.80%	Everyone should comply AI policy.

(i)The Belief Behaviour Gap: The central Findings of the study show a 42 percentenge gap between what they believe and what they actually do. 72% students intend to disclose, but 30 % actually do.

(ii)Academic Factor: Academic factor is the second largest factor and a negative predictor of disclosure ($\beta = -0.161$) in the regression

.

(iii)Correlation Analysis

Support Policy ↔ Actual Disclose	0.148	Strongest Positive: Student support policy to disclose.
Ethical Score ↔ Actual Disclose	0.007	Very weak positive: Even ethical awareness is not enough for disclosure.

Academic Pressure ↔ Ethical Score	-0.019	Near-zero: Academic pressure does not impact ethics in this sector.
Frequency ↔ Actual Disclose	-0.011	Slight Negative: Heavier AI users are less likely to disclose.
Submitted Unacknowledged↔Ethical Score	0.017	Near-zero: Even having ethical knowledge student may submit an unacknowledged assignment that used AI.

(iv) Regression Insights

Support for policy ($\beta = +0.381$): Student support, Institutional policy of AI usage.

Intended disclosure ($\beta = -0.413$): Not intended to disclose due to Academic Pressure.

Usage frequency ($\beta = -0.051$): More frequency user less they intend to disclose.

(v) Hypothesis Testing Summary: Hypothesis testing is not supported at $\alpha = 0.05$ due to low statistical power from the sample size, as n=82

.

(vi) Recommendation:

(1) Mandatory AI disclosure.

(2) Redesign the assessment process.

(3) Provide clear institutional guidelines.

6. Limitation

This study uses small size data and self-reported data that may introduce bias. Future work should include a larger dataset.

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AI-Enhanced Teaching and Learning in OBE-Aligned Electrical and Electronic Engineering Education

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Abstract
Higher education is being reshaped by artificial intelligence (AI) at a pace that institutions are still struggling to keep up with. On the other hand, engineering programs have more opportunities to implement AI into the curriculum, and AI-enhanced teaching and learning (AETL) can be integrated. In addition to operating under the Washington Accord (WA) framework, which was newly implemented by the board of accreditation for engineering and technical education (BAETE), and achieving full Washington Accord signatory status since June 2024, electrical and electronic engineering (EEE) programs can benefit from the implementation of AETL. The paper reviews four core AETL modalities from the peer-reviewed literature: Intelligent tutoring systems, generative AI along with large language models, AI-driven learning analytics, and adaptive edge AI and internet of thing (IoT)-enabled laboratory platforms. Each proposed teaching tool is mapped against the twelve WA and BAETE graduate attributes. For BAETE-accredited EEE programs in Bangladesh, a four-stage implementation plan has been proposed here. In addition, pressing challenges in academic integrity, equity, and digital infrastructure have been discussed. It has been reasoned that the proposed AETL structure can be implemented, keeping a clear institutional purpose with appropriate safeguards, thereby helping BAETE–accredited programs strengthen OBE practice and produce graduates who are ready for a global workforce in competitive engineering.

***Keywords**:* AI-Enhanced Learning, Washington Accord, BAETE, Outcome-Based Education, Electrical Engineering Education, Intelligent Tutoring Systems, Generative AI, Bangladesh

1. Introduction

In all areas of higher education, AI is transforming the way we learn and think about teaching. In every aspect of higher education, AI is reshaping the way education is delivered and received, and that is no exception in the field of engineering. These changes can be part of a process that will accomplish larger goals in engineering programs. AI tools are becoming more sophisticated and user-friendly, and universities are in a genuine scenario where they must ponder how to leverage these tools in ways that enhance learning for their students. If a program is accredited by the WA or BAETE, there's an additional challenge: ensuring that these new tools will help students learn the twelve key skills and qualities (such as problem-solving, teamwork, and lifelong learning required for accreditation. The school will need to establish the actual evidence that their students possess these skills. The uplifting news is that numerous studies now have demonstrated that AI tools can be effective in developing these essential skills, when used appropriately.

The EEE field is at a turning point. Much of this is math-related, circuit analysis, digital systems, and some practical lab work; AI, when used appropriately, could have a significant impact in these areas for students and teachers. However, if AI is introduced in an unplanned or poorly-supported manner, it could pose challenges. This threat is even greater in Bangladesh, where there are not sufficient clear guidelines and training for students to responsibly use AI tools.

On 12 June 2024, the BAETE, under the auspices of the institution of engineers, Bangladesh (IEB) became a full signatory of the WA. This makes the BAETE accredited programs in Bangladesh benchmarked with international programs and places a genuine commitment to the rigorous delivery of OBE. In this study, the focus is on this context and the identification of key AETL modes, mapping these to the identified 12 Graduate Attributes, and a practical framework for implementation in EEE programs that embodies the opportunities and challenges that lie ahead.

2. AI-Enhanced Teaching and Learning: An Overview

There is a wealth of technologies to consider when introducing AI in teaching and learning. These include data analytics, machine learning, NLP, and others that enable a more interactive class and keep students engaged. In this study, we're highlighting four areas: (1) Intelligent Tutoring Systems (ITS), (2) Generative AI tools and Large

Language Models (LLMs), (3) AI-powered learning analytics, and (4) Adaptive learning platforms with Edge AI and smart, IoT-enabled labs.

2.1 Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) have been described as a tutor that you have by your side. They determine precisely where a student may be having difficulty and alter the lesson to meet the student's needs. Research has demonstrated that students with AI-based ITS are better learners, more active and better recalling long-term what they have learnt than students in traditional classroom [5]. An actual example is AITEE, a tutoring system created to address the needs of only electrical engineering students. It combines big data models and circuit simulations with careful conversation to provide personalized support to each student [6]. The system is intelligent enough to provide feedback that is more accurate than the typical AI system, even for the subject matter. In the labs, researchers have taken the idea a step further by incorporating game-like elements and smart technology, which means the ITS can not only provide help for students' test scores, but also for how they are feeling as they learn [7].

2.2 Generative AI and Large Language Models

AI-powered tools such as ChatGPT and GitHub Copilot have emerged as commonplace fixtures in the engineering classroom, rather than hot new toys. For example, Nguyen and colleagues [1] looked at how students used ChatGPT in an integrated circuit systems course. They realized that this tool has the potential of assisting students in a meaningful way, providing them with personalized assistance and promoting a more interactive learning experience. However, they also saw challenges sometimes the answers were not entirely correct and students could begin to use the tool a little too much. In another study, Adorni and Grosso [8] applied generative AI algorithms in an embedded systems class as a creative partner. The AI provided students with prompts to work with, allowing them to create more complex projects than they would have been able to without the assistance. A comprehensive survey, which included 58 studies, by Elnaffar et al. [4] revealed that generative AI is the most significant AI tool in engineering education. There are some positive traits in the research, such as the ability for students to receive more personalized feedback and saving teachers time, but some of the common problems identified were difficulty with implementation of the technology, and the potential for students to learn superficially. Interesting to note here is that in China, over 50% of engineering students reported that generative AI enhanced their learning, and motivated them to be more proactive; even encouraging their creativity [9].

2.3 AI-Driven Learning Analytics

Learning analytics is like having an assistant in your classroom, monitoring students' learning and alerting the teacher to problems as soon as they arise, and explaining why the student has a problem. In an online engineering course, Ouyang and colleagues [10] found that students were more engaged, performance was improved, there was better teamwork, and there was higher satisfaction overall when using AI to predict performance and provide feedback. The smart tools will identify students who require additional support well before grades begin to drop, particularly in large classes for EEE. The authors of Sajja and others [11] illustrated how an AI learning hub could be employed across an engineering course, while another study revealed that AI assistants that assisted students in completing assignments and tackling complex content were well received by students [12].

2.4 Adaptive Learning Platforms and IoT-Enabled Laboratories

An adaptive learning platform is like having a teacher who is very focused on each student and tailors the lesson to that student. These systems are more like a variation on the same, except that they vary the content each student sees according to the respective student's performance. The two most prominent trends that have been identified recently are the use of smart tools for personalization of education and the emphasis on actual results [13]. The Adaptive Lab Mentor (ALM) is an example of AI-based automatic feedback tool which can provide instant and personalized feedback to students when performing hands-on experiments in EEE [14]. This is what the Washington Accord prizes interactive learning. Also, these platforms record the students' progress automatically, which is easier for tracking progress and fulfilling accreditation requirements.

3. The Washington Accord and EEE Education

The International Engineering Alliance (IEA) has developed the Washington Accord [2, 16] which establishes a clear set of skills and qualities that every accredited engineering program should try to build in their students (known as Graduate Attributes). These were revised in 2021 to include 12 attributes such as engineering knowledge, problem solving, generating innovative designs, exploring new concepts, applying current technology, knowledge about society and the environment, ethical behaviour, team working, communication, project management, financial management, and a willingness to learn [15].

All the programs that are based on the principles of electrical and electronics engineering in line with the ABET (USA), Engineers Australia, ECSA (South Africa) and BAETE (Bangladesh) require the adoption of Outcome Based Education (OBE). In other words, teaching and assessment should be explicitly aligned with learning the skills and qualities which students are expected to acquire. BAETE's latest rules (using the IEA's Graduate Attributes and Professional Competencies, Version 4) expect every accredited program to make sure these twelve qualities are woven into every part of the curriculum—from what's taught and how, to the way students are assessed and how the program keeps improving [17].

The challenge for teachers devising these programs is not only to ensure that students learn but also to demonstrate that learning takes and makes a difference. That's where AI-powered teaching and learning (AETL) comes into play. The Washington Accord is seeking graduates who will be able to approach difficult challenges with technical expertise, conscientiously consider ethical issues, and continue to learn throughout their careers. AETL tools are excellent for developing these skills and equally valuable in allowing easy identification and measurement of the progress made by each student in the process. [15]

4. Bangladesh Context and BAETE Accreditation

The engineering education in Bangladesh has experienced significant transformation in the past decade, but the year 2024 was truly transformative. In 2016, BAETE, which was established in 2003 to oversee accreditation of engineering programs, made a significant leap forward by becoming a provisional member of the Washington Accord. After several years of tremendous effort, including a lot of self-evaluation, training and support from other countries such as Singapore and Malaysia, BAETE was finally accepted as a fully fledged member on June 12, 2024. This is a big step because, starting from 2023, engineering programmes which are recognized by BAETE have the same high standard as those in the US, UK, Canada, Australia and India.

By 2024, BAETE had accredited 78 engineering programs at 30 different universities. The latter comprises of the popular public universities such as BUET and KUET, as well as the best private universities such as NSU, BRAC University, AIUB, IUB, UIU, EWU and UAP [19]. There is a lot to keep track of for the EEE programs in these schools: they all have to ensure that their students are able to achieve the 12 Program Outcomes (POs) based on the Washington Accord's Graduate Attributes. These outcomes range from technical skills to teamwork and ethical thinking and programs must demonstrate students' achievement of these outcomes by implementing a complete Outcome Based Education (OBE) process. This requires explicit association of course learning objectives (CLOs) with the following outcomes, providing instruction that teaches to the outcomes, monitoring student achievement, and continually striving to enhance instruction through continuous quality improvement (CQI) [20]. For this purpose, BAETE took the initiative to revise its official manual according to the most recent international standard and even in September 2025, organized a special seminar at the BUET campus to keep everyone updated [17].

These achievements are to be celebrated, but there are some practical challenges to face. However, in Bangladesh, over 100 universities are offering engineering degrees, but only a few have already been accredited as BAETE universities, mostly due to lack of resources and/or a reluctance to change [19]. Faculty of designing OBE assessments, composing effective course learning objectives (CLOs), and effectively interpreting students' work is not uniform [18]. To address these gaps, BAETE has stepped up its support measures including three intensive 2-day OBE training programmes for faculty members and programme evaluators in May 2025 and a national symposium in April 2024 for 220 participants from 43 institutions which will bring together academia and industry with the vision of Bangladesh 2041 [17]. It's a turning point: Bangladesh engineering schools are getting new recognition from the international community, but they must continue to strengthen their local capacities – and AI-powered teaching and learning (AETL) can make a difference for engineering programs accredited by the Bangladesh Accreditation Board of Engineering and Technology (BAETE).

5. Mapping AETL to WA Graduate Attributes in EEE

Table 1 presents a mapping of key AETL modalities to the WA Graduate Attributes most directly addressable in EEE programmes. The mapping is grounded in evidence from the reviewed literature.

TABLE 1 MAPPING OF AETL MODALITIES TO WA GRADUATE ATTRIBUTES IN EEE PROGRAMMES

AETL Modality	EEE Application Example	WA Graduate Attributes Addressed
Intelligent Tutoring Systems (ITS)	Adaptive circuit analysis tutoring (AITEE [6])	GA1: Engineering Knowledge; GA2: Problem Analysis; GA12: Lifelong Learning

AETL Modality	EEE Application Example	WA Graduate Attributes Addressed
Generative AI / LLM Tools	AI co-designer in embedded systems projects [8]	GA3: Design of Solutions; GA5: Modern Tool Usage; GA8: Ethics; GA10: Communication
AI Learning Analytics	Performance prediction in online EEE courses [10]	GA2: Problem Analysis; GA11: Project Management; GA12: Lifelong Learning
Adaptive Platforms / IoT Labs	Adaptive Lab Mentor for hands-on EEE labs [14]	GA4: Investigation; GA3: Design; GA7: Environment & Sustainability
AI-Gamified Learning	Gamified ITS for introductory EEE labs [7]	GA9: Individual and Team Work; GA10: Communication; GA12: Lifelong Learning

Intelligent Tutoring Systems (ITS) are a new approach to computer science that uses artificial intelligence to help engineering students improve their learning. They provide every learner with a unique collection of practice questions, examples and feedback that is personalized to the exact needs of the learner at the moment. Generative AI tools, however, can help students become familiar with latest technologies, which are now a prerequisite trait for any graduate. Students learn practical skills in prompt writing and AI collaboration, skills that are in high demand in the workplace today, in partnership with large language models (LLMs) as creative collaborators. Students and teachers can easily find out what works and what doesn't, where the problems lie, and make changes before they escalate to bigger issues with ease using learning analytics tools. In the lab, smart mentors with AI and IoT technology, using AI and IoT to provide real-time guidance during hands-on experiments and data analysis with students. The systems also maintain a digital record of each student's progress which is also extremely useful for fulfilling OBE accreditation requirements.

6. A Framework for AETL in WA-Aligned EEE Programs

The reviewed literature points toward a practical, four-phase framework for integrating AETL into WA-aligned EEE programs.

[1] ***Phase 1 – Curriculum Mapping:*** Firstly, link AETL tools with Course Learning Outcomes (CLOs) and the Graduate Attributes they are aligned with. Ensure that at least one way is identified to measure each of the 12 Washington Accord Graduate Attributes with AI. In this way, AI is not a mere visual gimmick, but rather a tool that is helping students to achieve key learning outcomes and ensuring that technology does not become an obstacle to learning rather than an aid.

[2] ***Phase 2 – Tool Integration:*** Use appropriate AETL tools in each course, aligned with learning. For instance, in circuits & signals class, provide actual practice with simulations using Intelligent Tutoring Systems (ITS) such as AITEE. In design project courses, allow students to leverage generative AI as a design collaborator to brainstorm and generate design concepts. In the lab classes, use IoT-AI mentoring systems to accompany students with experiments in real time. Ensure that the use of AI in the classroom is brought to teachers' confidence before introducing the tools.

[3] ***Phase 3 – Analytics and Feedback:*** Ensure learning analytics dashboards are set up to enable teachers to monitor student progress on each Graduate Attribute, both for the class and for every student. That allows for the identification of students who may be having difficulties, and provides assistance at a young age, as demonstrated by Ouyang et al. [10]. The information gathered from these dashboards should also seamlessly flow into necessary accreditation reports, thereby streamlining and clarifying the process.

[4] ***Phase 4 – Ethics and Quality Assurance:*** Put clear policies in place around using AI for assessments, protecting academic honesty, and keeping student data private. This is not only about rules, it's about trust and ensuring that everyone is in agreement on how games are played fairly and responsibly. It also can serve as a way to reinforce values that are significant to them such as ethics and the role of engineer in society. Ensure that your policies make it clear that you are using AI to assist students in their learning, and not as a quick cut around actual learning or individual achievement.

7. Challenges and Considerations

It's not easy to incorporate AI into education every time, though. Elnaffar et al. [4] found that in 93% of the studies they examined, there were real challenges such as teachers' lack of confidence with AI, lack of resources and lack of AI expertise among teachers. Over-reliance on AI is another prevalent issue; students can learn from AI but fail

to grasp the deeper meaning and substance. Engineering is a huge deal where safety relies on safety practitioners really knowing what they are doing. However, there are recognised risks to academic integrity with Generative AI, with the shift to more practical work and oral examinations highlighted as a potential solution for schools to help them assess students better.

It is important to recognize when meeting BAETE and Washington Accord standards, between what AI creates and what the student has truly learned or is capable of doing on their own. To be accredited, schools must demonstrate actual achievement of the Graduate Attributes, not be able to rely on AI tools. It is important to make it clear that any portfolio or report that uses AI should clearly show what the student did without AI and what the AI did.

One of the important factors here is the design of good assessments – AI can help students with the learning process, but the ultimate responsibility for demonstrating skill remains with the student. One of the major matters is fairness. Not all students can have access to the internet or devices in Bangladesh, and some students may have additional barriers due to their background. Leveraging too much on AI can widen those gaps. Also, a lot of faculty have yet to get familiar with the tools. This is why it is essential that teachers receive the proper training, and not only a good idea, for this framework to truly work.

8. Conclusion

In 2024, the Board of Engineers and Technologists of Electrical and Electronic Engineering (BAETE) became a full member of the Washington Accord, thus elevating the standard of Electrical and Electronic Engineering (EEE) programs in Bangladesh. What this paper has demonstrated is that AI in teaching and learning (AETL) is not a fad but a viable approach to achieve the new expectations that the programs have for it. The four categories of AETL tools we've explored are: ITS, generative AI, learning analytics, and adaptive/IoT lab platforms. All of these relate easily to the twelve Graduate Attributes described in the new BAETE manual, and, when combined, they provide much more concrete evidence of what students can actually do, as opposed to old school approaches.

In our proposed four-phase model, the curriculum mapping phase is a starting place for experimenting with AI, followed by the integration of tools, then analytics and feedback, and finally, ethics and quality assurance, where the use of AI is integrated thoughtfully and woven into accreditation. When digital infrastructure and OBE skills are not distributed uniformly, AETL can have significant impact: aiding teachers with analytics dashboards and AI-powered feedback, saving teachers from tedious tracking headaches and, most importantly, enhancing the quality of education.

None of this can come without real investment, however. AI tools in the classroom will require schools to improve their digital tools, invest in teacher training on AI tools, and establish policies to ensure academic integrity. When executed properly, AETL can be used to help reach the standards of the Washington Accord for BAETE-accredited EEE programs, enhance the Vision 2041 of Bangladesh and produce smart, skilled, ethical and world-ready engineers.

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From Awareness to Adoption: Mapping AI Usage Patterns Among University Students and Predicting Adoption Profiles

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Abstract
The rapid proliferation of generative AI tools has fundamentally altered academic practice in higher education, yet institutional responses remain poorly informed due to a lack of departmental-level evidence. This study investigates AI usage patterns among 131 university students across twelve academic task types using a 42-item cross-sectional survey grounded in the Technology Acceptance Model (TAM). A two-stage machine learning pipeline is applied: K-means clustering identifies two adoption profiles, Cautious Adopters (n=76, 58.0%) and Non/Minimal Users (n=55, 42.0%) followed by supervised classification achieving test macro F1 of 0.888 (Support Vector Machine) and LOOCV F1 of 0.783, a +0.528 improvement over the majority-class dummy baseline (0.367). SHAP analysis identifies perceived usefulness and self-efficacy as the dominant predictors. A Tiered Intervention Framework maps each profile to differentiated institutional responses.

***Keywords**:* Artificial Intelligence in Education; Student AI Adoption; K-Means Clustering; Machine Learning; SHAP; Technology Acceptance Model; Academic Integrity; Generative AI.

1. Introduction

The integration of generative AI tools such as ChatGPT, Gemini, Claude, and GitHub Copilot into university life has accelerated at a pace that institutional policy has not matched. Responses across higher education institutions have remained varied and fragmented, ranging from outright bans to ad hoc guidance with little evidence base [1]. Global surveys indicate that over 86% of university students now use AI tools in their studies [2], with adoption rates rising from 66% to 92% between 2024 and 2025 alone [3]. While direct Bangladesh-specific data remain limited, evidence from Sri Lanka and comparable South Asian Global South contexts suggests that free-tier AI platforms and smartphone access may lower commercial barriers to adoption in higher education, even where digital infrastructure and institutional policy remain underdeveloped [4]. This rapid uptake raises fundamental questions about how students engage with these tools across different academic task types and what institutional mechanisms are needed to respond effectively.

Despite this urgency, most existing research reports aggregate adoption statistics without differentiating the diverse ways in which students use AI across specific academic tasks [5]. Few studies have applied machine learning to move beyond description toward prediction. This study addresses that gap through a cross-sectional survey of university students. It maps AI usage across twelve task types, identifies empirically distinct adoption profiles through unsupervised clustering, and constructs a supervised classifier capable of predicting a student's adoption profile from demographics and attitudes alone, before any usage behaviour is observed. This prospective prediction capability, enabling deployment as an early-warning tool at semester start, is the primary methodological contribution. Four research questions guide the study: RQ1: What AI tools do students use, and for which tasks? RQ2: What distinct adoption profiles exist? RQ3: Can a profile be predicted before usage is observed? RQ4: What institutional interventions does each profile require?

2. Literature Review

Research on student AI adoption has grown rapidly since ChatGPT's release in 2022. Contractor and Reyes documented over 80% adoption at a US institution within two years [5], while HEPI found 92% of UK undergraduates used AI tools by 2025 [3]. Research from developing-country contexts remains sparse; to the authors' knowledge, no prior departmental-level profiling study exists for Bangladeshi higher education institutions, which this study addresses directly. The Technology Acceptance Model (TAM) [6], extended by UTAUT2 [7] with hedonic motivation and habit constructs, provides the dominant theoretical framework. TAM was preferred here for its parsimony and established validation in educational settings [7]. Marengo et al. developed and validated a 13-item Generative AI Attitude Scale extending TAM with ethical concern, dependency risk, and career relevance constructs [8]; this scale was validated in a Western context and its applicability in the South Asian setting has not been independently established. K-means clustering has been

applied to LMS interaction data to identify distinct learner engagement profiles, with higher-engagement clusters consistently associated with better academic outcomes [9]. SHAP [10] has enabled interpretable ML in educational research. Academic integrity literature shows students are significantly more likely to use AI in assessment contexts when institutional policy is unclear [11]. To the authors' knowledge, no prior study has applied a two-stage unsupervised-to-supervised pipeline to profile student AI adoption and validate a prospective early-warning classifier which is the primary contribution of this work. These three areas map directly to our methodology: attitude measurement (TAM) guided the instrument design, machine learning helped group the learners, and academic integrity informed the intervention framework.

3. Methodology

This study follows a two-stage machine learning pipeline illustrated in Fig. 1. Survey responses are first cleaned and encoded, then K-means clustering groups students into adoption profiles (unsupervised), and finally a supervised classifier predicts profile membership from demographics and attitudes alone before any usage behaviour is observed.

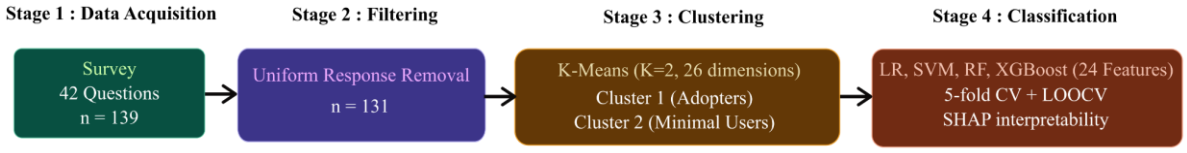


Fig.1 Overall research pipeline: from survey data collection to supervised adoption profile prediction.

3.1 Survey Instrument and Reliability

A 42-item questionnaire covered five sections: Section A (six demographic items), Section B (five AI awareness items), Section C (twelve task-specific frequency items on a 5-point Never-to-Always scale), Section D (fourteen attitudinal items across six TAM-grounded sub-scales), and Section E (five self-reported impact items and one optional open-ended response). Section D comprised fourteen Likert items spanning six sub-scales: Perceived Usefulness (D1–D3), Ease of Use/Self-Efficacy (D4–D5), Integrity Awareness (D6–D7), Workload and Dependency (D8–D9), Critical Evaluation (D10–D11), and Trust and Regulation (D12–D13), with career relevance assessed by a single item (D14). Internal consistency was assessed using Cronbach's alpha (Fig. 2). Perceived Usefulness (α=0.836) and Ease of Use/Self-Efficacy (α=0.818) achieved good reliability; Integrity Awareness (α=0.686) approached the acceptable threshold. Workload and Dependency (α=0.487), Critical Evaluation (α=0.132), and Trust and Regulation (α=0.214) fell below the 0.70 threshold. Because individual item scores rather than sub-scale composites are used as classifier inputs, sub-scale alpha values do not invalidate item inclusion. D12 and D13 are retained as independent item-level variables as the Trust and Regulation alpha remains well below the acceptable threshold regardless of correlation direction.

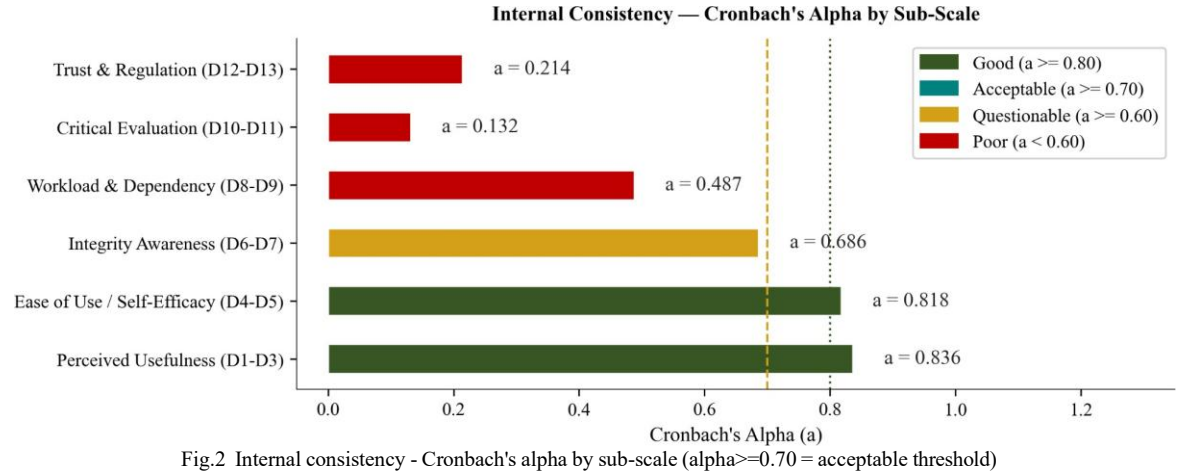


Fig.2 Internal consistency - Cronbach's alpha by sub-scale (alpha>=0.70 = acceptable threshold)

3.2 Data Collection and Participants

One hundred and thirty-nine (n=139) responses were received via LMS and official student emails. Eight were removed for exceeding the 20% missing data threshold or straightlining, yielding n=131. Voluntary participation and full anonymity were ensured. The study was conducted in accordance with all ethical guidelines and the

institutional code of conduct. Non-response bias was assessed by comparing the first 30% against the last 30% of respondents on six key variables using Armstrong-Overton test [12]. Three variables showed significant differences: D9 ($p<0.05$), B4 ($p<0.01$), and D1 ($p<0.01$).

3.3 Analytical Pipeline - Clustering

K-means clustering was applied to the combined C+D score vectors (26 standardised dimensions). The optimal number of clusters was determined through the elbow method and silhouette coefficient, evaluated across K=2–8. Cluster validity was additionally confirmed using the Calinski-Harabasz and Davies-Bouldin indices, both of which were optimal at K=2. As a robustness check, Gaussian Mixture Model and Agglomerative clustering (Ward linkage) were fitted for K=2–4; all three algorithms selected K=2 by silhouette, indicating moderate structural agreement. Bootstrapped cluster stability (n=200 resamples) yielded mean ARI=0.637±0.260, indicating acceptable partition reproducibility.

3.4 Analytical Pipeline - Classification

The classifier was trained on Section A (demographics) and Section D (attitudes) features only; Section C task-usage items were withheld to prevent data leakage. Four algorithms were compared: Logistic Regression, SVM, Random Forest, and XGBoost, alongside a majority-class dummy baseline, using an 80/20 stratified split. Five-fold stratified CV macro F1 and LOOCV F1 are both reported as primary metrics; bootstrap 95% CI over 1000 test-set resamples quantifies uncertainty. SHAP was applied to the Random Forest model to identify the dominant attitudinal predictors of profile membership.

4. Results

4.1 Descriptive Analysis

Figure 3(a) shows mean AI usage frequency by task. Understanding concepts (C7=3.95), Math/Technical problems (C4=3.66), and Exam preparation (C6=3.57) ranked highest, all above the scale midpoint; Take-home exams (C12=2.77) and Presentations/Visuals (C9=2.89) ranked lowest, suggesting students self-regulate toward effort-support rather than assessment-completion uses of AI. Figure 3(b) shows Section D attitudes: Verifies AI output (D11=4.05) and Tasks faster (D1=4.05) scored highest notably, verification behaviour topping the ranking indicates a responsible orientation toward AI use in this cohort; Submits without editing (D9=2.14) scored lowest, confirming that uncritical submission remains uncommon. Figure 4 (heatmap by year) shows 3rd-year students with the highest understanding-concept usage (C7=4.10) and exam preparation (C6=3.83) across all year groups. Postgraduate students showed the highest understanding-concept usage after 3rd year (C7=4.00) but lowest take-home exam AI use (C12=2.08), consistent with assessment-integrity awareness. First-year students showed notably high Math/Technical problems usage (C4=3.86), suggesting early adoption of AI for quantitative tasks.

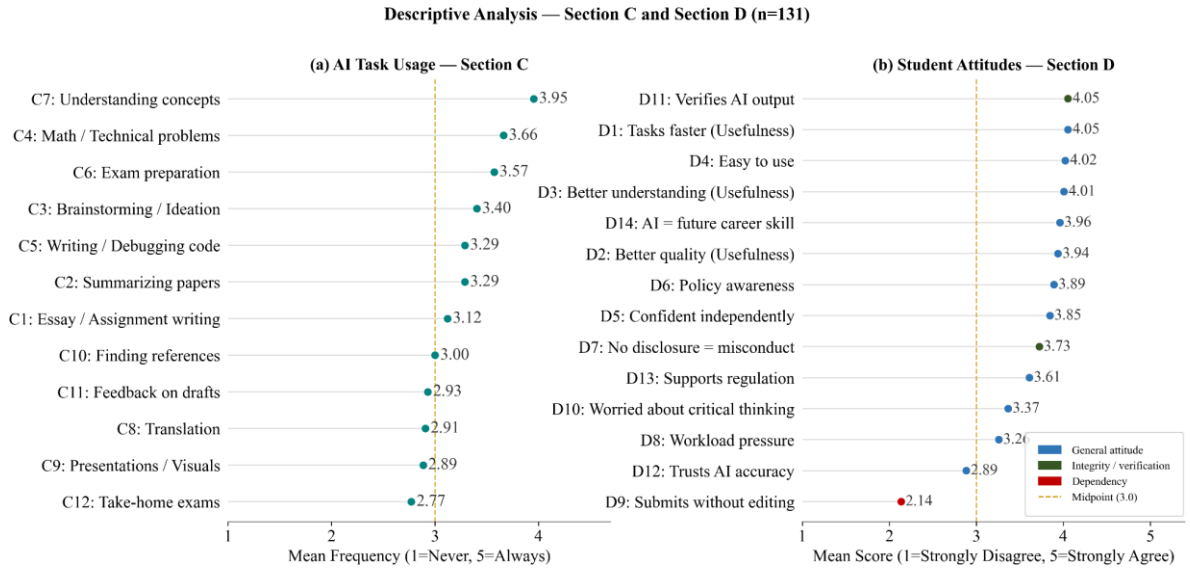


Fig.3 Descriptive analysis (n=131): (a) mean AI usage frequency by academic task type (Section C) — Understanding concepts highest (3.95), Take-home exams lowest (2.77); (b) mean student attitudes toward AI (Section D) — Verifies AI output and Tasks faster highest (4.05), Submits without editing lowest (2.14). The dashed line indicates scale midpoint (3.0).

4.2 Cluster Analysis and Adoption Profiles

The elbow method and silhouette analysis identified K=2 as optimal (silhouette=0.132, CH=21.14, DB=2.410). All three validity indices were best at K=2 relative to K=3–8, providing convergent support. Bootstrapped cluster stability yielded mean ARI=0.637±0.260 confirming the two-profile solution as robust. The clustering yielded two empirically distinct profiles summarised in Table 1 and visualised in Fig. 5. Cautious Adopters (n=76, 58.0%) showed substantially higher perceived usefulness (D1: 4.59 vs. 3.23), self-efficacy, and career relevance (D4: 4.29 vs 3.29) relative to Non/Minimal Users (n=55, 42.0%). Neither cluster exhibited high-dependency behaviour (D9: 2.20 and 2.05), a positive finding for academic integrity. Figure 5 radar chart visually confirms that Cautious Adopters (Cluster 1, n=76) occupy a substantially larger polygon area than Non/Minimal Users (Cluster 0, n=55), with the most pronounced outward extension at the Brainstorming (C3) Math/Technical (C4), and Exam Prep axes (C6).

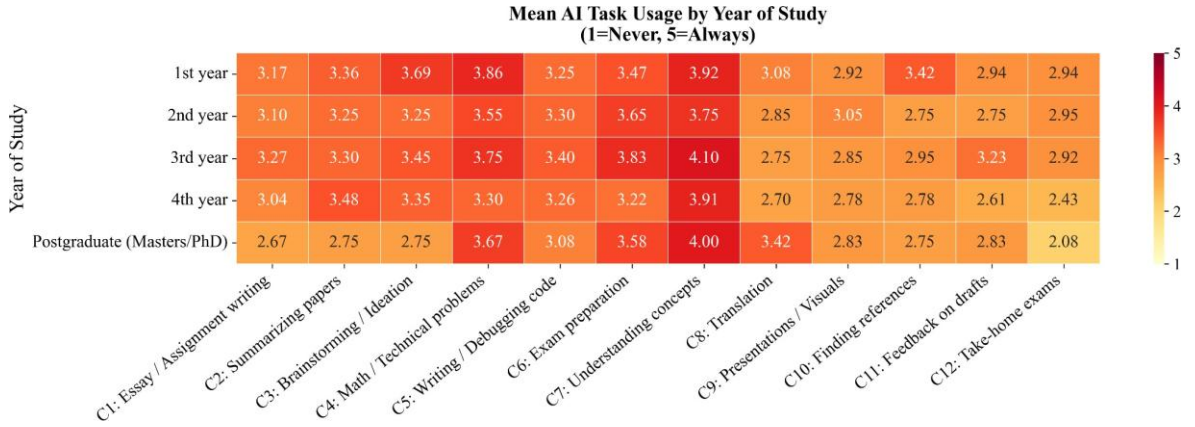


Fig.4 Mean AI task usage by year of study (1=Never, 5=Always). 3rd-year students show highest understanding-concept usage (4.10) and exam preparation (3.83); postgraduate students show lowest take-home exam AI use (2.08).

4.3 Classification Performance

Table 2 presents classifier performance across all models. The majority-class dummy baseline achieves CV macro F1=0.367, establishing the floor. All four classifiers substantially exceed the dummy baseline, with Logistic Regression and SVM achieving identical test accuracy (0.889) and near-identical test macro F1 (0.886 and 0.888 respectively). LOOCV F1 values are more reliable than 5-fold CV at this sample size and cluster tightly across all models (LR=0.782, SVM=0.783, RF=0.778, XGBoost=0.746), confirming generalisation.

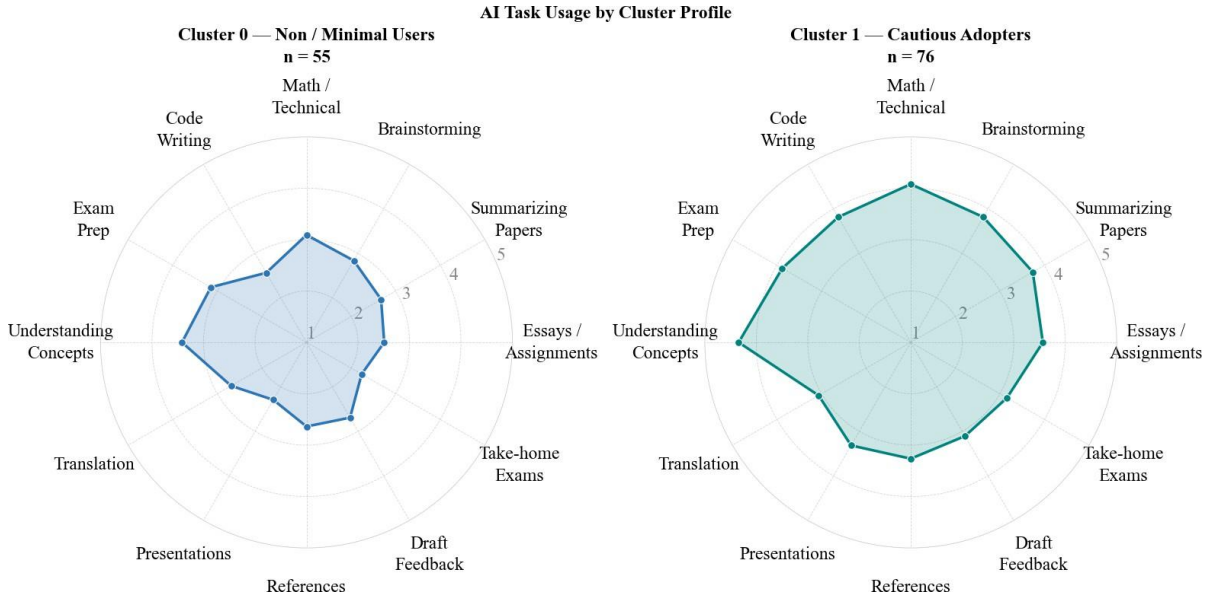


Fig.5 Radar chart of mean AI task usage by cluster profile (1=Never, 5=Always). Cautious Adopters (Cluster 1, n=76) consistently occupy a larger polygon area across all twelve task types than Non/Minimal Users (Cluster 0, n=55)

TABLE 1 AI ADOPTION PROFILES IDENTIFIED BY K-MEANS CLUSTERING

Profile	n	%	Submits without editing (D9)	Perceived Usefulness (D1-D3)	Career Relevance (D14)
Cautious Adopters	76	58.0%	2.20	4.59	4.29
Non / Minimal Users	55	42.0%	2.05	3.23	3.29

TABLE 2 CLASSIFICATION MODEL PERFORMANCE (* BEST CV F1; +/- = 1 SD ACROSS 5 FOLDS; 95% CI VIA 1000 BOOTSTRAP RESAMPLES OF TEST SET)

Model	Test Acc.	Test Macro F1	CV Macro F1	LOOCV F1	Bootstrap F1	95% CI
Majority-Class Dummy	0.593	0.360	0.367 ± 0.002		--	--
Logistic Regression	0.889	0.886	0.704 ± 0.081	0.782	0.881	[0.735, 1.000]
Random Forest	0.852	0.847	0.745 ± 0.095	0.778	0.842	[0.693, 0.963]
XGBoost	0.852	0.847	0.714 ± 0.053	0.746	0.842	[0.693, 0.963]
Support Vector Machine (RBF kernel)	0.889	0.888	0.722 ± 0.093	0.783	0.882	[0.741, 1.000]

4.4 SHAP Feature Importance

Figure 6 presents global SHAP importance for the top 10 features. Tasks faster (D1, mean |SHAP|=0.1005) was the strongest predictor by a clear margin. Better understanding (D3=0.0436) and Confident independently (D5=0.0415) ranked second and third, showing that TAM constructs around perceived usefulness (D1-D3) and self-efficacy (D4-D5) are the main drivers of profile separation. Policy awareness (D6=0.0317) and better quality (D2=0.0287) followed, and AI = future career skill (D14=0.0225) ranked sixth, suggesting that career-oriented motivation also plays a meaningful role at this sample size.

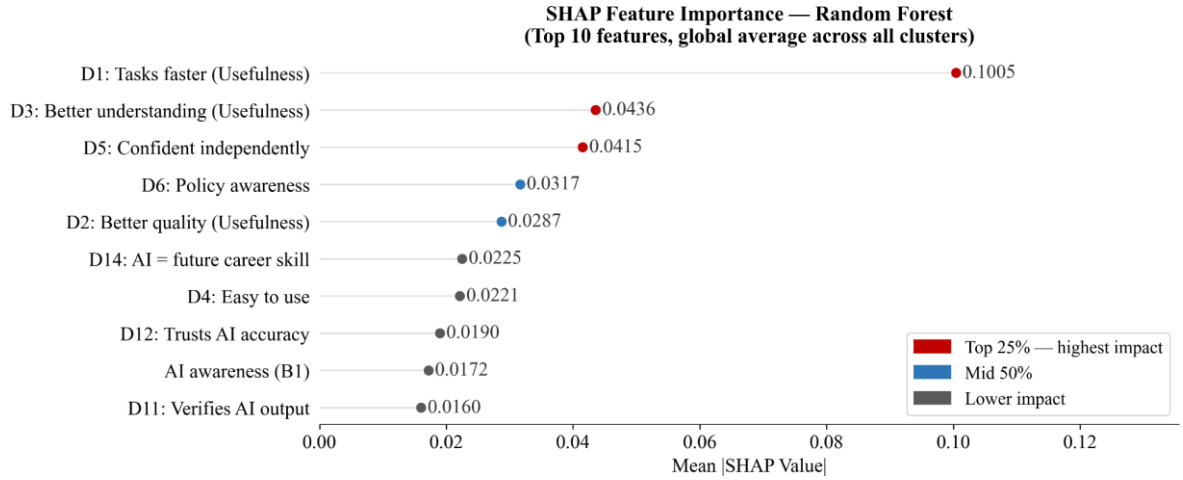


Fig.6 SHAP feature importance — Random Forest, top 10 features (mean |SHAP value|, global average across all clusters).

Only one Section B item appeared in the top 10: AI awareness (B1=0.0172), indicating that prior AI exposure has some predictive value but is clearly secondary to attitudinal constructs. Usage frequency (B4) did not appear in the top 10, which confirms that the soft-leakage concern raised in the methodology is negligible. Demographic variables such as gender, device access, and year of study contributed little predictive weight, further supporting the finding that attitude items alone are sufficient to drive classifier performance.

5. Discussion

The four RQs are addressed in sequence. RQ1: Cognitive-support tasks (understanding concepts, maths, exam preparation) are most AI-penetrated while assessment-completion tasks remain low, suggesting responsible self-regulation. RQ2: The two profiles differ primarily in perceived usefulness and self-efficacy rather than demographics, confirmed by SHAP analysis. RQ3: Test macro F1=0.888, LOOCV F1=0.783, and a +0.528 improvement over the dummy baseline validate the prospective classifier across multiple independent evaluation strategies. RQ4: Table 3 operationalises profile-specific institutional responses. The SHAP finding that TAM constructs (D1, D3, D5) dominate profile separation is consistent with TAM theory [6], suggesting

adoption profiles are driven by positive functional experience rather than external pressure. Interventions should therefore frame AI tools as quality-enhancement and career-preparation instruments rather than leading with restrictive policy. Logistic Regression and SVM performed comparably at n=131.

5.1 Tiered Intervention Framework

Table 3 maps each profile to differentiated institutional responses. Deployment at semester start requires students to complete only the 14-item Section D questionnaire (approximately four minutes), after which the Logistic Regression model assigns each student to a profile. Non/Minimal Users are proactively referred to AI literacy workshops; Cautious Adopters receive targeted policy communication and ethics training. The instrument's brevity and the model's interpretability make this scenario realistic within existing induction processes.

TABLE 3 TIERED INTERVENTION FRAMEWORK BY ADOPTION PROFILE

Student Profile	Recommended Institutional Intervention
Cautious Adopters (58.0%)	Clear AI policy communication per assessment type; ethics training embedded in courses; mandatory disclosure guidelines; reinforce verification behaviour (D11 mean=4.05)
Non / Minimal Users (42.0%)	AI literacy workshops framing AI as quality-enhancement and career-preparation tool; peer learning from Cautious Adopter cohort; access barrier removal; self-efficacy scaffolding (target D5)

5.2 Limitations

This study has four main limitations. First, non-response bias analysis detected significant differences on D9, B4, and D1, suggesting the sample may slightly overrepresent active AI users. Second, all measures are self-reported and subject to social desirability bias, particularly for C12 (take-home exam AI use). Third, silhouette=0.132 and bootstrapped ARI=0.637±0.260 indicate moderate cluster stability; the two-cluster solution may not persist as population diversity grows, and the cross-sectional design prevents causal inference. Fourth, the Marengo et al. [8] attitude scale has not been independently validated in a South Asian context, and the absence of a pilot study means psychometric properties are estimated rather than confirmed.

6. Conclusion

This study presents a two-stage unsupervised-to-supervised ML pipeline for student AI adoption profiling in a higher education context. Among 131 university students, two profiles were identified: Cautious Adopters (58.0%) and Non/Minimal Users (42.0%). Neither cluster exhibited high-dependency behaviour (D9 means: 2.20 and 2.05), a positive finding for academic integrity. Bootstrapped cluster stability ARI=0.637, confirmed the two-profile robust as a solution. Logistic Regression and SVM both achieved test macro F1=0.89 and LOOCV F1≈0.78, a +0.53 improvement over the dummy baseline; SHAP identified perceived usefulness and self-efficacy as dominant predictors at n=131, with integrity-related items gaining prominence over prior AI exposure features observed at smaller sample sizes. The Tiered Intervention Framework translates these findings into differentiated institutional support. The planned longitudinal extension will test whether a more granular taxonomy emerges and whether the early-warning classifier retains validity across semesters.

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From Passive Use to Active Engagement: Evidence and a Framework for AI-Enhanced Learning Among University Students in Bangladesh

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Abstract
Artificial intelligence (AI) has emerged as a transformative force in the world of education, yet little scholarly effort has been made to understand the effects of its passive and active use on the learning depth among young students, particularly in Bangladesh. This study thus intends to investigate the impact of different AI usage patterns on learning depth among undergraduate university students in Bangladesh and to develop a framework for the universities to help students effectively incorporate AI in learning. The study adopted a quantitative, cross-sectional survey design and created a 12-question survey through which data were collected from 106 undergraduate students of several private universities in Bangladesh. Data were analyzed using the Data Analysis ToolPak on Microsoft Excel. Findings from Pearson correlation analysis and multiple linear regression model demonstrated that while passive use of AI hardly enhances student learning, active use of AI can significantly deepen students' learning outcomes. The study proposed the PEARL-3T Framework and showed how student engagement, pedagogical design, and institutional policies can be combined to improve AI-assisted learning among undergraduate students of Bangladesh. By using the framework, universities can effectively train their students to achieve meaningful improvements in learning by actively engaging with artificial intelligence.

Keywords: Active Learning, Artificial Intelligence, Bangladesh, Learning Depth, Passive Learning, Student Behavior.

1. Introduction

The revolutionization of education has been largely influenced by the advent and subsequent adoption of modern technologies in every corner of the world (Kiong, 2022; Pietro & Muñoz, 2025). While the inclusion of technology in education has been confined to mobile devices, interactive whiteboards, instructional software, tablets, virtual laboratories, simulations, online learning platforms, the Internet of Things (IoT), and even social media (Haleem et al., 2022; Kiong, 2022) over the past few decades, the emergence of Artificial Intelligence (AI) has drastically reshaped learning for students in recent years (Alam et al., 2026; Allison et al., 2025; Baidoo-Anu & Ansah, 2023; Faraon et al., 2025; Gasaymeh et al., 2025; Rahman et al, 2026; Shittu et al., 2025; Stohr et al., 2024). Owing to its transformative powers, AI in education has become a central theme of research for a great many scholars, with some focusing on the overall impacts and learning outcomes of AI-assisted tools such as ChatGPT (Alam et al., 2026; Hossain et al., 2025; Huang et al., 2025; Islam et al., 2025), some acknowledging the positive role of AI tools in enhancing student learning, understanding, and engagement (Songsiengchai et al., 2023; Yıldız, 2023) while others questioning their overall effectiveness (Uzun, 2023; Wu et al., 2024), and some evaluating students' attitudes, perceptions, intentions and knowledge about using AI tools in higher education (Blahopoulou & Ortiz-Bonnin, 2025; Faraon et al., 2025; Haq et al., 2025; Shittu et al., 2025; Stohr et al., 2024). While the findings of these studies significantly contribute to the growing body of literature on the role of AI in education, few scholarly contributions exist, particularly in the context of Bangladesh, to understand the distinction between passive and active use of AI as well as their impacts on young students' learning depth. The primary purpose of this study, therefore, is to investigate the effects of different AI usage patterns on learning depth among undergraduate university students in Bangladesh. Based on the findings of its empirical work, the study further aims to develop a framework for the academia by integrating student engagement, pedagogical design, and institutional policies.

Following research questions were formulated to steer the course of the study.

RQ1. What kind of effects does passive use of AI tools have on learning depth among undergraduate university students in Bangladesh?

RQ2. What kind of effects does active use of AI tools have on learning depth among undergraduate university students in Bangladesh?

RQ3. How can AI tools be used to deepen student learning?

2. Methodology

This study employed a quantitative, cross-sectional survey design to evaluate how passive and active uses of artificial intelligence influence the learning depth of undergraduate university students in Bangladesh. In executing this research method, primary data were collected from current undergraduate students of several private universities in Bangladesh. A structured online questionnaire with 12 questions was used where 3 questions (Q1, Q2, Q3) focused on demographic characteristics and general AI use of students, 3 questions (Q4, Q5, Q6) on students' surface-level engagement with AI tools, 3 questions (Q7, Q8, Q9) on students' deeper engagement with AI tools, and 3 questions (Q10, Q11, Q12) on students' perceived learning depth. Taking passive AI use and active AI use as independent variables and learning depth as dependent variable, a 5-point Likert scale was used to measure items from Q4 to Q12 (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). Both convenience sampling and snowball sampling techniques were adopted as respondents were initially approached based on accessibility and availability, with some of them sharing the survey form link with individuals in their own networks. A total of 106 undergraduate students across different years of education and different departments, including Business Administration, Computer Science and Engineering, Electrical and Electronic Engineering, Law, English, etc. voluntarily and anonymously participated in the survey. Collected data from this sample were analyzed using the Data Analysis ToolPak on Microsoft Excel, which delivered a 4-step analysis comprising (a) composite variable construction – scores for Passive AI Use, Active AI Use, and Learning Depth calculated by averaging relevant items; (b) descriptive statistics – mean and standard deviation calculated to comprehend general patterns of AI use among students and their learning outcomes; (c) correlation analysis – Pearson correlation analysis conducted to assess relationships between different variables; and (d) regression analysis – a multiple linear regression model used to evaluate the effects of passive and active AI use on students' learning depth. The regression model used in the study is as follows.

$$LD = \beta_0 + \beta_1(AU) + \beta_2(PU) + \epsilon$$

Where,

- LD = Learning Depth
- AU = Active AI Use
- PU = Passive AI Use
- ε = Error term

Moreover, for secondary data collection, an electronic database searching method was utilized to select 25 papers on relevant literature from Scopus and ScienceDirect. A keyword-based filtering strategy combined with inclusion/exclusion criteria was used, with Active Learning, AI-Enhanced Learning, Artificial Intelligence, Bangladesh, Learning Depth, Passive Learning, Student Behavior, University, and University Students used as keywords. As for inclusion/exclusion criteria, only peer-reviewed articles, book chapters, and conference papers published between January 2021 and April 2026 were included while editorials, perspectives, white papers, notes, and non-English items were excluded.

Finally, the highest standards of ethics were maintained throughout the entire study; especially, during the data collection phase, respondents were clearly informed about the academic purpose of the work in which their participation was completely voluntary. The study collected no personally identifiable information and thus, ensured absolute anonymity and confidentiality.

3. Findings and Discussions

The descriptive statistics (Table 1) show that Active AI Use had the largest mean out of all of the items (Mean = 4.51, Standard Deviation = .63). This indicates that nearly all of the students in this study used AI in an active way; i.e., in a goal-directed manner asking questions and synthesizing information. On average, students believed that they were obtaining some level of meaningful understanding from their learning experience using AI (Mean = 3.95, Standard Deviation = .76), but only moderately so. In contrast, there is evidence that students did not rely heavily upon AI output without critical review since the passive AI Use construct yielded a low mean (Mean = 1.80, Standard Deviation = .73). All reliability estimates for the measures were adequate. Nearly 79 percent of participants reported that they frequently (Often or Very Often) used AI tools.x

In the correlation matrix (Table 2) we can see a statistically significant moderate-sized positive correlation ($p<.001$) between Active AI Use and Learning Depth ($r = .44$); thus, it appears that when students were more likely to question, refine, and synthesize the output from AI, they also reported that they learned much more deeply. Passive AI Use was found to have a nonsignificant and very weak relationship with Learning Depth

(r=0.027, p = .78), which suggests that passively consuming the output from an AI does not provide any apparent benefits to deeper learning. It should also be noted that the very low mean for Passive AI Use (M = 1.80) indicates limited variance in this construct, which may have restricted its ability to predict outcomes statistically. Also, the correlation between Passive AI Use and Active AI Use was nonsignificant (r=0.13, p=.18) providing additional support for the idea that these are distinct constructs.

TABLE 1 DESCRIPTIVE STATISTICS

Variable	Mean	Std Dev
Passive Use	1.795597484	0.726768239
Active Use	4.506289308	0.631167780
Learning Depth	3.949685535	0.758433993

All values shown at full precision. Scale: 1–5.

TABLE 2 CORRELATION MATRIX

	Passive Use	Active Use	Learning Depth
Passive Use	1	—	0.027239331
Active Use	—	1	0.449414406
Learning Depth	0.027239331	0.449414406	1

Shaded diagonal cells = 1.00 (self-correlation). Lower triangle mirrored from upper.

In tables 3.1, 3.2, and 3.3, a multiple linear regression analysis was conducted where Learning Depth served as the dependent variable. The results of the multiple linear regression indicated that a statistical significance existed ($F(2,102) = 13.12$; $p<.001$), however the overall model explained a relatively small percentage (approximately 20%) of the total variability in Learning Depth ($R^2=.203$; Adjusted $R^2=.188$).

Active AI use was found as the only statistically significant predictor ($\beta = .545$, SE = .107, $t = 5.11$, $p < .001$; 95% CI [.335, .755]). For every unit increase in active AI use, there is an expected .545-unit increase in learning depth while passive AI use is held constant. Passive AI use was also found to have no statistical significance ($\beta = .034$, SE = .093, t = .359, p = .718), and had virtually no correlation with learning depth based on its near zero coefficient.

TABLE 3.1 REGRESSION OUTPUT - MODEL FIT STATISTICS

Statistic	Value
Multiple R	0.450541292
R Square	0.202987456
Adjusted R Square	0.187511484
Standard Error	0.683638332
Observations	106

TABLE 3.2 REGRESSION OUTPUT – ANOVA

Source	df	SS	MS	F	Sig. F
Regression	2	12.26010192	6.130050958	13.11629795	0.00000842
Residual	103	48.13822094	0.467361368	—	—
Total	105	60.39832285	—	—	—

TABLE 3.3 REGRESSION OUTPUT – COEFFICIENTS

Predictor	Coeff.	Std Error	t Stat	p-value	Lower 95%	Upper 95%
Intercept	1.55357182	0.491921389	3.158170905	0.002083532	0.577961766	2.529181873
Passive Use	-0.033521485	0.092594806	-0.362023379	0.718076236	-0.217161444	0.150118475
Active Use	0.545083691	0.106619771	5.112407237	0.0000014737	0.333628521	0.756538861

Dependent variable: Learning Depth. Significance F and p-values shown in scientific notation converted to decimal.

The primary finding, that Active AI Use will predict Learning Depth ($\beta = 0.545$, $p < .001$) at a level where Passive AI Use does not ($\beta = 0.034$, $p = .718$), supports the notion that an educationally valuable AI is dependent upon how the student chooses to interact with the AI technology. Students using the AI technology to challenge assumptions, provide feedback, etc., to then combine with the course material are utilizing the type of deep learning behaviors, as found in work by Lee et al. (2024). Conversely, those students accepting the output from the AI technology without question are replicating surface learning behavior in a digital format.

The nearly zero coefficient for passive AI use should be given some thought. While this indicates there could be no harm from passive use of AI technology, it also means students can compartmentalize their use of AI technology and utilize the technology passively for routine items (e.g. summarizing or formatting) while still engaging in deeper ways during the majority of the learning process. Research on cognitive off-loading has indicated that even when students selectively delegate routine processes to the computer, they do not diminish their ability to think critically about higher order processes (Lindo & Cutad, 2024).

The findings above, thus, provide answers to the research questions presented in Introduction. Overall, this study demonstrates that AI directly does not enhance young students' learning depth, especially when used in a passive manner; however, if used actively, AI can significantly deepen students' learning outcomes. This finding is supported by the work of Lathigara et al. who in their 2026 study demonstrated through a quasi-experimental design that if Artificial Intelligence is strategically embedded into an active learning framework, it can substantially improve the cognitive and affective learning experiences of young undergraduate students.

4. Implications for Academia: The PEARL-3T Framework

The research findings suggest a number of applications at all three levels of higher education, namely the student, faculty and institution. This study proposes a model called PEARL-3T (Figure 1), which combines an active cycle of student level engagement with a three-tier institutional structure (3T).

The Student Level Active Engagement Cycle (Pearl Cycle, Tier 1): In order to translate active use of AI into practical, iterative cycles of action, there are five components of the Pearl Cycle. Prompt Critically: A student creates a prompt that clearly articulates their goals/needs so that from the start of the learning experience, cognitive work begins with the learner. Evaluate Output: A student reviews the AI generated output to assess whether it is accurate, based upon reasonable assumptions, and relevant to their needs. Identify Gaps: Based on comparison of the AI output to existing course material(s), a student identifies areas where the AI output may be incomplete or oversimplify information. Refine Understanding: A student iteratively re-prompts the AI until they refine their understanding as a result of each iteration. Connect to Course Outcomes: A student will directly connect the refined understanding to specific CLOs/PLOs in order to ensure the AI assisted learning experience is anchored

to the OBE framework. None of the actions listed above allow for passive behavior; each requires the student to apply critical thinking skills and prior knowledge during each interaction.

Pedagogical Design (Faculty Level, Tier 2): Assessment tasks need to be designed such that students are required and rewarded to exhibit PEARL behaviors. Since assessment tasks using higher levels of Bloom's Taxonomy (analysis, evaluation, and creation) require original synthesis and cannot be produced by passive AI users, tasks that are created using these higher levels of Bloom's Taxonomy are automatically associated with active AI user behaviors. Faculty members can help structure AI dialogue experiences through instructional design (i.e., creating structured activities), which require students to record their AI interaction process, identify areas where AI has limitations, and compare different responses generated from multiple prompts. As faculty development in AI pedagogy becomes formalized, then faculty members will also become able to provide scaffolding support to students regarding how to engage productively with AI tools.

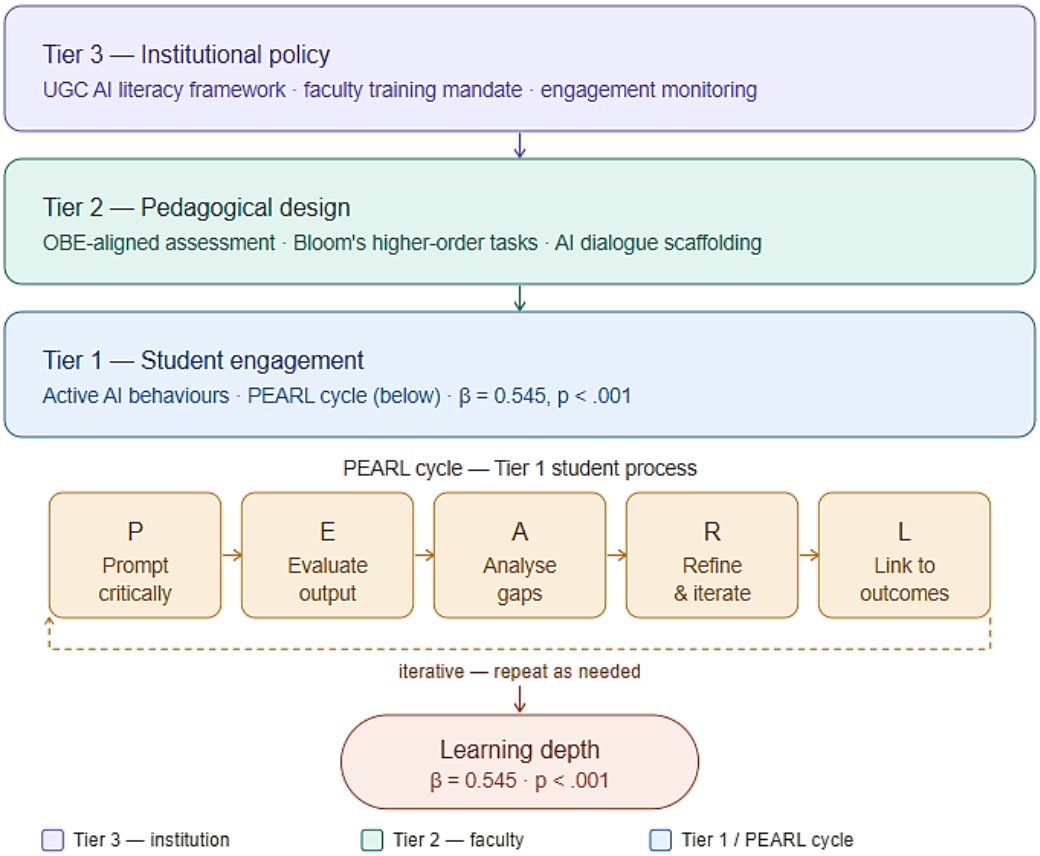


Fig.1 The PEARL-3T Framework

Institutional Policy (Institution Level, Tier 3): University institutions and the University Grants Committee (UGC) need to create a tiered Academic AI Literacy Framework that moves beyond negative academic integrity policy enforcement mechanisms to provide positive direction about productive AI engagement across disciplines. This framework should define minimum AI literacy competencies, mandate student orientation modules on PEARL behaviors at program entry, and establish periodic anonymous surveys, using instruments of the type validated in this study, to monitor engagement patterns across cohorts. Faculty AI pedagogy training should be embedded in onboarding and continuing professional development, ensuring Tier 2 capacity is built and sustained institution-wide.

This framework draws inspiration from the guidance-based ChatGPT-assisted learning aid or GCLA proposed by Lee et al. in their 2024 study that introduced the mechanism to help students reduce their excessive reliance on ChatGPT and other AI tools. By innovating educational assistance and building a more interactive relationship between students and technology, GCLA showed that the power of AI can be harnessed to enhance student learning through active engagement.

5. Conclusion

The arrival and simultaneous adoption of AI in education have radically transformed learning for young students everywhere in the globe, as supported by the current repository of literature; yet little systematic effort has been made to find connections between different manners of AI usage and students' learning depth, specifically in the context of Bangladesh. This study, therefore, undertook an investigation into finding the connection and then proposed a framework for academic institutions to help students effectively use AI in their learning. The findings of the study revealed that while passive AI use barely promotes learning depth among students, active AI use helps them gain much deeper learning through better understanding of concepts, critical analysis of subject matters, and application of knowledge to real-life problems or situations. Supported by the outcomes of GCLA, the proposed framework named the PEARL-3T Framework demonstrated how student engagement, pedagogical design, and institutional policies can be combined to improve AI-assisted learning among undergraduate students of Bangladesh. Though the findings along with the framework were the results of a focused investigation, research was conducted using data collected only from undergraduate students of Bangladeshi private universities. Therefore, future researchers should also direct their efforts to postgraduate students as well as students from public universities in Bangladesh. Also, given that the regression model explained only approximately 20% of the variance in learning depth ($R^2 = .203$), other unmeasured factors likely also contribute to learning outcomes, and these findings should be interpreted with appropriate caution.

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AI as Pedagogical Catalyst or Academic Shortcut? Ethical Disengagement, Learning Practices, Assessment Shifts & Pedagogical Innovation within a Peripheral University ELT Context in Bangladesh

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Abstract
The growing use of generative artificial intelligence (AI) in English Language Teaching (ELT) has amplified ongoing debates about pedagogy, ethics, and assessment, especially within under-resourced peripheral university settings. It is changing how students learn but not in the same way. In contexts like Bangladesh, where resources and support can be uneven, the effects are even more complex. This study looks at how students are actually using AI in their academic work-whether it supports learning or quietly replaces it. This study investigates whether AI functions as a pedagogical catalyst or an academic shortcut by examining patterns of student engagement, ethical perception, and pedagogical response in a Bangladeshi peripheral university. Adopting a mixed-method design, the research combines qualitative data from interviews, classroom observations, and document analysis with quantitative insights from a Likert-scale questionnaire administered to 40 undergraduate students. The findings show that students are not using AI in the same way. Some treat it as a support tool to improve their language skills, working with it to refine their writing. Others, however, use it more directly to complete tasks, often without really engaging with the content. What stands out is that many students no longer see this as a serious issue—they view AI use as normal. At the same time, a smaller group seems aware of the risks and tries to hide their reliance by paraphrasing AI-generated responses. In response, teachers report a shift toward offline and gamified assessment practices to restore authenticity and reduce AI reliance. Drawing on sociocultural theory and critical digital pedagogy, the study suggests that AI use in peripheral contexts is shaped by institutional conditions, uneven digital literacy, learning practice, and digital inequality, calling for context-sensitive pedagogical recalibration.

***Keywords**:* Artificial Intelligence in ELT, Peripheral Universities, Academic Integrity, Ethical Disengagement, AI Literacy, Gamified Assessments, Mixed Methods Research

1. Introduction

The emergence of generative artificial intelligence (AI), particularly large language models such as ChatGPT, has rapidly reconfigured the pedagogical landscape of English Language Teaching (ELT). In language learning contexts, these tools are increasingly used for grammar correction, vocabulary support, idea generation, drafting, and feedback. Recent scholarship suggests that AI can support learner autonomy and extend opportunities for language practice beyond the classroom by enabling students to interact with language in more immediate and individualized ways (Zheng et al., 2023). At the same time, growing concerns have emerged regarding students' overreliance on AI-generated content, the weakening of critical cognitive engagement, and the implications of AI-mediated writing for academic integrity and assessment authenticity.

Within ELT classrooms, these tensions are particularly significant because language production functions both as a learning process and as evidence of learner competence. Existing research has increasingly highlighted concerns regarding dependency on AI-generated outputs, reduced cognitive involvement, and difficulties in distinguishing between supported learning and academic outsourcing (Tikhonova & Raitskaya, 2023). On one hand, AI tools can function as scaffolds that support learners' linguistic development; on the other, they may encourage task completion without meaningful engagement, raising questions about whether AI facilitates independence or fosters dependency.

These dynamics become even more complex in peripheral university contexts such as Bangladesh, where infrastructural limitations, uneven digital literacy, limited institutional guidance, and assessment-driven learning cultures intersect. In such settings, access to AI does not necessarily translate into effective or ethical use. At the same time, teachers are increasingly confronting challenges related to assessment authenticity, especially when written assignments no longer reliably reflect students' actual linguistic competence.

Despite the rapid growth of scholarship on AI in education, much of the existing literature remains focused on well-resourced institutions in Global North contexts. Comparatively limited attention has been given to how AI-mediated learning practices are developing within peripheral or resource-constrained ELT settings, particularly in South Asian higher education contexts. Furthermore, relatively few studies have examined the relationship between AI literacy, prompting competence, ethical perception, and changing assessment practices within a single analytical framework.

Addressing this gap, the present study investigates how students and teachers in a peripheral Bangladeshi university negotiate the opportunities and challenges associated with AI use in ELT classrooms. Moving beyond binary framings of AI as either beneficial or harmful, the study conceptualizes AI engagement as a spectrum shaped by ethical perceptions, institutional structures, and varying levels of digital literacy.

Specifically, the study examines: (1) how students use AI tools for language learning and academic tasks; (2) the ethical perceptions associated with such use; (3) how teachers perceive AI's impact on learning authenticity and assessment practices; and (4) the pedagogical responses emerging in reaction to increasing AI use in ELT classrooms.

2. Literature Review

The integration of artificial intelligence (AI) into education, particularly in English Language Teaching (ELT), has generated a rapidly expanding body of scholarship that spans pedagogical affordances, ethical concerns, and institutional implications. While early research predominantly emphasized the transformative potential of AI as a tool for personalized learning, more recent work has begun to interrogate its deeper impact on knowledge production, learner agency, and the structure of educational systems.

A substantial portion of the literature highlights the pedagogical benefits of AI in language learning. AI-powered tools offer immediate feedback, adaptive learning environments, and opportunities for iterative practice, enabling learners to refine linguistic competence in ways that were previously constrained by classroom time and teacher availability (Zheng et al., 2023). Within a sociocultural framework, such tools can be conceptualized as mediational artifacts that extend learners' engagement within their Zone of Proximal Development.

However, this optimistic framing has been increasingly challenged by research that points to the risks of over-reliance and cognitive outsourcing. Studies focusing on AI-generated writing warn that such practices can lead to diminished critical thinking, superficial engagement with content, and an erosion of authorship (Tikhonova & Raitskaya, 2023). Parallel to these concerns, scholars argue that assessment systems emphasizing measurable outputs over meaningful learning may encourage students to use AI as a shortcut rather than a learning aid (Costa, 2025).

At the same time, the literature increasingly points toward pedagogical adaptation rather than prohibition. Traditional written assessments are widely recognized as vulnerable to AI mediation, prompting educators to experiment with oral examinations, process-based evaluation, and interactive assessment formats. Another critical dimension emerging in the literature is digital inequality, as students with stronger digital literacy are more likely to use AI strategically while others rely on it uncritically. These disparities may be particularly significant in peripheral or under-resourced educational contexts.

Despite the growing body of research, there remains a notable gap in studies examining AI use within peripheral educational contexts, especially in the Global South. Much of the existing literature is based on well-resourced institutions whose conditions differ significantly from contexts such as Bangladesh. This study addresses that gap by investigating AI use within a peripheral Bangladeshi university and providing a context-sensitive understanding of how AI is experienced, interpreted, and utilized by students and teachers.

3. Methodology

This study employed a convergent parallel mixed-method design to investigate patterns of AI use, ethical perception, and pedagogical responses within a peripheral English Language Teaching (ELT) context in Bangladesh. The mixed-method approach combined qualitative and quantitative data to provide a comprehensive understanding of AI-mediated learning and assessment practices.

The study was conducted at a private university outside the major metropolitan educational centers of Bangladesh. The institution represents a peripheral university context characterized by uneven digital access, varying levels of English proficiency, and limited institutional guidance regarding AI use in academic work.

Participants were selected through purposive sampling and included 40 undergraduate students enrolled in English foundation courses and 6 ELT instructors involved in teaching and assessment. To preserve anonymity, pseudonyms were used and no identifying information was included in the study.

Data were collected over a three-month period through four instruments: semi-structured interviews, classroom observations, document analysis, and a Likert-scale questionnaire. Interviews explored patterns of AI use, ethical perceptions, and assessment experiences. Classroom observations examined AI-related learning behaviors and assessment practices. Document analysis focused on student assignments to identify patterns suggestive of AI mediation, while the questionnaire investigated AI use, dependency, ethical attitudes, and perceptions of assessment.

Qualitative data were analyzed using thematic analysis following Braun and Clarke's (2006) framework, while questionnaire data were analyzed using descriptive statistics, including frequencies and percentages. Findings from both datasets were integrated during interpretation to identify areas of convergence and divergence.

To enhance trustworthiness, data triangulation was employed across interviews, observations, documents, and questionnaire responses. Participation was voluntary, informed consent was obtained, and all responses were treated confidentially.

4. Findings

4.1 AI as a Learning Scaffold: Strategic and Development-Oriented Use

A segment of students demonstrated purposeful and reflective engagement with AI tools, using them as scaffolds to enhance language learning rather than replace cognitive effort. These learners reported using AI for grammar correction, vocabulary enhancement, idea generation, and draft refinement. One participant noted:
"It helps me improve my sentences… I usually write first, then check with AI and see what I did wrong."

Quantitative data supports this pattern. Approximately 62% of respondents agreed that AI helps them learn better English, while 57% reported using AI to improve their writing rather than replace it. These findings suggest that AI can function as a pedagogical support tool when used critically and reflectively.

4.2 AI Literacy, Prompting Practices, and Uneven Engagement

A recurring pattern across interviews, observations, and document analysis was the uneven nature of students' AI literacy and prompting competence. While many students had access to AI tools, their ability to formulate effective prompts, evaluate outputs, and revise generated content varied considerably. Students with stronger language proficiency tended to use AI more strategically, whereas others often accepted generated responses without critical evaluation. These findings suggest that access to AI alone does not guarantee meaningful learning and that prompting competence has become an important dimension of language learning in AI-mediated environments.

4.3 AI as an Academic Shortcut: Conscious Outsourcing and Cognitive Disengagement

In contrast, a substantial portion of students engaged in direct academic outsourcing, using AI to generate complete assignments with minimal personal input. Teachers reported encountering assignments that were linguistically advanced beyond students' demonstrated proficiency and difficult for students to explain orally. One instructor remarked:
"Some students submit perfect writing, but when asked, they cannot explain even one sentence."

Quantitative findings reinforce this trend. Approximately 48% of respondents admitted using AI to complete assignments when under time pressure, while 41% reported relying on AI to finish tasks quickly rather than to learn. These findings indicate a tendency toward cognitive disengagement, where task completion is prioritized over learning.

TABLE 1 KEY PATTERNS OF AI USE AND PERCEPTION AMONG STUDENTS

Category	Percentage (%)
AI supports learning	62%
AI use under time pressure	48%
AI not perceived as misconduct	58%
AI use is normalized	61%
Ability to evaluate AI accuracy	38%

4.4 AI as a Veil: Strategic Paraphrasing and Concealment Practices
Between learning-oriented use and direct outsourcing, some students employed AI as a concealment mechanism. Rather than submitting AI-generated content verbatim, they modified wording, paraphrased responses, or combined AI output with limited personal input. Approximately 52% of respondents agreed that modifying AI-generated content makes it acceptable to submit. This finding highlights students' tendency to equate surface revision with originality, blurring the boundary between legitimate assistance and academic misconduct.

4.5 Ethical Disengagement and the Normalization of AI Use
A notable finding was the emergence of ethical indifference toward AI use. Rather than actively justifying or concealing AI use, many students treated it as a normal and inevitable part of academic work.
i."Everyone is using it. So it's normal." *ii."If it helps, why not use it fully?"*

Quantitative findings support this observation. Approximately 58% of respondents did not consider AI-generated content to constitute serious misconduct, while 61% viewed AI as a normal part of student work. These findings suggest a growing normalization of AI-mediated academic practices.

4.6 Digital Divide and Uneven AI Literacy
Although AI tools were widely accessible, students' ability to use them critically varied considerably. While 65% of respondents reported frequent AI use, only 38% expressed confidence in evaluating the accuracy of AI-generated content. This gap between usage and evaluative competence suggests a form of functional dependency and indicates that AI may reproduce existing inequalities rather than serving as an equalizing educational resource.

4.7 Teacher Perceptions and the Crisis of Assessment Authenticity
Teachers consistently reported concerns regarding the authenticity of assessment practices. Traditional written assignments were widely perceived as unreliable indicators of actual student ability. One instructor stated:
"We are no longer sure what we are assessing—the student or the machine." This uncertainty has increased skepticism toward take-home assignments and encouraged experimentation with alternative assessment formats.

4.8 Pedagogical Adaptation: Shift Toward Offline and Interactive Assessment
In response to these challenges, teachers reported adopting offline, in-class, and interactive assessment strategies, including in-class writing tasks, oral defense activities, collaborative exercises, and gamified learning & assessment activities. These approaches were perceived as more effective in capturing authentic student performance and reducing dependence on AI-generated outputs.

Quantitative findings indirectly support this shift, with 67% of students reporting that they perform differently in in-class or interactive tasks than in take-home assignments and they genuinely had to work to gain such performance outputs.

5. Synthesis Of Findings

Taken together, the findings reveal that AI engagement in this context is shaped by a complex interplay of Learning intention (scaffold vs shortcut); Ethical perception (engagement vs indifference); Strategic behavior (veil/paraphrasing); Institutional conditions (assessment design, policy gaps); AI Literacy Gap. Rather than a simple dichotomy, AI functions simultaneously as A pedagogical resource, A performance optimization tool, A concealment mechanism, A normalized academic practice and a new ecosystem of the educational landscape.

At the same time, teachers are actively renegotiating their pedagogical approaches, indicating that the impact of AI is not unidirectional but part of an evolving educational ecosystem, and all may adapt for the greater good.

6. Discussion

The findings of this study complicate dominant narratives surrounding artificial intelligence (AI) in English Language Teaching (ELT), particularly those that frame the issue in binary terms of benefit versus misuse. Rather than positioning AI as either a pedagogical catalyst or an academic threat, the results indicate that AI operates as a force shaped by students' habits, institutional constraints, and assessment design. AI therefore appears not only to introduce new challenges but also to expose pre-existing tensions within educational systems.

One of the most significant findings is the normalization of AI use among students. The emergence of a pragmatic "Que sera sera" attitude suggests a shift away from rule-based academic integrity toward situational decision-making. High levels of AI use coexist with limited ability to evaluate AI-generated content critically, while uneven prompting competence further influences how effectively students engage with AI. These findings indicate that AI use is shaped not only by ethical choices but also by varying levels of digital literacy and evaluative ability.
At the same time, student engagement with AI is not uniformly superficial. While some students rely on AI for task completion and exhibit signs of cognitive disengagement, others employ it strategically as a learning scaffold to improve language proficiency. This supports sociocultural perspectives that view AI as a mediational tool capable of supporting learning. However, the benefits of AI appear unevenly distributed, with students possessing stronger linguistic and digital competencies deriving greater educational value from its use.

The findings also highlight growing concerns regarding assessment authenticity. Teachers reported increasing difficulty in determining whether submitted work accurately reflects students' abilities, leading to a decline in confidence in traditional take-home assessments. In response, many educators have begun experimenting with offline, in-class, oral, and interactive assessment formats designed to emphasize process, participation, and real-time performance.

Taken together, these findings suggest that AI is not simply transforming ELT but reconfiguring the conditions under which learning, assessment, and academic integrity are understood. Rather than relying solely on detection and prevention strategies, educational institutions should develop context-sensitive pedagogical frameworks that integrate AI into learning while promoting critical engagement, ethical awareness, and authentic assessment practices.

7. Conclusion and Implications

This study examined how artificial intelligence (AI) is being engaged, interpreted, and negotiated within a peripheral ELT context in Bangladesh. The findings demonstrate that AI use cannot be adequately understood through binary distinctions such as beneficial versus harmful or ethical versus unethical. Instead, AI emerges as a multi-functional phenomenon, simultaneously operating as a learning scaffold, a shortcut for task completion, and a normalized component of academic practice.

A central finding of the study is the growing normalization of AI use among students. While some learners employ AI critically to support language development, others rely on it unreflectively, leading to cognitive dependency and concerns regarding assessment authenticity. The findings further indicate that differences in digital literacy and evaluative competence shape how effectively students benefit from AI, highlighting the importance of AI literacy within ELT contexts.

The study also reveals that teachers are increasingly adapting assessment practices through offline, in-class, oral, gamified and interactive assessment formats in an effort to preserve authenticity and better evaluate actual student competence. These developments suggest that the challenge posed by AI is fundamentally pedagogical rather than purely technological.

The findings underscore the need for context-sensitive institutional policies, AI literacy initiatives, and assessment designs that promote critical engagement rather than simple prohibition. Future research should continue to investigate AI-mediated learning in underrepresented educational contexts and explore its long-term impact on language learning, assessment, and academic practices.

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[Appendices & Data are available on request]

How to Deliver Lecture with AI Tools for Better Learning, Reducing Pressure on Faculty, and Transforming the Classroom Environment

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Abstract
The integration of Artificial Intelligence (AI) tools in higher education is redefining lecture delivery, faculty workload, and classroom dynamics. This paper examines how AI-powered platforms such as intelligent tutoring systems, automated content generators, real-time transcription, and adaptive assessment tools can enhance student learning while reducing faculty pressure. IT analyzed the transformation of traditional classrooms into interactive, data-driven environments that support personalized learning paths, instant feedback, and predictive analytics for at-risk students. The study identifies key benefits including improved engagement, differentiated instruction, efficient grading, and 24/7 learning support. We also address ethical considerations, implementation challenges, and faculty training needs. A framework for AI-integrated lecture design is proposed, supported by a comparative table of AI tools and a diagram of the AI-enhanced classroom model. The findings suggest that focused implementation of AI tools can create a more equitable, efficient, and effective teaching-learning ecosystem through augmentation rather than replacement of educators.

Keywords: Artificial Intelligence, Lecture Delivery, Faculty Workload, Personalized Learning, Educational Technology, Classroom Transformation, EdTech, ChatGPT, Intelligent Tutoring Systems, AI Ethics

1. Introduction

Higher education is experiencing a paradigm shift driven by Artificial Intelligence (AI), moving from instructor-centered delivery to learner-centered, technology-augmented ecosystems [1-3]. Faculty members face increasing pressure from large class sizes, diverse student needs, administrative tasks, and the demand for continuous content updates. According to UNESCO [5], educators spend 30-50% of their time on non-teaching activities. Simultaneously, students expect interactive, personalized, and flexible learning experiences. AI tools offer a strategic solution by automating repetitive tasks, generating adaptive content, and providing real-time analytics. This paper explores how AI can be systematically integrated into lecture delivery to enhance learning outcomes, reduce faculty burden, and transform the classroom environment. We argue for focused integration of AI tools to augment teaching rather than replace educators, ensuring human mentorship remains central while technology handles scalability and personalization [4-5].

2. AI Tools for Lecture Delivery and Their Impact

Table 1 presents a mapping of key AI tools, their classroom applications, and the primary benefits for students and faculty. These tools align with Bloom's Taxonomy by supporting lower-order tasks like remembering and understanding through automation, freeing time for higher-order activities like analysis, evaluation, and creation during lectures [6]. Studies show that AI-assisted content generation can reduce preparation time from 6 hours to 1.5 hours per lecture [7].

TABLE 1 AI TOOLS FOR CLASSROOM INTEGRATION AND BENEFITS

AI Tool Category	Example Tools	Application in Lecture	Key Benefit
Content Generation	ChatGPT, Claude, Gamma, Tome	Auto-generate slides, quizzes, case studies, lesson plans from syllabus	Saves 60-70% prep time, ensures consistency [7]
Intelligent Tutoring	Khanmigo, MATHia, Century Tech, Duolingo	Real-time Q&A, step-by-step problem solving, adaptive practice	Personalized support, 24/7 access, mastery learning
Assessment & Feedback	Gradescope, Turnitin AI, Quizizz AI, MagicSchool	Auto-grading of MCQs/essays; plagiarism + AI writing detection	Reduces grading load by 80%, instant feedback [8]

Engagement & Interaction	Mentimeter AI, ClassPoint AI, Curipod	Generate live polls, word clouds, quizzes, exit tickets from lecture text	Increases participation to 85%+, formative assessment
Accessibility & Analytics	Otter.ai, Microsoft Reading Coach, IntelliBoard, Fathom	Live transcription, translation, identify at-risk students, attendance	Inclusive learning, data-driven intervention, 90% accuracy

3. Transforming the Classroom Environment with AI

The AI-enhanced classroom shifts from a one-to-many lecture model to a dynamic, feedback-rich ecosystem. Figure 1 illustrates the proposed framework where AI tools mediate between faculty, students, and content. During class, AI facilitates engagement through live polls and captures comprehension data. Post-class, AI provides analytics, personalized revision plans, and flags concepts needing reteaching. This reduces faculty pressure by automating administrative tasks and enables instructors to focus on mentoring, critical discussions, and curriculum innovation [9]. Case studies at Georgia Tech show a 34% increase in student satisfaction when AI assistants were deployed [12]

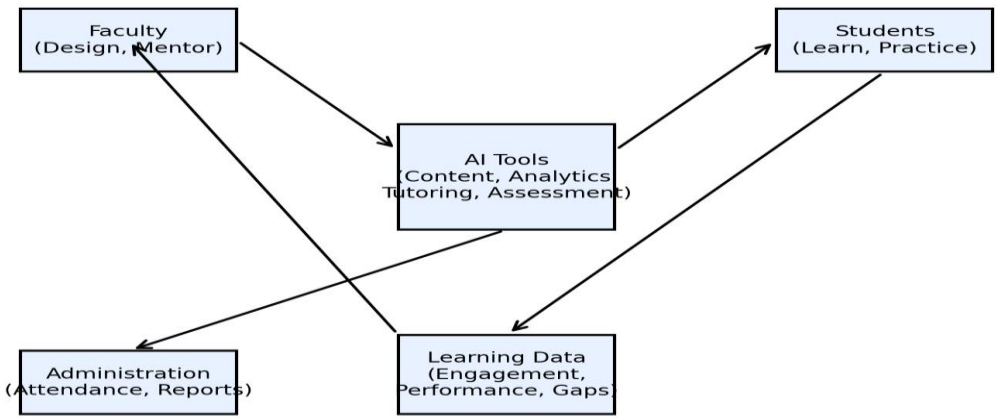


Fig.1 AI-Enhanced Classroom Ecosystem Framework

4. Reducing Faculty Pressure: Practical Strategies

Faculty burnout is a critical issue, with 40% of educators reporting unsustainable workloads [11]. AI addresses this through: 1) Automated Content Creation: Tools like Gamma and Tome convert lecture outlines into full slide decks with visuals in minutes. 2) Intelligent Grading: Gradescope clusters similar answers and applies rubrics automatically, cutting grading time from 10 hours to 2 hours for 200 students. 3) AI Teaching Assistants: Chatbots trained on course material handle 70% of student FAQs outside office hours [12]. 4) Analytics for Intervention: Platforms like IntelliBoard predict dropout risk with 90% accuracy, allowing targeted support. 5) Accessibility Automation: Otter.ai provides real-time captions, reducing accommodation workload. These strategies shift faculty time from routine tasks to high-impact activities like curriculum design and student mentorship.

5. Ethical Considerations and Implementation Challenges

Despite benefits, AI integration requires addressing key concerns. Academic Integrity: AI detection tools are only 68% accurate, necessitating new assessment designs focused on process over product [13]. Data Privacy: Student learning data must comply with FERPA/GDPR; institutions need clear AI data policies. Algorithmic Bias: AI trained on biased data may disadvantage certain groups, requiring human oversight. Digital Divide: Unequal access to devices/internet can worsen inequity if AI is mandated. Faculty Training: 65% of faculty report lacking AI literacy [14]. Solutions include: adopting 'AI-resistant' assessments like oral defenses and in-class writing, establishing AI ethics committees, providing equitable device access, and mandatory faculty development programs. The goal is responsible augmentation, not blind adoption.

6. Why Focus on Augmentation, Not Replacement

While AI can automate content and assessment, the human elements of empathy, mentorship, ethical guidance, and contextual adaptation remain irreplaceable [10]. Meta-analyses show blended human-AI instruction

outperforms AI-only by 23% [15]. AI excels at scale, repetition, and data processing. Faculty excel at inspiration, social-emotional learning, Socratic questioning, and navigating ambiguity. A hybrid model delivers better learning and teaching experiences by combining both. We advocate replacing inefficiencies like manual grading and transcription, not educators. Key benefits of augmentation include: 1) Reduced faculty burnout; 2) Equitable access via 24/7 AI tutors; 3) Higher-order engagement as class time shifts to discussion; 4) Data-informed teaching; 5) Scalable personalization without increasing faculty ratio.

7. Future Directions and Recommendations

To maximize AI benefits, institutions should: 1) Develop AI Literacy Curricula for both faculty and students covering prompt engineering and critical evaluation. 2) Pilot AI Tools in Low-Stakes Settings before full deployment. 3) Redesign Courses using the 'Flipped-AI' model: AI handles content delivery, class time focuses on application. 4) Invest in Infrastructure ensuring campus-wide access and LMS integration. 5) Establish AI Governance with clear policies on use, privacy, and academic integrity. Future research should conduct longitudinal studies on learning outcomes, motivation, and faculty well-being in AI-augmented classrooms across disciplines.

8. Conclusion

Strategic integration of AI tools in lecture delivery transforms classrooms into adaptive, efficient, and student-centered environments. By automating preparatory, administrative, and assessment tasks, AI reduces pressure on faculty and creates space for meaningful pedagogical innovation. The proposed framework, tool mapping, and implementation strategies provide educators a pathway to adopt AI as a teaching partner. Ethical deployment with proper training ensures equity and integrity. The emphasis must remain on augmenting human teaching to achieve better learning, not on replacing the educator's irreplaceable role in inspiration, mentorship, and critical thinking development.

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Exploring Artificial Intelligence Adoption among University Students: An Extended Technology Acceptance Model

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Abstract
The study aims to evaluate how perceived usefulness, perceived usage ease, and perceived evaluation shape students' attitudes, and how attitudes, subjective norms, perceived behavioral control, and behavioral intention influence the use of AI among public university students in Bangladesh. The study collected data from students of public universities in Bangladesh using convenience sampling. We have collected data from 403 participants through a questionnaire designed with a five-point Likert scale. Data were analyzed using IBM SPSS Statistics 27 and SmartPLS 4.1.1.5. The study's findings reveal that perceived usefulness, perceived ease of use, and perceived evaluation positively shape students' attitudes. In addition, attitude, subjective norms, perceived behavioral control, and behavioral intention significantly influence students' desire and actual behavior toward adopting AI tools. Perceived ease of use has the strongest relationship with attitude, while perceived behavioral control is identified as the most influential factor affecting behavioral intention. Moreover, behavioral intention has the strongest influence on actual AI adoption behavior. This is the first study in the Bangladesh context that examines students' actual behavior toward AI, utilizing the Technology Acceptance Model, a framework overlooked in prior research.

Keywords: Artificial Intelligence**,** Adoption, Public University Students, Technology Acceptance Model.

1. Introduction

Technological advancement has brought substantial changes in the way we perform in the digital era (Strielkowski et al., 2025). The application of artificial intelligence (AI) is recognized as one of the innovative change makers. AI has begun to effectively and efficiently influence our daily lives, from customized learning to academic growth. AI has started capturing the attention of academics, students, and policymakers after realizing its performance capacity in education, business, and other fields (Cubric, 2020). Before the 21st century, the notion of utilizing AI was primarily bound in theory, and later it became popular to use it in preparing diagrams and flow charts (Ivanov et al., 2024). AI has developed the capacity to handle complex algorithms and make functions easier for its users to understand. For the ongoing contribution of AI in diverse fields, after launching ChatGPT in November 2022, it has become a major part of the discussion topics among pupils, scholars, and mainstream media (Ali et al., 2023; Rice et al., 2024). Initially, for education perspective, the application of AI was confined to the fields of science, mathematics, technology, and engineering (Quon et al., 2022). At present, AI users have the opportunity to customize the command and utilize it to meet their diverse field's needs, including business, medical, education, and other platforms. Many researchers proposed that AI has started engaging and performing in every dimension to make human tasks easier (Abadie et al., 2023; Dastjerdi et al., 2023). In the education sector, AI's roles can be categorized into two broad dimensions: constructivism and connectivism. Constructivism deals with providing interactive learning opportunities to the students so that they can strengthen their knowledge by building a strong network through interacting with others. Likewise, connectivism focuses on sharing and distributing resources to the networks. According to Ahmad et al. (2022), AI also involves providing access to the students to ask creative questions, problem-solving, and personalized guidance. A good number of researchers state that AI is playing a game-changer role in the educational division (Ali et al., 2024; Huang & Tan, 2023). The tendency to adopt AI tools among the students is gradually increasing for completing assignments, preparing notes, and sitting for exams. When students feel the class lectures are difficult to understand, to make it simple, they take support from the AI tools (Yuce et al., 2019). AI's algorithms have become so strong that they can now easily access real-time data to provide accurate results (Dahri et al., 2025). It can evaluate the user's performance level to solve problems by assessing their chat history, and based on that, it provides superior solutions to its users. It can also create an exam test portal for the students to measure their performance (Soomro et al., 2024).

AI using patterns has become common among university students in Bangladesh. According to Biswas (2023), many studies have been conducted to track Bangladeshi university students by utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT). Ivanov et al. (2024) suggest that incorporating attitude, subjective norms, behavioral intention, and use behavior into the study provides a better understanding of students' AI-

adopting behavior. The study incorporates the Technology Acceptance Model (TAM) to unveil the factors of attitudes and ultimate behavior of students toward adopting AI. According to the TAM theory, perceived usefulness and perceived usage ease positively shape a user's attitude to pursue a specific intention and later behavior (Davis, 1989). To ensure robust contributions to the literature, the study considers the perceived evaluation of AI as an additional factor in the study. We firmly believe that our study will significantly contribute to the four areas. Firstly, this is the first kind of study in Bangladesh considering the TAM theory to adopt AI behavior of university students, although, Alam (2024) and Ferdouse et al. (2025) have conducted a study only on unveiling students' usage patterns of ChatGPT. Secondly, incorporating the TAM theory, our study also unveils the additional perceived evaluation of AI as an additional antecedent of attitudes. Thirdly, our study will meet the knowledge gap and provide directions for the implications to make AI tools productive for the public university students. Finally, incorporating the study's findings and uniting existing studies, potential researchers can make their study impression more evocative.

2. Theoretical Framework and Research Hypotheses

2.1 Theoretical Underpinning

The Technology Acceptance Model (TAM) is derived from the Theory of Rational Action (TRA) (Ajzen & Fishbein, 1980) and the Theory of Planned Behavior (TPB) (Ajzen, 1985). It is employed to look into how people embrace and use technology (Davis, 1989; Venkatesh et al., 2003a). According to Ajzen and Fishbein (1977), TRA assumes that an individual's behavior is determined by their behavioral intentions (BI), which are influenced by subjective norms and attitudes. The insufficient strength of TRA is addressed by TPB, which is an extension of TRA (Ajzen & Fishbein, 1980). Actions over which people have whole volitional control are beyond the scope of TRA. The desire of the individual to carry out a specific behavior is the primary focus of TPB (Marangunić & Granić, 2015). Perceived usefulness (PUa) and perceived usage ease (PUe) are two TAM metrics that may eventually replace the bulk of technological acceptance measures in the TRA and TPB.

2.2 Hypotheses Development

2.2.1 Perceived Usefulness (PUa) toward Attitude

Perceived Usefulness (PUa) is the individual's assessment of whether utilizing some sort of framework will enhance their productivity (Davis, 1989). PUa is the accumulation of benefits a person gets from utilizing a particular system (Liaw & Huang, 2013; Romero-Rodríguez et al., 2023)**.** The Technology Acceptance Model (TAM) confirms that a user's attitude is significantly impacted by the total benefits that the tools offer (Camilleri, 2024). PUa is considered a crucial factor in influencing one's attitude towards adopting new technology (Ge et al., 2023)**.** According to prior studies (Cao et al. 2023; Choe et al. 2021; Liu et al. 2010), users' perception regarding the capabilities of AI tools is positively correlated with their attitude toward using the tools (Du et al., 2023; Shen et al., 2023). In the arena of education, students' perception and attitude toward using AI tools for academic development are positively related (Venkatesh et al., 2003). Considering the above evidence, this study hypothesizes that:

H1: Perceived Usefulness (PUa) positively shapes students' attitudes toward adopting AI.

2.2.2 Perceived Usage Ease of AI (PUe) towards Attitude

PUe refers to how easy it is for one to use it and plays a key role in determining the student's attitude toward adopting the AI. According to the Technology Acceptance Model (TAM), individuals want technology that is effortless for accomplishing their duties (Davis, 1989). A further study conducted by Venkatesh et al. (2003), highlighted how users' perception of the ease of technology significantly impacts their attitude. In the context of education, PUe demonstrates to the students the perception of the accessibility and simplicity of AI systems (Venkatesh, 2000; Venkatesh et al., 2003). Empirical studies found a positive correlation between PUe and attitudes towards using technology. For example, Kumar and Krishnan (2020); Shen et al. (2023) emphasize that how easily students can use AI tools largely determines their level of satisfaction and engagement with AI tools. Considering the above discussion, this study hypothesizes that:

H2: Perceived Usage Ease of AI (PUe) has a significant influence on students' attitudes toward adopting AI.

2.2.3 Perceived Evaluation (PEv) of AI towards Attitude

PEv refers to the user's assessment of the technology's performance and the reliability of the output. When an individual can evaluate the strengths and weaknesses of a certain technology, they can form a perception of whether to adopt it. According to the Technology Acceptance Model, when users can utilize the best tools for the specific tasks and can use the solution among the provided answers, then it creates a positive impression towards using the AI tools (Davis, 1989). This is validated by the Unified Theory of Acceptance and Use of Technology (UTAUT), which posits that users' knowledge and expertness enhance their desire to adopt AI (Venkatesh et al.,

2003). According to Satici et al. (2025); Choung et al. (2023); Ivanov et al. (2024), prior studies have demonstrated that users' PEv capability helps them in making more accurate decisions and assessments to lessen the anxiety about AI errors. Considering the above evidence, this study hypothesizes that:
H3: Students' Perceived Evaluation (PEv) of AI is positively correlated with attitude toward using AI.

2.2.4 Attitude toward Behavioral Intention and Use Behavior
Attitude (AT) is considered the first determinant of intention in the TPB framework. AT indicates a person's agreement or disagreement regarding a specific outcome (Venkatesh & Bala, 2012). According to Londono et al. (2017), AT could be recognized as positive and negative, and it demonstrates the outcome of actions. Armitage and Conner (2001) revealed that rational and irrational factors can influence a person's attitude. A person's intention to perform a specific task is enhanced when they possess a positive attitude. According to a good number of scholars, AT plays a key role in developing a user's intention to adopt AI (Nie et al., 2020; Faham & Asghari, 2019). Similarly, Mohr and Kühl (2021) and Sohn and Kwon (2020) found that a person's AT is the key determinant of their willingness to adopt AI. A positive attitude towards eco-friendly resorts increases tourists' intention to reserve a room (Han et al., 2010). Based on the extant literature review, the following hypothesis has been developed:
H4: Students' favorable attitude has a positive influence on their behavioral intention to adopt AI tools.

2.2.5 Subjective Norms toward Behavioral Intention and Use Behavior
Subjective norms (SN) prioritize an individual's surroundings, people's beliefs, rather than their own. According to Ajzen (1985), a group of people's perception of a specific action influences an individual to follow the same belief. In many societies, SN is considered the accepted code of behavior (Foon et al., 2020). A positive SN influences a person to build a strong willingness to perform what they want to do. A good number of pieces of evidence confirm this relationship, including applying for a patent (Lin & Yu, 2018), using drone logistics delivery (Choe et al., 2021), and digital learning (Chu & Chen, 2016). Similarly, willingness to participate in recycling activities (Tang et al. 2011), purchasing AI packages (Sohn & Kwon, 2020), and participating in enterprising endeavors (Otache, 2019) are largely influenced by SN. Based on the previous literature review, the following hypothesis has been formulated:
H5: Students' Subjective norms have a positive role on their behavioral intention to adopt AI tools.

2.2.6 Perceived Behavioral Control toward Behavioral Intention and Use Behavior
Perceived behavioral control (PBC) indicates an individual's personal judgment regarding the simplicity and complexity of executing a specific job (Ajzen, 2011). According to Chai et al. (2020), PBC evaluates a person's intrinsic and extrinsic abilities for cultivating a role. In the TPB theory, PBC positively influences a person's intention to pursue a specific action (Ajzen, 1991). Many scholars suggest that PBC has a significant impact on individuals in different dimensions, including integration of technologies, meditation, and buying choices (Ajzen 2020; Leong et al., 2023; Choe et al., 2021). Similarly, the PBC also affects people's willingness to practice recycling and purchasing organic foods in their daily necessities (Wang et al., 2019; Yadav & Pathak, 2016). Based on the extant literature review, the following hypothesis has been suggested:
H6: Students' perceived behavioral control positively shapes their behavioral intention to adopt AI tools.

2.2.7 Behavioral Intention toward Use Behavior
Behavioral Intention (BI) indicates a person's instant willingness to take a certain action. According to Ajzen (1991), BI is determined by somebody's attitude, subjective norms, and perceived behavioral control, and that is the most influential determinant of users' behavior in different dimensions, covering sustainable practice, digital marketing, and purchasing behavior (Sari et al., 2025). Numerous studies showed that a person's intention drives them to adopt a new digital device (Ajjan & Hartshorne, 2008). When employees develop an intention to apply AI-oriented tools in their operations, then they really do that. According to Brown et al. (2003), customers who have a higher intention to buy certainly buy more than others. Similarly, Thøgersen (2009) proposed that there is a strong connection between an individual's intention to purchase natural food and actually doing so. Moreover, an individual becomes able to maintain distance during COVID-19 when they develop an intention to ensure social distancing (Das et al., 2021). Based on the above literature review, the following hypothesis has been developed:
H7: Students' behavioral intention has a positive influence on their use behavior to adopt AI tools.

3. Research Methodology
The study was grounded in a positivist philosophy to evaluate the factors influencing the behavior of Bangladeshi public university students in adopting AI tools. We conducted a quantitative analysis based on a deductive

approach. Our study focused on the age group of Bangladeshi public university students, aged 18 to 27, using a Google form due to its familiarity to the respondents. We designed our questionnaire on a five-point Likert scale for collecting data because of its familiarity to the respondents and to increase the response rate of the survey (Revilla et al., 2014), ranging from 5 for "Strongly Agree" to 1 for "Strongly Disagree," which indicates the responder's level of agreement with each item. Our questionnaire consists of two parts. The first part covers the demographic information of the respondents, which we analyzed using IBM SPSS 27. The second part contains the measurement items of the study, analyzed using SmartPLS 4.1.1.5. We received 403 responses through convenience sampling method from the total population size of 7,25,971 (BES, 2023). According to Saunders et al. (2023), a sample size of 384 is considered adequate when the population exceeds 10,00,000, given a 5% acceptable margin of error. The sample size should be 5 to 10 times higher than the number of variables used in the study (Hill, 1998). Similarly, if the sample size exceeds 10 times the highest path of the inner or outer model, then the size would be considered ideal (Goodhue et al., 2012). Hence, our study's sample size of 403 meets the minimum suggested response to enhance the study's eligibility.

4. Results

4.1 Respondents' demographic characteristics

We collected 403 responses through a valid questionnaire for the study. Among the respondents, the majority of the respondents (52.4%) were male, and the remaining 47.6% were female (Table 1). Regarding their age group, the highest number of respondents was 20–24 years, accounting for 78.2% of the total respondents. The response percentages for the age groups under 20 and above 24 years were 15.1% and 6.7%, respectively. The university types indicate that all respondents attended public universities (100%). Additionally, the study level reveals that the majority of the respondents were undergraduate students (62.3%), with the remainder being graduate students (37.7%).

TABLE 1 RESPONDENTS' DEMOGRAPHIC CHARACTERISTICS

Demographics	Classification	Number	Percentage	Cumulative Percentage
Gender	Male	211	52.4	52.4
	Female	192	47.6	100
Age Group	Under 20	61	15.1	15.1
	20–24	315	78.2	93.3
	Above 24	27	6.7	100
University Type	Public	403	100	100
Study Level	Undergraduate	251	62.3	62.3
	Graduate	152	37.7	100

Source: Authors' own work, 2026

4.2 Model evaluation

The study's construct has been evaluated in two different stages. At first, reliability and validity were checked to investigate the model. Later we investigate the model with beta-values, t-values, R^2 and f^2. Moreover, we follow the PLS bootstrapping 5000 to determine beta-coefficient, t-statistics, R^2 and f^2 values.

4.2.1 Measurement model evaluation

The reliability of the measurement items of a study determines their capability to express what it intended to state. Indicator reliability determines the uniformity of the different measurement methods and ensures items are bias-free. The construct's total reliability for the study is examined by the internal consistency (Cronbach's alpha) and composite reliability. A cutoff value for the reliability is 0.70 (Hair et al., 2021). The study's results show that all the calculated values of the composite reliability are within the benchmark, ranging from 0.849 to 0.907 (Table 2).

TABLE 2 CORRELATION MATRIX

	AT	BI	PBC	PEv	PUa	PUe	SN	UB
AT	0.903							
BI	0.344	0.876						

PBC	-0.077	0.367	0.880					
PEv	0.194	0.021	-0.035	0.905				
PUa	0.395	0.181	0.015	0.009	0.862			
PUe	0.517	0.129	-0.009	0.138	0.231	0.866		
SN	0.002	0.343	-0.05	-0.047	-0.035	-0.021	0.907	
UB	0.240	0.696	0.249	0.033	0.112	0.067	0.259	0.878
CA	0.887	0.848	0.903	0.890	0.826	0.889	0.893	0.852
CR	0.888	0.849	0.907	0.892	0.827	0.891	0.900	0.852
AVE	0.816	0.767	0.774	0.819	0.742	0.750	0.823	0.771

Source: Authors' own work, 2026

LV. Latent variable: AT = Attitude, PEv = Perceived evaluation, PUa = Perceived usefulness, PUe = Perceived Usage Ease, PBC = Perceived behavioral control; BI = Behavioral intention, SN = Subjective norms, UB = use behavior, CA = Cronbach's alpha, CR = Composite reliability, AVE = Average variance extracted. To measure the validity of the study, we investigate the convergent validity and discriminant validity of the construct. Convergent validity depicts the level of similarity among the different evaluation methods. Average Variance Extracted (AVE) is a valuable method for determining convergent validity, and the measurement value should be greater than 0.50 (Hair et al., 2021). The findings of the study show that AVE values are greater than 0.50. Discriminant validity is calculated using a correlation matrix and Heterotrait-monotrait (HTMT) ratio. Table 2 represents that the square root of the Average Variance Extracted (AVE) for a construct exceeds the correlations of the study's construct (Fornell & Larcker, 1981). The Heterotrait-monotrait (HTMT) ratio is best for evaluating the discriminant validity, and the threshold for this is 0.85 (Henseler et al., 2015). Table 3 represents the HTMT that all the measurement values are within the threshold.

TABLE 3 HETEROTRAIT-MONOTRAIT RATIO OF CORRELATIONS

	AT	BI	PBC	PEv	PUa	PUe	SN	UB
AT								
BI	0.395							
PBC	0.088	0.416						
PEv	0.219	0.036	0.039					
PUa	0.462	0.214	0.050	0.032				
PUe	0.582	0.146	0.047	0.155	0.269			
SN	0.032	0.391	0.061	0.052	0.050	0.044		
UB	0.276	0.819	0.284	0.051	0.133	0.083	0.294	

Source: Authors' own work, 2026

4.3 Structural model

4.3.1 Structural model evaluation

The inner model's assessment demonstrates the model's descriptive capability, analytical capability, level of significance, and alignment with a structured model. The variance inflation factor (VIF) should be assessed to ensure the fairness of the regression outcomes. According to Hair et al. (2021), VIF values for both inner VIF and outer VIF are less than 3, which is ideal (VIF <3). Study's inner VIF lies between 1.000 to 1.078, and outer VIF lies between 1.794 and 2.933, which are within the suggested standard range. Besides, we assessed β, R^2, and f^2 values for the study. β values of 0.10 - 0.20, 0.20 - 0.50, and 0.50 or above indicate a little, good, moderate, and significant relationship in the social science field (Hair et al., 2019). Figure 1 and Table 4 show that only PUa has a small impact on AT (β = 0.132), and only BI has a strong impact on UB (β = 0.696); the others, PUe on AT, PEv on AT, AT on BI, SN on BI, and PBC on BI, have moderate influential power. Figure 1 represents the R^2 values for AT (0.365), for BI (0.405), and for UB (0.484), demonstrating moderate to strong explanatory power in the social science field (Hair et al., 2019).

4.3.2. Results on Hypotheses Testing

The results of hypotheses testing are presented in Table 4. In hypothesis 1, we assumed that students' attitudes toward AI are positively correlated with their intention to use AI. The result of the study demonstrates that the effect is positive and significant (β = 0.294, t-value = 7.604, p = .000). Hence, our H1 is supported. Similarly, we

assessed the other hypotheses of the study and found that H2 (β = 0.431, t-value = 11.495, p = .000), H3 (β = 0.132, t-value = 3.356, p = .000), H4 (β = 0.375, t-value = 9.971, p = .000), H5 (β = 0.363, t-value = 10.207, p = .000), H6 (β = 0.414, t-value = 10.958, p = .000), and H7 (β = 0.696, t-value = 27.329, p = .000), are also significant. Thus, H2, H3, H4, H5, H6, and H7 are also supported.

TABLE 4 HYPOTHESES TESTING

Hypothesis	Path Relations	β	t-estimates	P value	Decision
H1	PUa → AT	0.294	7.604	***	Supported
H2	PUe → AT	0.431	11.495	***	Supported
H3	PEv → AT	0.132	3.356	***	Supported
H4	AT → BI	0.375	9.971	***	Supported
H5	SN → BI	0.363	10.207	***	Supported
H6	PBC → BI	0.414	10.958	***	Supported
H7	BI → UB	0.696	27.329	***	Supported

Source: Authors' own work, 2026
Note: p-value: ***p<0.005.

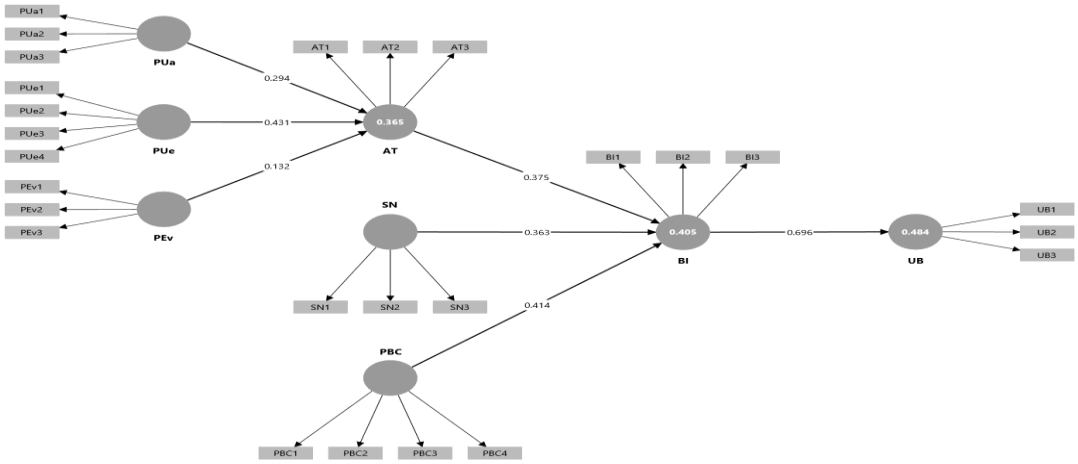


Fig.1 Structural equation model

5. Conclusion

As the use of AI patterns has sharply increased among students, scholars are concentrating more on knowing why students are engaging more with innovative AI tools. The results provide quantitative evidence that perceived usefulness, perceived usage ease, and perceived evaluation play a valuable role in shaping students' attitudes. This study contributes to the literature by providing extant support on the factors of students' attitudes, behavioral intention, and use behavior. It provides significant insights for academics and policymakers to design and formulate strategies for the betterment of students. Moreover, further research is needed to investigate the long-term AI adaptation behavior of the students.

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Environmental Burden and AI Ethics: Developing Quality Education

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Abstract
Generative AI tools such as ChatGPT are rapidly integrating into higher education, reshaping how students are learning, yet their misuse is raising concerns about learning quality, fairness and academic integrity. This study aimed to inspect the frequency and patterns of AI misuse among undergraduate students in Bangladesh and assess its impact on the educational environment and learning outcomes. A quantitative, cross-sectional survey design was used and data were collected from 1700 Bangladeshi undergraduates to measure AI misuse, AI consumption intensity, learning outcomes, ethical awareness, and educational environmental burden. To portray AI misuse as a systemic burden rather than just an isolated misconduct, the study applied an adapted IPAT framework (Population × AI Consumption × Technological Strength). Findings indicate that AI use is rigorous and normalized, however, misuse happens at a moderate level. Regression results partially support H1: AI Misuse increases Educational Environmental Burden., while results partially support H2: Higher AI Consumption predicts weaker Learning Outcomes. However, the H3 got rejected, giving new insights on education and ethics. In effect, the study recommends ethical AI literacy, assessment redesign, clear AI use guidelines, and selective monitoring to reduce AI-driven educational burden and protect learning integrity.

***Keywords**:* Generative AI, Academic Integrity, AI Misuse, Learning Outcomes, Ethical Awareness, IPAT Model, Educational Environmental Burden, AI Ethics

1. Introduction

Generative artificial intelligence (AI) technologies like ChatGPT are quickly being adopted in higher education and are changing the way students learn and perform academic tasks. These technologies enhance efficiency and inclusivity but their pervasive and often unregulated use poses risks to learning outcomes, academic integrity and assessment fairness. These concerns are particularly relevant in Bangladesh, given the rapid uptake of these tools by students and the lag in institutional policies and assessment practices. This paper explores the prevalence and patterns of AI misuse and consumption among undergraduate students in Bangladesh, and its associations with learning outcomes and educational environmental burden. To understand misuse as a systemic risk rather than individual misconduct, the study uses a modified IPAT model (Population × AI Consumption × Technological Strength) to describe how misuse prevalence, intensity, and technological invisibility can amplify institutional risk. Through a large cross-sectional survey of Bangladeshi undergraduates, the study assesses associations between AI misuse, intensity of AI consumption, learning outcomes (memory, understanding, originality, and academic ownership), and educational environmental burden (integrity and fairness erosion, institutional strain), while examining ethical awareness as a potential moderator. The results will inform evidence-based recommendations for ethics education, assessment reform, and balanced governance to ensure responsible co-existence of AI in higher education.

2. Adapted IPAT – A data driven model

The IPAT model was created by Paul Ehrlich and John Holdren in the early 1970s, with Environmental Impact (I) defined as: $I=P\times A\times T$. This research extends IPAT to model AI misuse as an educational risk, where P is the prevalence of misuse (number of students misusing AI), A is the intensity of AI use in academic work, and T is technological strength (undetectability, the proportion of AI-generated work that cannot be detected). National data supports a multiplicative approach: in 2023-4, nearly 7,000 cases of proven AI cheating were reported (approximately 5.1 per 1,000 students), and survey findings show 88% of students use AI tools, and up to 94% of AI-written work is undetected, demonstrating the compounding effect of prevalence, intensity, and invisibility. Using the Westbridge case, we set P=6980, A=0.88, and T=0.94, and define a unitless Educational Impact (EI) score as $EI=P\times A\times T$. Plugging in these values, we get $EI=6980\times 0.88\times 0.94=5770$, which is the compounding effect of a high-risk population, high AI use, and poor detection of AI-written academic work.

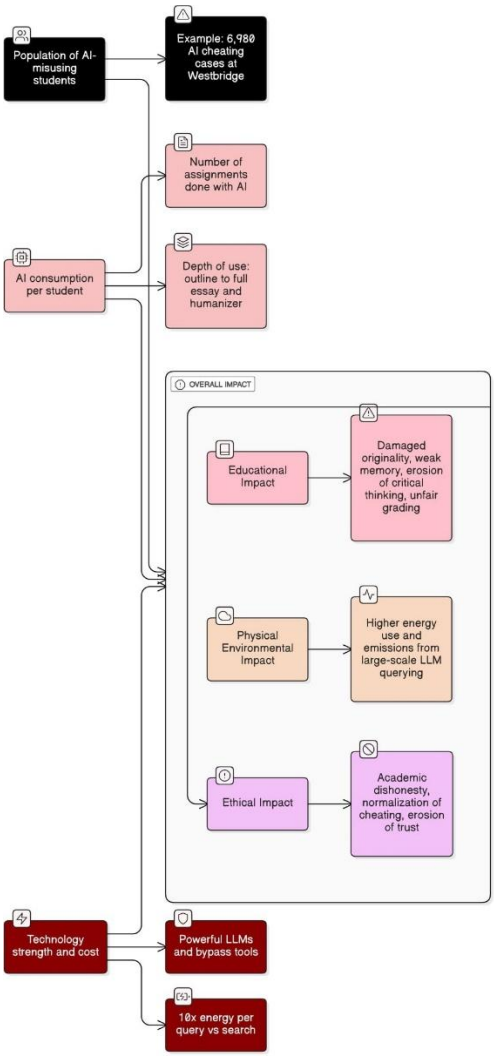


Fig.1 Adapted IPAT

3. Hypothesis & Conceptual Model

• H1: AI Misuse increases Educational Environmental Burden.
• H2: Higher AI Consumption predicts weaker Learning Outcomes.
• H3: Ethical Awareness moderates AI Misuse (protective influence).

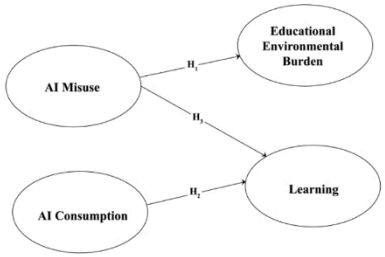


Fig.2 Conceptual Model

4. Design & Methodology

A convenience sampling method will be used for the survey and sample size will be 1700 (N=1700). The target population will be undergraduate students of private universities in Bangladesh due to their relevant exposure and unlimited access to technology (LLMs). The survey will contain Likert questions (eg; 1-5, where 1 represents strongly disagree and 5 represents strongly agree). The process will be done through Google forms and responses will be analyzed by SPSS software. Variables to be used are: Ai misuse (AIM), Ai consumption intensity (AICI), Learning outcome (LO), Educational Environmental Burden (EEB) and Moderating factors like Ethical awareness (EA). The educational environmental impact will be computed by an adapted IPAT model: EI = P x A x T where EI = Environmental Impact and environment means (Educational environment), P = Ai misusing student population, A = Consumption of LLMs and T = the strength of technology. The study will also run sensitivity analysis by testing how EI will shift under alternative assumptions of T (low/medium/high vulnerability).

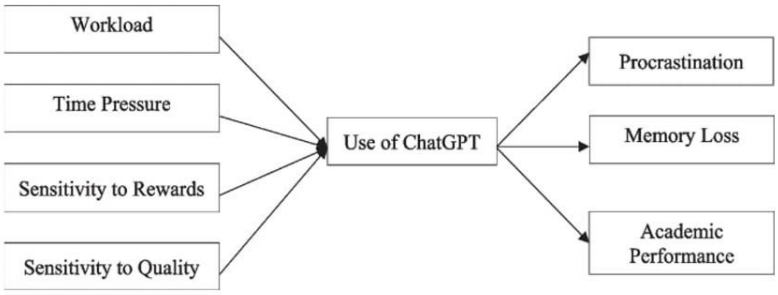


Fig.3 Current state of students (model)

5. Analysis

5.1 Reliability Analysis

All constructs demonstrated good to excellent internal consistency, confirming the reliability of the measurement scales.

TABLE 1 RELIABILITY STATISTICS

Variable	Cronbach's Alpha	Interpretation
AI Misuse (AIM)	0.770	Good
AI Consumption (AICI)	0.789	Good
Learning Outcomes (LO)	0.794	Good
Educational Environmental Burden (EEB)	0.852	Excellent
Ethical Awareness (EA)	0.785	Good

Overall, all scales met reliability thresholds, supporting the validity of subsequent analyses.

5.2 Regression Results: Educational Environmental Burden (H1)

Five regression models were estimated using Educational Environmental Burden (EEB) items as dependent variables and AI Misuse (AIM1–AIM5) indicators as predictors. Results show statistically significant models for integrity- and quality-related burden dimensions, while fairness-related burden is not significant.

TABLE 2 REGRESSION RESULTS FOR EDUCATIONAL ENVIRONMENTAL BURDEN (EEB): MODEL-LEVEL SIGNIFICANCE

EEB Dimension	Model p-value	Result
EEB1 (Unfair evaluation)	p = 0.689	Not significant
EEB2 (Integrity weakened)	p = 0.004	Significant

EEB3 (Institutional strain)	p = 0.099	Marginal
EEB4 (Honest students disadvantaged)	p = 0.059	Marginal
EEB5 (Threat to education quality)	p = 0.028	Significant

Interpretation: Overall, H1 is partially supported (weak): AI misuse predicts selected burden dimensions (especially integrity/quality-related outcomes), but the pattern is not consistent across all EEB dimensions.

5.3 Regression Results: Learning Outcomes (H2)

Learning outcome items (LO1–LO5) were regressed on AI misuse (AIM1–AIM5) and AI consumption (AICI1–AICI5) indicators. All models are statistically significant at the model level with small explained variance.

TABLE 3 REGRESSION RESULTS FOR LEARNING OUTCOMES (LO): MODEL-LEVEL SIGNIFICANCE AND FIT

Learning Outcome	R^2	Model p-value	Result
LO1 (Memory)	0.069	$p \approx 2.93 \times 10^{-22}$	Significant
LO2 (Understanding)	0.066	$p \approx 4.55 \times 10^{-21}$	Significant
LO3 (Originality)	0.047	$p \approx 9.20 \times 10^{-14}$	Significant
LO4 (Ownership)	0.038	$p \approx 1.32 \times 10^{-10}$	Significant
LO5 (Learning without AI)	0.025	$p \approx 2.51 \times 10^{-6}$	Significant

Interpretation: H2 is partially supported: learning outcomes are significantly associated with AI-related behaviors, but the incremental role of AI consumption alone is weaker and may vary when AI misuse is controlled.

5.4 Moderation Test: Ethical Awareness (H3)

To test whether Ethical Awareness (EA) moderates the effect of AI Misuse (AIM) (protective influence), AIM and EA were mean-centered and an interaction term (AIM×EA) was added. Moderation is evaluated using the interaction coefficient and ΔR^2.

TABLE 4 MODERATION RESULTS (H3): INTERACTION TERM (AIM×EA)

DV	Interaction B	p-value	R^2	ΔR^2
EEB_mean	−0.0011	0.9567	0.3408	0.0000
LO_mean	−0.0013	0.9578	0.1352	0.0000

Interpretation: The interaction term is not significant for either outcome, and ΔR^2 is effectively zero. Therefore, H3 is rejected / not supported: ethical awareness does not moderate the relationship between AI misuse and educational burden or learning outcomes.

TABLE 5 HYPOTHESIS TESTING SUMMARY (UPDATED)

Hyp.	Statement	Decision
H1	AI misuse increases educational environmental burden	Partially supported
H2	Higher AI consumption predicts weaker learning outcomes	Partially supported
H3	Ethical awareness moderates AI misuse (protective influence)	Rejected

6. Discussion & Recommendations

6.1 Discussion related to findings and literature

Generative AI is an everyday part of life in Bangladeshi universities, but the latest findings reveal the academic effects of generative AI are not a simple "good or bad" narrative. The results show a mixed but significant pattern: AI misuse is related to some aspects of educational environmental burden, learning outcomes are significantly

related to AI usage with small effect sizes, and ethical awareness does not act as a statistical "shield" when AI misuse happens. This mix supports the theory that AI misuse is not just an individual ethics problem, it is a systemic problem when many students use AI frequently and universities do not have clear boundaries, assessment designs and governance. Theoretically and from a literature perspective, the findings support the idea that generative AI transforms misuse from plagiarism to "AI-authorship" that is difficult to detect, and causes institutional pressures and trust problems. Our partial support for H1 aligns with literature arguing integrity and degree value are the most obvious consequences of AI misuse. Students may not always perceive misuse as "unfair evaluation" because fairness is affected by other factors like grading leniency, teacher differences, peer ability, and workload. But the weakening of integrity and perceived threats to education quality are consistent with academic integrity theory: if AI misuse is widespread and hard to detect, then the institution's integrity and learning culture are damaged. Likewise, H2 being partially supported aligns with learning theory and recent research on cognitive offloading: AI can be time-saving but can undermine deep processing, originality, memory encoding and ownership if it substitutes for reading and thinking. The small effect sizes also indicate that learning is a complex process with many factors (teaching quality, motivation, time, assessment) influencing it, so AI is not the only factor. The failure to support H3 is a key finding. Many ethics models assume that increased ethical awareness leads to better behaviour. Our finding suggests a more realistic process: students can be aware of ethics, but it does not necessarily mitigate misuse effects under high academic pressure. Students can be aware of the rules, but misuse AI due to time constraints, fear of poor grades, competition, AI accessibility, and inconsistent enforcement. This finding confirms a common message in applied ethics and behavioural science: knowledge and attitudes are not always sufficient to change behaviour unless there are supports for ethical behaviour. For our model, it means that ethical knowledge is not enough, and structural interventions are required to make it easier to do the right thing and harder to misuse AI. In terms of implications, the study has several practical and policy implications. For higher education, the findings indicate that a detection-only strategy is insufficient. Given misuse is part of the integrity and quality problem, universities should aim to minimise "substitution use" (students using AI to replace their own thinking) rather than outlawing AI. The results endorse a hybrid governance model: education plus assessment redesign plus limited monitoring. For teachers, the message is to change assessment so that it focuses on process as well as product. Process grading, draft trails, reflection statements, oral assessment, in-class writing, and applied tasks can minimise misuse incentives and retain valid signals of learning. For policymakers and quality assurance agencies, the research supports the development of national guidelines on acceptable and unacceptable use of AI, with examples, disclosure standards and minimum standards for assessment integrity in universities.

6.2 Recommendations

Based on the findings, the following actionable and realistic recommendations are proposed:

Integrate Ethical AI Education: Universities should introduce compulsory AI ethics and literacy modules to clarify acceptable and unacceptable AI use.

Redesign Assessment Methods: Increase the use of in-class tasks, oral presentations, reflective journals, and process-based grading to reduce AI misuse.

Establish Clear AI Usage Policies: Institutions should publish transparent, student-friendly AI guidelines with concrete examples rather than vague restrictions.

Promote Responsible AI Use: Encourage supervised use of AI as a learning aid rather than a content generator to reduce cognitive offloading.

Adopt a Hybrid Governance Approach: Combine ethics education, assessment redesign, and selective technological monitoring instead of relying solely on detection software.

Continuous Policy Review: Regularly update institutional policies to keep pace with evolving AI capabilities and misuse patterns.

Collaboration between Institutions and AI companies: To save the learning environment and establish fairness, AI companies should collaborate with universities and educators to design LLMs for students' use that can limit misuse from the root.

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Alokbartika: An Interactive Programming Education Platform for Teenager Learners

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Abstract
The digital classrooms have posed new challenges for programming education, especially for beginners and early secondary school students. The traditional way of teaching is not always effective online, leading to less engagement, slower feedback and problems with self-guided problem-solving. Students often find programming concepts abstract, lacking sufficient guidance and instruction, leading to confusion with coding tools. There are online coding platforms available to practice coding, but they are not tailored to be used by young learners and do not offer curriculum alignment, interactive guidance, or engaging learning experiences. In this paper, the idea of creating an integrated and easy-to-use browser-based coding environment for school-level learners (Grades 6-8) of Bangladesh, named Alokbartika, is being presented. It provides one environment for the browser, reducing IDE confusion, real-time AI-assisted guidance, structured step-by-step learning modules and intelligent feedback systems. Elements of gamification and multimedia content, such as Bangla audio instructions, are included to enhance motivation, accessibility, and conceptual understanding. The proposed system is intended to address the existing gap in the field of digital programming education and offer a scalable solution to improve digital programming education in the context of SDG 4 (quality education).

***Keywords**:* Digital Classroom, Delayed Feedback, IDE Confusion, Programming Language, AI-Assisted Guidance, Multimedia Content, Bangla Audio Instructions, Gamification

1. Introduction

Digital technologies are evolving in a way that has transformed education into a different space (Tarafdar et al., 2025). Today, online and blended learning have become the new norms globally (Shohel et al., 2021). While these changes have made education more accessible and flexible for many, they have also introduced significant challenges, particularly in teaching programming to children. The implementation of the United Nations Sustainable Development Goal 4 (SDG 4: Quality Education) increasingly emphasizes the importance of equitable and inclusive digital literacy for everyone (Hajdukiewicz & Pera, 2020).

Transitioning to online coding can be challenging for middle school students in grades 6–8. During this developmental stage, students, typically aged 11 to 14, are moving from concrete to abstract thinking. Programming is often viewed as abstract and difficult. As a result, students miss out on traditional in-person mentorship, immediate feedback, and hands-on laboratory experiences (Ahmad et al., 2020). This demographic is frequently disadvantaged by conventional online teaching methods, which can lead to feelings of learning isolation, reduced engagement, and difficulty in grasping fundamental computational concepts.

In Bangladesh, it is estimated that only a small number of students in grades 6-8 are aware of concepts of programming, out of a very large population of school-level students. The preliminary results show that many students are familiar with the idea of programming, but only a much smaller group has gained practical experience in it. This highlights a significant gap between awareness and actual skill development in early programming education.

To fill this gap and make it compatible with SDG 4.4, which calls for "significantly increasing the proportion of youth with relevant, transferable and entrepreneurial skills", this paper introduces Alokbartika, an integrated, localized and beginner-friendly platform that eradicates technical complexities and offers interactive, voice-guided inputs in Bangla to create an inclusive digital education ecosystem.

2. Problem Statement

Online coding platforms (OCPs) such as HackerRank, CodeForces, and CodeWars lack several key features for children. These platforms do not allow kids to interact with one another, receive immediate feedback, learn in a game-like environment, or access age-appropriate problem sets. Additionally, there is a shortage of structured

frameworks to support teachers in effectively integrating these tools into their classrooms. The existing platforms also do not provide sufficient monitoring and assessment capabilities related to school evaluation practices. This limitation prevents teachers from effectively observing students' performance and adjusting their teaching methods accordingly.

3. Objectives

The general objective of this study is to design and develop an interactive browser-based programming learning platform that enhances students' programming skills, engagement, and problem-solving abilities through AI-supported guidance, multimedia learning, and structured programming education. Specifically, the study focuses on the following objectives.

i. To develop a browser-based interactive programming learning platform with built-in IDE, Bangla audio guidance, and AI support.
ii. To provide a structured learning path from basic logic to Python programming.
iii. To increase student engagement through gamification and multimedia content.
iv. To improve student problem-solving skills and learning outcomes using AI-based guidance.

4. Literature Review

Education in programming has become an essential component of the modern curriculum, with programming skills increasingly recognized as necessary for success. As technology has advanced rapidly, there has been a greater emphasis on understanding how to effectively teach and learn programming. Additionally, attention is being directed towards the challenges students face and how digital tools and platforms can enhance the learning experience.

TABLE 1 COMPARISON OF EXISTING STUDIES

Author	Key Contribution	Research Gap
Sakeef et al. (2025)	Variety of frameworks and their corresponding coding schemes have been utilized to examine students' cognitive engagement detection within an online learning environment.	These frameworks can be inadequate to identify cognitive engagement.
Lai et al. (2025)	The model combines CDIO with real-time code visualization to not only enhance programming skills but also promote sustainable education via project-based learning.	The limitations are that there was a quasi-experimental design over the years, only project scores were used, no qualitative data, and only one system for Scheme.
Wan (2025)	Supports the effectiveness of online assessment systems for formative evaluation and balancing of automated assessment	Validate existing studies, challenge assumptions, educator impact, policymaker insights, practical benefits, and intelligent online assessment tools.
Ou et al. (2023)	Programming education's ambiguous status can be identified, the gender gap and curriculum defects can be identified, and improvement measures can be put forward.	Fails to consider limitations, biases and external influences outside of the school, teacher and student level.
Swacha and Muszyńska (2023) [9]	explores how readily available student demographic information can be used to accurately predict drop-out rates.	Only compared two similar MOOCs and data from 1,585 students, which reduces the generalizability of the findings, but still provides value for further research.
Feklistova et al. (2021)	Differences between completers and non-completers in assessment achievement, identifying impact of engagement and problem-solving on achievement.	Limited to participants who completed one four-week Estonian-language Python MOOC and has been reduced as some participants opted out of the use of their performance data.
Zinovieva et al. (2021)	Compare the characteristics of different online platforms.	Lack of in-depth research on their effect on skill development in programming.
Förster et al. (2021)	Identifies three important strategies for sustainable intervention (based on student experiences of pandemic, and SDG 4) which have not been explored in student-perspective research: support, communication, and engagement.	Information not available for privacy/ethics reasons. Learners' regular learning routines have been disrupted by the pandemic.

The analyzed papers (see Table 1) emphasize the increasing significance of online education, programming education, engagement of learners, assessment systems and predictive analytics in contemporary education. Some studies aimed at enhancing the detection of cognitive engagement, programming learning skills, the effectiveness of online assessment, the prediction of student retention and sustainable learning practices. The research conducted by Sakeef et al. (2025) and Lai et al. (2025) showed how advanced frameworks, coding schemes and real-time visualization systems can be used to augment online learning and programming education. Other researchers, such as Swacha and Muszyńska (2023) and Feklistova et al. (2021), have studied predictive methods for student dropouts and the prediction of differences in student achievement.

Although these contributions have been made, there is still a great deal of research that is needed. Small sample sizes, a narrow range of participants, failure to carry out a qualitative analysis, platform-specific implementations, and inadequate attention to external factors that impact student performance limited many studies. Other studies also failed to comprehensively analyze long-term skill development, learning behavior of the students and educational impact in the real world.

5. Methodology

5.1 Requirement Analysis and Curriculum Mapping

The primary objective of this phase is to make sure that the platform is technically feasible and pedagogically suitable for young learners (Grades 6-8) in Bangladesh. The major emphasis of target audience analysis is on 11-14 year olds' cognitive level and, in particular, on the reduction of English language barriers and syntax anxiety. The functional requirements are a single browser-based IDE (no software installation, Bengali voice guidance, real-time hints from AI and a gamified dashboard. The platform is lightweight and stable, and is designed to run on low-end school computers that are equipped with low-bandwidth internet connections. Three steps in the curriculum lead students from "no-code logic" to "Python proficiency" as described in Table 2.

TABLE 2 CURRICULUM MAPPING ACROSS LEARNING STAGES

Stage	Focus Area	Key Activity
Stage 1: Logic First	Computational Thinking	Solve logic problems and sequences without coding.
Stage 2: Visual Bridge	Structural Understanding	Structural understanding of loops and conditions using drag and drop blocks.
Stage 3: Textual Python	Syntax & Problem Solving	Write real Python code in the Live Code Explorer using AI.

5.2 System Architecture

The proposed system is based on secure authentication, as shown in Fig. 1. Users can register or login and the system starts a new session and recognizes their role (Student or Admin).



Fig.1 System Architecture and User Flow Diagram

A multi-layered security architecture has been put in place (Fig. 2) that includes password hashing, HTTPS/TLS encryption, and SQL injection protection to ensure data integrity.

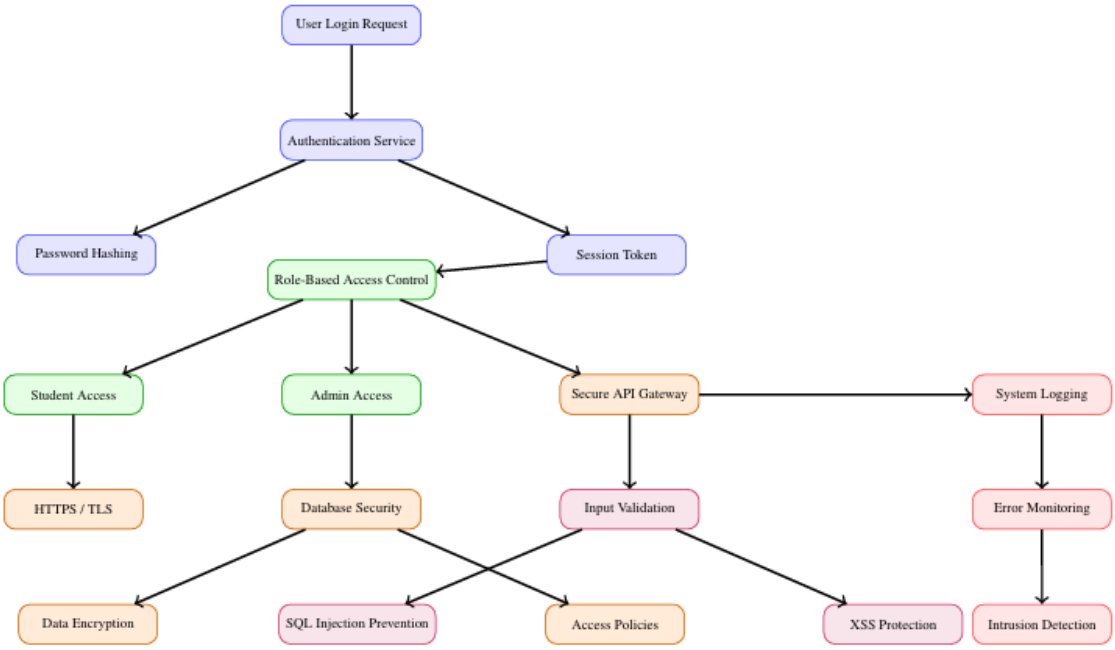


Fig.2 System Security Architecture and Data Protection Layers

The Learning Module Controller handles the core mechanism of learning as illustrated in Fig. 3. Students can communicate using Reading, Visual or Practical mode. This Web IDE is built-in and enables live execution of code, integrating an AI Assistant for diagnostics and a Gamification engine for XP and badges for progress rewards.

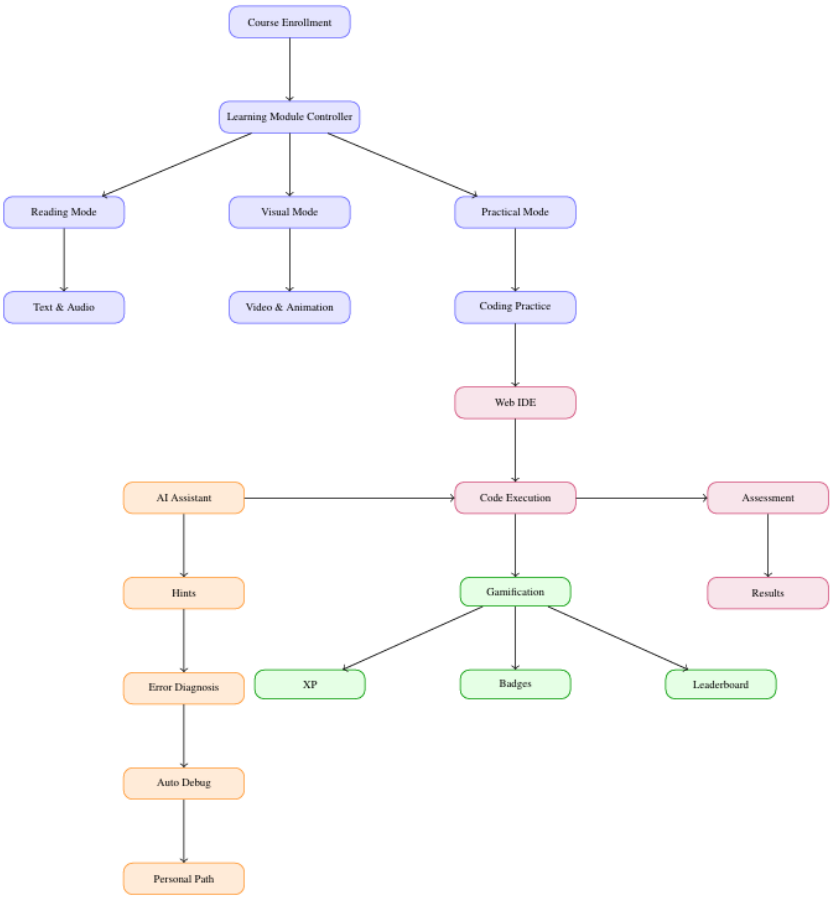


Fig.3 Educational Content Delivery and Code Execution Workflow

5.3 Pedagogical Strategy: CDIO Framework

Alokbartika project follows the Model of Conceive, Design, Implement, Operate, which is known internationally for engineering and technical education. Table 3 shows the mapping of the CDIO phases with the learning theory and platform implementation.

TABLE 3 CDIO PHASE-MAPPED LEARNING IN ALOKBARTIKA

CDIO Phase	Learning Theory	Implementation in Alokbartika
Conceive	Scaffolding (Vygotsky) & ZPD	Students use logic puzzles to identify problems, construct conceptual understanding in their ZPD, and then code.
Design	Dual Coding Theory (Paivio)	Students create solutions through the use of visual block coding. Bengali audio, along with visuals, helps to create a reduced cognitive and linguistic overload.
Implement	Piaget's Constructivism & Cognitive Load Theory	Students program designs in Python through a web-based IDE to minimize setup preparation and focus on active knowledge building.
Operate	Self-Determination Theory	Students operate and test code through the teacher dashboard. Increased motivation and autonomy with gamification (XP, badges).

5.4 Pilot Implementation and Testing

The main purpose of this step is to test and show the platform to users and evaluate its technical and educational success. The pilot will be conducted over a period of two weeks in a controlled environment in the ICT laboratory of one of the local schools, which will consist of 20-30 students in grades 6-8. During this period, the students will complete between 5 and 10 learning modules.

5.5 Evaluation Criteria and Data Collection

An improvement of the suggested platform will be judged based on quantitative and qualitative criteria. There are three evaluation strategies used:

- Pre-test and Post-test Analysis: Analyzes students' programming knowledge before and after using the platform.
- Learning Analytics (Admin Dashboard): AI can monitor the number of attempts and identify the common errors in the system dashboard.
- User Satisfaction Survey: Evaluated the usefulness and fun of Bangla voice guides and gamification features to students.

5.6 *Feedback System*

To ensure that the platform is educationally sound, they conducted post-session interviews to gain feedback from all stakeholders, which included questions that addressed how intuitive the UI/UX was and whether the AI assistance was understood. Monitors will provide qualitative feedback on how easily they could monitor student progress through the dashboard and the platform's alignment with classroom goals. A Technical Design Log will be kept to document any technical problems, delays in cloud execution, or audio/visual synchronization problems that occur during the pilot.

6. Contributions

This provides an integrated, browser-based programming environment that includes a built-in IDE, Bangla audio instructions, and real-time AI assistance. It aims to eliminate common learning barriers such as IDE confusion, language difficulties, and delayed feedback for young learners in Bangladesh. It further contributes a structured curriculum that guides students from basic logical thinking and block-based visual coding to actual Python programming, ensuring a smooth, age-appropriate progression. Gamification elements (XP, badges) and interactive multimedia content are incorporated to enhance student engagement and motivation. The platform significantly reduces the need for teacher intervention on syntax errors by providing instant AI-driven feedback. We are providing pretest and posttest results that demonstrate measurable improvements in learning outcomes. Additionally, user satisfaction surveys confirm the positive impact of localized Bangla voice guidance and accessibility. This makes the system a scalable solution for delivering quality programming education at the secondary level.

7. Conclusion

This paper introduces a novel solution for programming education in Grades 6-8 in Bangladesh, which is localized and innovative. Its seamless integration of AI-powered mentorship, Bangla multimedia content, and a zero-setup IDE streamlines the learning curve and removes technical and language barriers. This project is not a typical education project to develop computational thinking and problem-solving skills. It has been designed for the early secondary level, but could be extended to the upper levels. Finally, Alokbartika aims to promote a generation of confident and competent Bangladeshi students in a digital world and help bridge the digital divide.

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BAC Expert Bot: An Automated Pre-Evaluation System for Accreditation Documentation Using RAG-Augmented LLM and Hybrid Compliance Scoring

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Abstract
The Bangladesh Accreditation Council (BAC) evaluates program quality across 63 structured criteria under 10 standards, demanding departments to prepare exhaustive and precisely structured documentation. Faculty members frequently lack domain-level accreditation expertise, leading to poorly constructed documents, repeated revisions, and delayed outcomes. We propose BAC Expert Bot, a secure, responsive, multi-agent AI web application enabling university departments to pre-evaluate, score, and refine accreditation documents prior to BAC submission. The system accepts Word and PDF inputs, routing content through specialized agents that evaluate document sections against all 63 BAC criteria. A Retrieval-Augmented Generation (RAG) pipeline grounds each evaluation in a curated knowledge base of BAC-approved documents. Sentence-BERT handles structural similarity scoring, while a private-GPU-deployed Qwen2.5-72B LLM generates expert-level explanations and actionable recommendations. The CASCADE algorithm provides deterministic rubric-compliant scoring. Institutional confidentiality is enforced throughout via secured private infrastructure. BAC Expert Bot aims to standardize higher education quality across Bangladesh by making accreditation expertise universally accessible.

Keywords: Accreditation Automation, BAC, RAG, Multi-Agent LLM, Higher Education Quality Assurance, Bangladesh.

1. Introduction

Higher education quality assurance has emerged as a critical policy priority across the developing world, where accreditation frameworks serve as the primary instrument for standardizing program quality and safeguarding graduate employability. In Bangladesh, systemic concerns over curriculum relevance, institutional accountability, and graduate competitiveness led to the enactment of the Bangladesh Accreditation Council (BAC) Act in 2017 [1], establishing a formal, criteria-driven accreditation regime for higher education programs. The BAC framework is structured around 10 overarching standards encompassing 63 discrete evaluation criteria that collectively assess curriculum design and learning outcomes, faculty qualifications and professional development, student support services, research activity, institutional governance, physical infrastructure, and financial sustainability [2]. Attaining BAC accreditation carries substantial institutional consequences: it directly affects a program's national and regional recognition, influences graduate employability in regulated professions, and determines eligibility for government funding and international academic partnerships.

Despite this strategic importance, the documentation preparation process remains one of the most resource-intensive and error-prone undertakings in the higher education sector. Faculty members and departmental administrators who bear primary responsibility for compiling accreditation evidence are typically disciplinary experts with limited familiarity with BAC's procedural expectations, criterion-specific evidence standards, and documentation conventions [3]. This knowledge gap generates a predictable set of recurring failures: submissions that are structurally incomplete, evidence misaligned with evaluative criteria, justifications that do not demonstrate compliance in the format expected by assessors, and cyclical patterns of panel feedback, revision, and resubmission that can delay accreditation outcomes by months or even years. The problem is structurally amplified by resource inequities: established metropolitan universities may draw on experienced accreditation consultants and accumulated institutional memory from prior cycles, while private universities, newly established programs, and institutions in secondary cities or rural areas, which constitute the majority of the higher education landscape in Bangladesh- lack equivalent support [4]. This asymmetry directly undermines the BAC's foundational objective of standardizing academic quality across the full spectrum of the sector.

Recent advances in large language models (LLMs), dense semantic embedding, and retrieval-augmented generation (RAG) have created a qualitatively new class of tools for document evaluation and structured

compliance assessment [5]. Unlike earlier rule-based or keyword-matching approaches, modern AI systems engage with the semantic substance of institutional documentation assessing whether a curriculum narrative genuinely demonstrates alignment with stated learning outcomes, whether faculty qualification records substantively satisfy applicable standards, and whether evidence is presented with the specificity and consistency that BAC rubrics require. When grounded in domain-specific knowledge, these capabilities can deliver analytical depth previously achievable only by experienced human reviewers, and at a scale and speed that makes pre-submission evaluation accessible to all departments regardless of institutional resources.

This paper proposes BAC Expert Bot, a secure, responsive, multi-agent AI web application that enables university departments to pre-evaluate, score, and refine their accreditation documentation prior to formal BAC submission. The system accepts institutional documents in Word and PDF formats and routes their content through a multi-agent pipeline in which specialized agents independently assess each of the 63 BAC criteria. A RAG pipeline grounds every evaluation in a curated knowledge base of previously BAC-approved documents, ensuring that feedback is anchored in verified accreditation exemplars rather than unconstrained model generation. Sentence-BERT is employed for structural similarity scoring at the criterion level, while a private-GPU-deployed Qwen2.5-72B LLM generates detailed, expert-quality explanations and actionable improvement recommendations. Deterministic compliance scoring is performed by the proposed CASCADE (Checkpoint-Aware Scoring with Cumulative Accreditation Driven Evaluation) algorithm, which validates LLM outputs against the official six-band BAC rubric through a structured checkpoint evaluation process. Institutional data confidentiality is enforced end-to-end via private infrastructure, with no document content transmitted to external APIs at any stage.

The principal contributions of this work are as follows:

1. LLM benchmarking for accreditation. Seven LLMs across three families (Qwen, DeepSeek, LLaMA) are evaluated for rubric-based scoring, establishing Qwen2.5-72B as the optimal deployment model.
2. Three-tier RAG-augmented pipeline. A modular system covering criterion-aware ingestion into Milvus, semantic retrieval, and CoT-prompted LLM evaluation across all 63 BAC criteria.
3. CASCADE scoring algorithm. A checkpoint-aware step-down algorithm validating LLM outputs against the BAC six-band rubric with a bonus mechanism for partially satisfied bands.
4. Privacy-preserving tiered architecture. A two-tier service model on private GPU infrastructure with automated gap logging and BAC-formatted reports.

2. Literature Review

Accreditation systems rely heavily on documentation quality as a determinant of outcomes, independent of actual programmatic quality [6]. Studies across South and Southeast Asian institutions consistently show that inexperienced faculty produce significantly weaker documentation regardless of actual program quality [7, 8] a structural gap that automated pre-evaluation tools can directly address. The BAC's 63 criteria across 10 standards demand both substantive accuracy and formal alignment, yet most departments receive feedback only after formal submission, creating costly revision cycles.

NLP and ML applications have advanced from surface-level essay scoring to criterion-referenced compliance evaluation. Transformer-based models can evaluate curriculum documents against accreditation standards with inter-rater reliability comparable to trained human evaluators [9]. BAC Expert Bot's multi-agent architecture, deploying specialized agents per criteria cluster rather than a single model, addresses known capacity dilution in multi-standard evaluation [10, 11]. RAG addresses LLM hallucination by grounding generation in retrieved authoritative content [12, 13]. Sentence-BERT (SBERT) produces semantically meaningful embeddings supporting cosine similarity scoring even when surface wording differs [14], while the LLM layer generates qualitative, actionable feedback that scores alone cannot provide. Accreditation documents contain sensitive institutional data that commercial API services cannot safely handle [15, 16]; BAC Expert Bot deploys inference on private GPU infrastructure, implementing data minimization principles appropriate for institutional confidentiality requirements [17].

3. Methodology

BAC Expert Bot is organized as a three-tier pipeline: (i) Data Ingestion and Vector Storage, (ii) Semantic Retrieval and AI Evaluation, and (iii) Compliance Validation and Reporting. Each tier is functionally independent, enabling modular updates without end-to-end redesign. Figure 1 presents the architectural overview.

3.1 Open-Source Model Evaluation and Selection

A systematic evaluation of seven candidate open-source LLMs across three model families (Qwen, DeepSeek, LLaMA) was conducted to identify the model best suited to instruction-following capability and deployment feasibility. Models were assessed across parameter scale, VRAM requirement, infrastructure cost, and instruction-following quality on structured rubric-based scoring tasks via controlled prompt trials using representative BAC criterion descriptions and synthetic evidence excerpts.

TABLE 1 OPEN-SOURCE MODEL EVALUATION SUMMARY

Model	Params	VRAM Req.	Infra Cost	Instruction Following	Status
Qwen-7B	7B	~16 GB	Low	Moderate	Rejected
Qwen-14B	14B	~28 GB	Moderate	Good	Rejected
DeepSeek-7B	7B	~16 GB	Low	Moderate	Rejected
DeepSeek-67B	67B	~130 GB	High	Very Good	Shortlisted
LLaMA-3-8B	8B	~18 GB	Low	Moderate	Rejected
LLaMA-3-70B	70B	~140 GB	Very High	Excellent	Shortlisted
Qwen2.5-72B*	72B	~144 GB	Very High	Excellent	Selected ✓

As shown in Table 1, models in the 7B–14B parameter range demonstrated insufficient instruction-following quality for nuanced rubric-driven scoring, consistently failing to maintain structured output formats and producing unreliable justifications. LLaMA-3-70B and Qwen2.5-72B demonstrated markedly superior performance. Qwen2.5-72B was selected as the primary evaluation model based on superior multilingual document comprehension, optimized instruction-tuning for long-context structured tasks, and availability under a permissive open-source license suitable for institutional deployment.

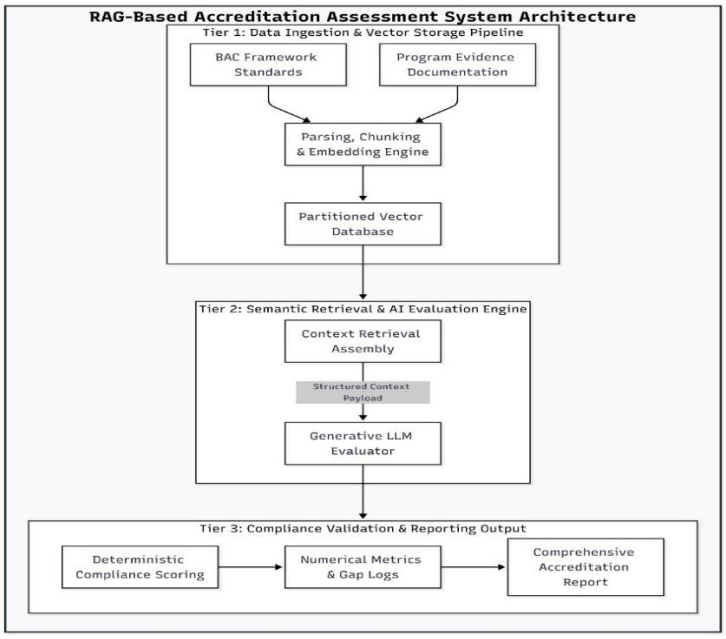


Fig.1 Three-tier pipeline architecture of BAC Expert Bot.

3.2 Tier 1: Data Ingestion and Vector Storage

Two primary document categories serve as system inputs: (i) BAC Framework Standards—official criteria, rubrics, and compliance benchmarks parsed and embedded into the vector database for criterion-level retrieval; and (ii) Program Evidence Documentation, institutional records, policies, and procedures submitted by the HEI/POE as the evidentiary basis for compliance evaluation.

All input documents undergo multi-stage preprocessing: parsing from native formats (PDF, DOCX) into plain text, followed by segmentation into overlapping chunks using a sliding window strategy. Chunk boundaries are determined by a combination of logical document structure and token length constraints. Chunk sizes range from

150–300 tokens for supporting evidence files to 400–600 tokens for annual reports and self-study documents, with BAC Framework Standards chunked at criterion-level section boundaries (300–500 tokens) and program evidence documents at policy/procedure paragraph boundaries (200–400 tokens). Each chunk is annotated with structured metadata document type, criterion reference identifier, source file name, page range, and timestamp- used to filter and rank retrieved chunks during semantic retrieval. Text chunks are encoded into dense vector representations using a sentence-transformer embedding model selected for strong performance on formal institutional and regulatory language. All embeddings are stored in a partitioned Milvus vector database organized by criterion category and document type, supporting approximate nearest-neighbor (ANN) search with configurable similarity thresholds.

3.3 Tier 2: Semantic Retrieval and AI Evaluation Engine

For each BAC criterion scheduled for assessment, a natural language query is constructed from the criterion description and its associated rubric descriptors. This query is embedded using the same sentence-transformer model employed during ingestion and used to retrieve the top-k most semantically similar chunks from the vector database, scoped to the relevant partition to avoid context contamination. Retrieved chunks are ranked by cosine similarity and assembled into a structured context payload subject to the LLM's effective context window constraint.

The structured context payload is embedded within a carefully engineered prompt template providing: (i) the full BAC criterion and sub-criteria descriptions, (ii) the complete six-band rubric, (iii) the retrieved evidence context, and (iv) explicit output format instructions requiring a numeric score, band label, and structured justification citing specific evidence elements. Chain-of-thought (CoT) prompting is incorporated to encourage systematic reasoning prior to score assignment, improving both interpretability and reliability of model outputs. The assembled prompt is submitted to Qwen2.5-72B-Instruct; in production deployment, inference will be performed entirely within the local institutional environment, ensuring no accreditation documents or evaluation outputs are transmitted to external APIs.

3.4 Tier 3: Compliance Validation and the CASCADE Algorithm

The proposed CASCADE (Checkpoint-Aware Scoring with Cumulative Accreditation Driven Evaluation) algorithm provides a deterministic rubric-based module to validate LLM-generated evaluations against the official BAC compliance rubric. The rubric consists of six score bands and four sequential checkpoints: (P1) adoption and practice, (P2) policy and procedural support, (P3) document sufficiency, and (P4) evidence adequacy (Table 2).

TABLE 2 BAC COMPLIANCE SCORING RUBRIC

Score	Level of Compliance
100%	1. The HEI/POE adopted the criterion and formalized in practice for at least four semesters/two years. 2. Policies, procedures and strategies, as applicable, are available for systematic adoption and maintenance of the criterion. 3. Document(s) is/are available that demonstrates the adoption and maintenance of the criterion appropriately and consistently without any gaps/lapses. 4. Evidence(s) is/are clear enough to support the adoption and maintenance of the criterion appropriately and consistently without any gaps/lapses.
80% to less than 100%	1. The HEI/POE adopted the criterion and practicing since last two semester/one year. 2. Policies, procedures and strategies are, as applicable, available for systematic adoption and maintenance of the criterion without significant gaps/lapses. 3. Document(s) is/are available that demonstrate the adoption and maintenance of the criterion at a satisfactory level without significant gaps/lapses. 4. Evidence(s) is/are clear to support the adoption and maintenance of the criterion at a satisfactory level without significant gaps/lapses.
60% to less than 80%	1. The HEI/POE decided to adopt the criterion and practice is at the early stage. 2. Policies, procedures and strategies, as applicable, for systematic adoption and maintenance of the criterion need improvement. 3. Document(s) is/are not sufficient and, in some cases, need improvement. 4. Evidence(s) are not sufficient and clear enough to support the adoption and maintenance of the criterion at a satisfactory level.
40% to less than 60%	1. The HEI/POE did not adopt the criterion systematically but practicing occasionally/irregularly. 2. No documented policy, procedure or strategy for adoption and maintenance of the criterion. 3. Document(s) is/are not sufficient to demonstrate the adoption and maintenance of the criterion. 4. Evidence(s) are not sufficient and clear enough to support the adoption and maintenance of the criterion. Need attention to address the weaknesses in system and documentation.
20% to less than 40%	1. The HEI/POE did not adopt the criterion but practicing occasionally/irregularly. 2. No policy, procedure or strategy for systematic adoption and maintenance of the criterion. 3. No document(s) or evidence(s) is/are to support the adoption and maintenance of the criterion.

	4. No significant evidence(s) is/are available to support the adoption and maintenance of the criterion. Need serious attention to address the weaknesses in system and documentation.
0	No initiative/process takes place to adopt and maintain the criterion.

Algorithm 1 CASCADE: Checkpoint-Aware Scoring with Cumulative Accreditation Driven Evaluation

```
Require: Evidence set E for criterion c; rubric R with bands B = {100, 80, 60, 40, 20, 0};
         checkpoints P = {P1, P2, P3, P4} per band; bonusPerPoint = 5
Ensure:  Final score s_final

 1: s_final ← 0
 2: failedAt ← P1    ▷ Start from P1 in the first band
 3: carriedPoints ← 0  ▷ Count of checkpoints passed in previous bands
 4: for each band b ∈ B in descending order do
 5:     passed ← true
 6:     for each checkpoint p ∈ {failedAt, ..., P4} do
 7:         result ← Evaluate(E, b, p)
 8:         if result = false then
 9:         passed ← false
10:          failedAt ← p    ▷ Record which checkpoint failed
11:          break    ▷ Drop to next lower band
12:          end if
13:     end for
14:     if passed = true then
15:         if b = 100 then
16:         s_final ← 100   ▷ No bonus needed, already maximum
17:         else
18:         s_final ← b + (carriedPoints × bonusPerPoint)  ▷ e.g. 80 + (1 × 5) = 85
19:         end if
20:         return s_final   ▷ Early stopping
21:     end if
22:     carriedPoints ← failedAt − 1  ▷ Number of checkpoints passed so far
23: end for
24: return 0   ▷ Returns 0 if no band satisfied
25: function Evaluate(E, b, p)
26:     criterion ← GetCriterion(R, b, p)
27:     if E satisfies criterion then
28:         return true
29:     else
30:         return false
31:     end if
32: end function
```

The CASCADE algorithm begins from the highest score band and evaluates each checkpoint in order. If a checkpoint is satisfied, the system proceeds to the next. If it fails, the system moves to the next lower band, resuming from the failed checkpoint while retaining previously satisfied checkpoints. This step-down process ensures the final score reflects the lowest compliance level required by the rubric, incorporating a bonus mechanism for partially satisfied higher bands (e.g., 80 + 1×5 = 85). The LLM provides structured checkpoint-level judgments and evidence-based justification, while CASCADE assigns the final score band deterministically. Outputs with unclear justification or inconsistency with rubric logic are flagged for human review.

4. System Design and Service Architecture

BAC Expert Bot is implemented as a responsive web application accessible across devices. Document inputs (Word and PDF) are accepted through a secure upload interface. The multi-agent orchestration layer assigns specialized agents per BAC standard domain, enabling parallel evaluation across all 63 criteria. The free standard tier provides automated AI-driven pre-evaluation with structured scoring and gap logs; the premium subscription tier provides access to verified BAC-approved human expert consultation for final-stage review and targeted criterion support. Institutional data confidentiality is enforced throughout: LLM inference executes entirely on private GPU infrastructure, no document content is transmitted to external cloud services, and all evaluation outputs are scoped to the requesting institution. Figure 2 mentioned some screenshot directly from websites.

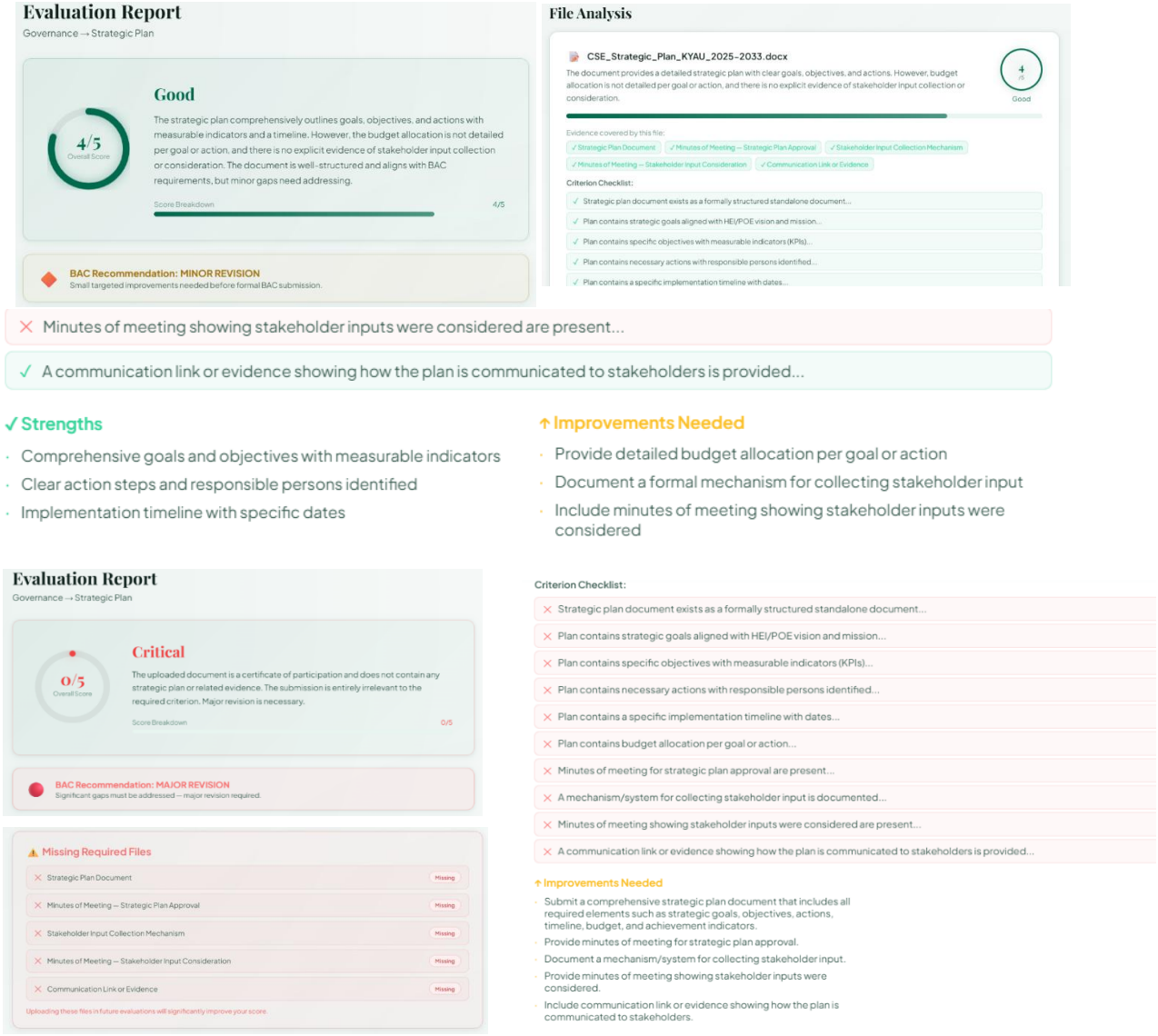


Fig.2 UI from the live BAC Expert Bot web application showing the main dashboard interface.

Fig. 2 presents screenshots from the live BAC Expert Bot web application illustrating the criterion-level evaluation workflow. The top panel displays a Critical-scored Evaluation Report for the Governance – Strategic Plan criterion, identifying missing required files and flagging a BAC recommendation of Major Revision. The bottom panel shows a contrasting Good-scored report for the same criterion, with a detailed File Analysis view highlighting satisfied checklist items alongside identified gaps. Both panels demonstrate the system's capacity to generate structured compliance feedback, evidence-referenced criterion checklists, and actionable improvement suggestions in real time.

5. Conclusion

BAC Expert Bot presents a principled and practically grounded solution to the accreditation preparation gap in Bangladeshi higher education. By integrating RAG-grounded LLM evaluation, SBERT-based semantic scoring, and the CASCADE deterministic compliance algorithm within a secure multi-agent architecture, the system enables departments across all resource levels to receive expert-quality, criterion-specific feedback prior to formal BAC submission. The tiered service model democratizes access to accreditation expertise, while private-infrastructure deployment addresses the institutional data sensitivity requirements inherent to the accreditation context. Future work will include prospective validation of CASCADE scoring against official BAC assessor judgments, fine-tuning on the full corpus of BAC-approved documentation, and integration of cross-lingual support for Bangla-medium evidence documents.

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AI in Business Education - Transforming Teaching, Learning, and Future Workforce Readiness: A Literature Review

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Abstract
This is an age of Artificial Intelligence (AI) transforming higher education and influencing the future of business school education globally. The learning experience, pedagogy, curriculum development and workforce preparation have been transformed by generative AI technologies, such as ChatGPT, adaptive learning, predictive analytics and intelligent tutors. This review explores how AI is being integrated into business schools, the implications for pedagogy, student learning outcomes, preparing for the future workforce, ethical issues, and institutional adjustment. The paper reviews the most recent literature and reflects on the impact of AI technologies on the transformation of business education to a personalized, data-driven and human-AI learning experience. The results demonstrate the potential of AI to enhance the effectiveness of teaching and learning, customize learning, and promote future skills. Academic dishonesty, the inadequacies of government, the inadequacy of teachers, cognitive dependency, and policy uncertainty are of some importance, but they are problems of academic honesty, inadequacies of government, inadequacies of teachers, cognitive dependency, and policy uncertainty. The study also underscores the need for AI literacy, critical thinking, ethical consciousness, and the capability to work alongside AI systems since they are crucial for the students to adapt and prosper in AI-driven work environments. Finally, these results highlight key areas of research that require further investigation and research in the future to enable AI to be integrated in a sustainable way into business schools that have a human-centered approach.

***Keywords**:* Artificial Intelligence, Business Education, Generative AI, Workforce Readiness, Higher Education, AI Literacy, Human-AI Collaboration

1. Introduction
Artificial intelligence (AI) is one of the most disruptive technologies today, used by organizations and educational institutions. The advent of machine learning, natural language processing, predictive analytics, and generative artificial intelligence (AI) systems has revolutionized knowledge generation, sharing, and utilization across various sectors. In the context of higher education, there is increasing integration of AI technologies in teaching and learning, administration, assessment, and curriculum development (Dubey & Crevar, 2025). AI-driven economies and digitally transformed workplaces are placing heavy pressure on business schools to adjust their educational models to meet fast-changing needs. The emergence of generative AI tools such as ChatGPT, Gemini, Claude, and AI platforms for analytics has fueled conversations about the future of business education. Currently, AI technologies can produce reports, analyze business information, make presentations, create simulations of strategic decisions, and assist in real-time problem-solving. Consequently, business schools are beginning to rethink conventional pedagogical approaches and shift toward more individualized and competency-based learning models that utilize technology (Stetar et al., 2024). This change is also strongly associated with the rise of Industry 5.0, in which human-centered technological integration, interaction between humans and smart systems, and digital responsiveness are becoming key skills that the workforce needs to master. Graduates who can think critically, apply ethical judgment, demonstrate emotional intelligence, be creative, and work collaboratively with AI are increasingly in demand in the workplace (Alahmed et al., 2023; Taghipour & Lu, 2025). Thus, business schools should rethink their curricula and learning environments to equip students for the AI-enhanced working environments of the future. While the use of AI in education is becoming more widespread, concerns remain regarding ethical governance, academic integrity, cognitive dependence, faculty readiness, and institutional preparedness. As the use of generative AI (GAI) tools grows, it is essential to consider several key issues, such as originality, critical thinking, the validity of assessment tools, and responsible use of AI in education (Jyoti, 2026; Pahuja et al., 2024). Moreover, there is still no clear governance structure for the use of AI in many HEIs and no sustainable implementation plan. Considering this, this study provides a survey of the existing body of literature on the use of AI for business school learning. The study addresses five key areas: (1) AI transformation of teaching, (2) AI-enhanced learning experiences, (3) workforce readiness and future skills, (4) ethical and governance issues, and (5) institutional readiness and strategic transformation.

2. AI transformation of teaching

AI technologies are revolutionizing how teaching is done in business schools. The old model of teacher-centred teaching is gradually changing towards an interactive, personalized and technology-rich learning system. By leveraging AI, educators can streamline repetitive tasks in the classroom, such as grading, checking attendance, creating assessments, and creating educational content, enabling them to spend more time mentoring, having critical discussions, and facilitating strategic learning (Arya & Verma, 2024; Gonzales Ticona & Duran Peñaranda, 2025). AI has also revolutionized the field of education, with the development of AI-powered tutoring systems and adaptive learning platforms. These systems analyze students' performance data and provide suggestions for learning based on each student's learning behaviors and progress. Adaptive teaching techniques result in better student involvement, learning, and retention of knowledge (Garima & Jain, 2025; Rakesh, 2020). AI technologies are increasingly being implemented in business schools, for instance, in business analytics, marketing, finance, operations management, and strategic management courses. In real world, pupils now have access to AI based simulations, predictive analytics applications and business intelligence platforms for experiential learning. The generation of case studies with the help of AI and virtual business simulations also enables students to acquire practical managerial and analytical skills for current business contexts. Generative AI has also revolutionized teaching by facilitating the creation of content in seconds, providing instant feedback, and enhancing classroom dynamics. AI tools are increasingly being adopted by faculty to create lecture summaries, quizzes, learning materials, and business scenarios. In the implementation of AI tools in education, there is a need to avoid the risk of overreliance, as it can lead to a loss of creativity and a reduction in meaningful learning relationships, when the tools are used inappropriately (H K et al., 2024; Marshik et al., 2024; Sürmelioğlu et al., 2025).

3. AI-enhanced learning experiences

In the context of business education, AI is fundamentally changing the way students learn. Personalized and adaptive learning systems allow students to get individualized learning support based on their learning rate, learning style and learning outcomes. AI systems can help identify learning gaps, recommend specific resources, and provide instant feedback, which enhances student satisfaction and learning outcomes (Kumar & Batra, 2025; Sree & E, 2026). Students are increasingly using generative AI tools to aid their research, report writing, coding, data visualization, brainstorming, and idea generation. Business students are now leveraging AI tools for market research, crafting business strategies, creating financial statements, and formulating ideas. These technologies can improve efficiency and enable cooperative learning. Moreover, AI-integrated education nurtures independent and lifelong learning. AI-powered learning platforms offer flexibility and accessibility in learning, as they can be accessed anytime and from anywhere (Kabudi et al., 2020; Kosorukov, 2025). The need for a continuous development of skills and digital competencies is essential for employability in the current business environment, particularly in the context of business education nowadays. These are significant benefits, but the issue of cognitive dependency and reduction in critical thinking is problematic. A potential consequence of relying heavily on generative AI could be a decline in students' independent analytical skills and a decrease in the level of engagement in deep learning (Montiel et al., 2025; Thompson et al., 2023). Students may be tempted to use AI-generated answers without understanding the ideas or the reasoning behind the answers. Integrity issues in academic learning with the use of AI are also a major concern. Generative AI systems can generate complex essays, reports, and presentations, posing challenges to traditional evaluation methods and questions of originality and authorship. Teachers are thus making the switch to more creative, problem-solving, critical thinking and experiential learning assessments.

TABLE 1 SUMMARY OF PRIOR STUDIES ON ARTIFICIAL INTELLIGENCE IN BUSINESS SCHOOL EDUCATION AND WORKFORCE READINESS

No.	Authors	Year	Methodology/Type	Major Findings	Relevance to Current Review
1.	Alahmed et al.	2023	Conceptual/Discussion	Ethical AI and human-centered governance are critical for workforce transformation	Supports ethical AI and workforce readiness discussion
2.	Alsalmi et al.	2025	Empirical/Review	AI improves learning but raises academic integrity concerns	Supports ethics and governance section
3.	Amah & Okesipe	2026	Book Chapter	AI reshapes workforce skills and employability expectations	Supports workforce readiness discussion
4.	Arya & Verma	2024	Review	AI automates teaching tasks and improves instructional efficiency	Supports teaching transformation
5.	Aziz et al.	2025	Book Chapter	AI creates both opportunities and governance challenges in business education	Supports ethics and institutional transformation

6.	De Cremer & Narayanan	2023	Conceptual	Business schools must prioritize ethical upskilling beyond digital skills	Supports AI ethics and curriculum redesign
7.	Dubey & Crevar	2025	Book Chapter	AI is increasingly embedded in curriculum and administration	Supports introduction and AI integration
8.	Garima & Jain	2025	Review	Adaptive AI systems improve student engagement and retention	Supports AI-enhanced learning
9.	Gonzales Ticona & Duran Peñaranda	2025	Review	AI can act as an educational ally for instructors	Supports teaching innovation
10.	H K et al.	2024	Review	AI improves teaching effectiveness and classroom dynamics	Supports AI-supported pedagogy
11.	Jyoti	2026	Policy/Conceptual	Ethical AI use requires strong governance and policy frameworks	Supports ethical AI governance
12.	Kabudi et al.	2020	Literature Mapping	AI enhances accessibility and adaptive learning	Supports AI-enhanced learning experiences
13.	Kosorukov	2025	Review	AI platforms support flexibility and lifelong learning	Supports adaptive learning discussion
14.	Kumar & Batra	2025	Book Chapter	AI reshapes business education and future workforce competencies	Strong support for workforce readiness theme
15.	Liu & Ai	2026	Empirical	Faculty readiness and institutional support remain major challenges	Supports institutional readiness section
16.	Marshik et al.	2024	Empirical Survey	Students and instructors increasingly adopt AI tools in learning	Supports AI adoption trends
17.	Maryala	2025	Conceptual Framework	Transparent governance is necessary for ethical AI implementation	Supports governance and transparency
18.	Montiel et al.	2025	Empirical	Students increasingly rely on generative AI for learning activities	Supports cognitive dependency concerns
19.	Pahuja et al.	2024	Book Chapter	AI significantly changes learning and assessment practices	Supports AI-enhanced education
20.	Rakesh	2020	Conceptual	AI-driven adaptive learning enhances student performance	Supports teaching transformation
21.	Sales	2025	Conceptual	Faculty capability gaps hinder AI integration	Supports institutional readiness challenges
22.	Samuel	2025	Perspective Article	Lifelong digital learning is essential in AI-driven societies	Supports workforce adaptability discussion
23.	Sree & E	2026	Review	AI supports personalized and customized educational experiences	Supports adaptive learning systems
24.	Stetar et al.	2024	Conceptual	Business schools must redesign curricula for AI economies	Supports curriculum transformation
25.	Sürmelioğlu et al.	2025	Book Chapter	AI enhances instructional design and educational innovation	Supports AI-supported pedagogy
26.	Taghipour & Lu	2025	Book Chapter	AI-era workforce requires ethical and interdisciplinary skills	Supports workforce readiness
27.	Thompson et al.	2023	Editorial/Review	AI adoption raises concerns regarding deep learning and dependency	Supports cognitive dependency discussion
28.	Triantoro et al.	2025	Conceptual/Industry Perspective	AI transforms business roles and management education requirements	Supports future workforce and MBA transformation

4. Workforce readiness and future skills

The connection between using AI in business school education and workforce readiness and employability is strong. The world of work is changing fast due to automation, intelligent systems and AI-driven organizational processes. Employers want graduates that have digital skills, AI literacy, analytical reasoning, adaptability and human-AI collaboration skills (Triantoro et al., 2025). AI is becoming an integral part of decision-making processes in the workplace, making it essential for business schools to prepare students for this change. The future professionals should know how to effectively work with AI tools without losing touch with their ethical, strategic and emotional intelligence (Amah & Okesipe, 2026; De Cremer & Narayanan, 2023). AI literacy goes beyond understanding technology; it involves comprehending algorithmic bias, data ethics, transparency, and responsible

AI governance. As new careers within the AI sector emerge, the demand for curriculum change in business education is on the rise, with roles such as AI governance consultants, algorithm auditors, AI ethics managers, and prompt engineers all playing a crucial role in the AI-driven future. The importance of courses focusing on business analytics, AI strategy, digital transformation, and responsible innovation is growing in business school programs. In addition, the skills needed to work in the AI era require interdisciplinary skills, combining technical knowledge and human skills. While AI systems are adept at processing large volumes of data and performing complex calculations, they still lack the capacity to fully replace human judgment, empathy, and contextual understanding, which is why critical thinking, creativity, leadership, communication, and adaptability are essential skills for supplementing AI. But for many higher education institutions, it is difficult to stay ahead of the game with the constantly evolving work expectations. At times, the faculty members do not have proficiency in AI technologies, and institutions are not technologically ready (Sales, 2025; Samuel, 2025). Hence, there is a need for a strategic collaboration between academia, industry, policy makers, and technology providers to prepare sustainable workforces.

5. Ethical and governance issues

AI presents both opportunities and ethical and institutional dilemmas in the field of business education. Privacy, algorithmic bias, data security, transparency, and academic misconduct are significant concerns in AI-enriched educational settingsc (Aziz et al., 2025). Generative AI systems can inadvertently propagate biases present in the data used for training, which can impact the learning content, evaluation results, and decision-making. Moreover, issues related to data collection, surveillance, and safeguarding privacy must be addressed with robust institutional governance systems (Maryala, 2025). One of the most discussed issues regarding the use of AI in higher education is academic integrity (Alsalmi et al., 2025). Traditional assessment systems may be less effective in identifying AI-generated assignments and reports. Therefore, it is necessary to rethink the evaluation methods in business schools, focusing on genuine learning, real-life projects, verbal communication, joint problem-solving, and critical reflection.

6. Institutional readiness and strategic transformation

Institutional preparedness is also a key factor in the successful embedding of AI. Technological infrastructure, faculty training, policy development, and resource allocation are problematic areas in many universities. Teacher resistance and a lack of AI knowledge among teachers could hinder the adoption process (Liu & Ai, 2026). To meet these challenges, business schools must invest in faculty development programs, AI governance policies, ethical guidelines, and digital infrastructure. It is also important to encourage responsible AI literacy among students to promote sustainable and responsible AI use in educational settings.

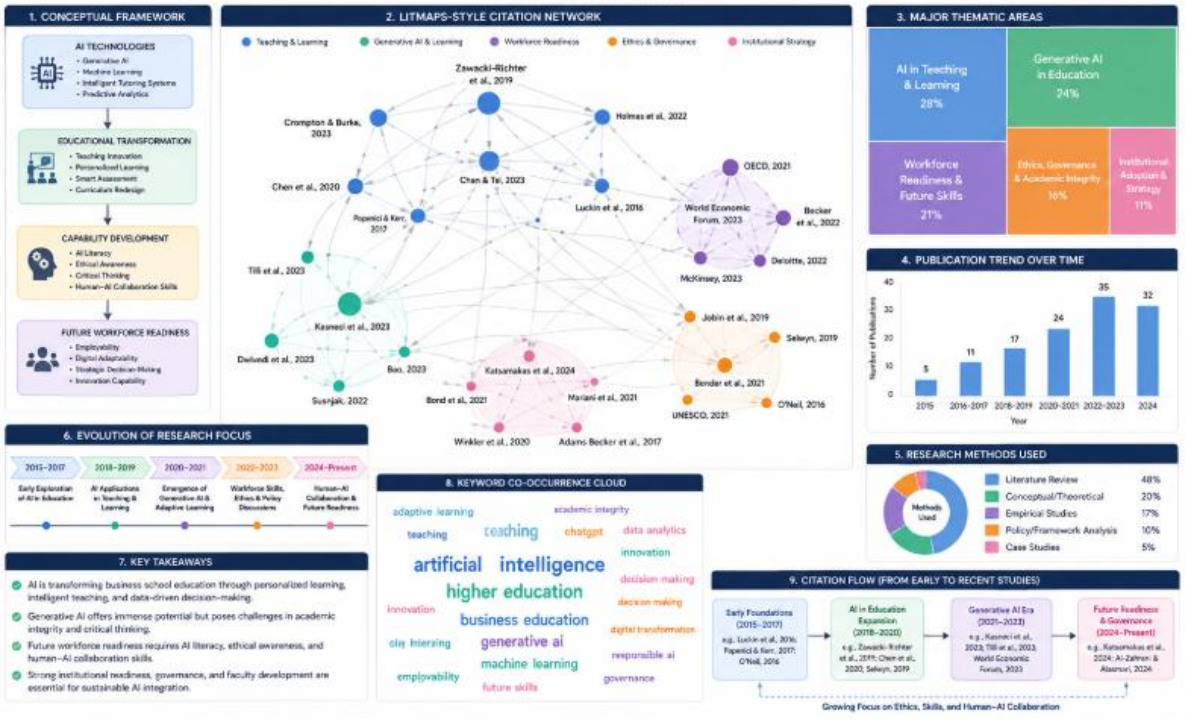


Fig. 1 paper review map by litmaps

7. Conclusion

AI is fundamentally reshaping business school education in the areas of how schools teach, how students learn, how schools are organized, and how schools prepare students for the workplace. With the use of AI technologies, there are plenty of chances for personalization, adaptive education, intelligent decision making and development of future skills. Business schools are transitioning to an environment of Human-AI collaboration in learning, with a focus on analytical, creative, and digital skills. But the wave of AI integration brings about profound issues in ethics, pedagogy, and institutions. Issues of academic integrity, cognitive dependency, algorithmic bias, privacy, and faculty preparedness need to be addressed through governance and strategic institutional planning. Therefore, incorporating AI into Business Education is crucial and requires responsible AI frameworks, curriculum innovation, faculty development, and human-centered educational approaches. Future education in business should be technologically efficient with a creative, ethical and critical attitude. The future of AI is impacting on the dynamics of organizations and the labor market, a significant challenge for business schools to develop graduates who can maximize their performance in an AI-fueled economy and who also have strong ethical and socially responsible skills.

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Leading Sustainable Quality Education: A Phenomenological Study of Higher Education Institutions in Bangladesh

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Abstract
Quality education in sustainability is based on the principles of equity, inclusivity, and lifelong learning. Higher Education Institutions (HEIs) serve as key drivers in integrating sustainability within educational systems. The purpose of this study to explore how leaders of HEIs in Bangladesh integrate sustainability into curriculum design, faculty development, inclusivity, and lifelong learning. Using a qualitative methodology grounded in hermeneutic phenomenology, the study captured the lived experiences of HEI leaders to understand how leadership shapes sustainable quality education. Data were collected from two HEIs through purposive sampling. A total of 35 participants were engaged, including 25 IDIs and one FGD with 10 academic and administrative leaders. Findings indicate that transformational leadership plays a central role in integrating sustainability by promoting interdisciplinary curriculum, teaching quality, equity, and lifelong learning, and stakeholder collaboration. However, participants also highlighted persistent challenges, including financial constraints, limited student engagement, and frequent policy shifts. This study contributes to the growing body of knowledge on sustainability leadership in HEIs, especially in developing country contexts where empirical research remains limited. By embracing inclusive, equitable, and sustainable educational practices, HEIs can directly contribute to building resilient communities, promoting social justice, and advancing the sustainability in Bangladesh and beyond.

***Keywords**:* Leadership, Sustainability, Quality Education, Higher Education, Bangladesh.

1. Introduction

Sustainable development is a framework for fostering global progress in ways that balance people, planet, and prosperity. The 2030 Agenda for sustainable development, actionable through the 17 global goals, heralds a new phase of concerted effort, envisioning transforming the world with sustainability (UN, 2015). Among these goals, quality education plays a pivotal role. Higher education institutions (HEIs) hold a critical position in this global transformation as centers of knowledge creation, innovation, and leadership (Carolina & Franco, 2023). They have a social and moral responsibility to equip students with the competencies for advancing sustainability in their communities and professional fields (Leal Filho et al., 2019). Sustainable quality education emphasizes inclusivity, equity, and lifelong learning (UNESCO, 2016), and HEIs are expected to promote these values through curriculum innovation, community outreach, and research (Tomasella et al., 2022).

The higher education sector of Bangladesh is undergoing significant transformation. Traditionally rooted in lecture-based instruction, the system has begun shifting toward student centered and outcome-based learning (Alam et al., 2023; Shohel et al., 2021). This change aligns with global trends that emphasize employability, interdisciplinary skills, and the integration of sustainability into curriculum and institutional practices (Hasan et al., 2024). HEIs are increasingly expected to align their policies and operations with national development goals and sustainability, especially through the implementation of the National SDG 4 Strategic Framework (MoE, 2020). In this evolving context, university leaders are being called upon to navigate institutional change, integrate sustainability principles, and adopt inclusive strategies that support long-term educational and social outcomes (Hosen & Islam, 2023; Islam & Jirattikorn, 2023).

The objective of the study is to explore how leaders of Bangladeshi HEIs are integrating sustainable quality education within their institutional strategies, focusing on curriculum design, faculty development, inclusivity, and lifelong learning and also the faced challenges. This study contributes valuable insights to the global discourse on sustainable education and leadership, especially in resource-constrained settings.

2. Literature Review

Sustainable development, as defined by the Brundtland Report, refers to "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). It advocates for the responsible use of resources to ensure their continued availability (Hopwood et al., 2005) and aligns human development goals with the protection of natural systems (Lawn, 2006). Education has consistently played a central role in advancing the goals of sustainable development. Education empowers individuals by equipping them with the knowledge, values, and skills needed to make informed choices and tackle environmental, social, and economic challenges (Rieckmann, 2018). Ensuring quality education through equity, inclusivity, and lifelong learning is a key priority in global education agendas. The concept of equity has evolved beyond gender parity to address disparities related to geography, socioeconomic background, language, and disability (UNESCO, 2016). Schleicher (2014) frames educational equity through fairness, ensuring background factors like gender or income do not hinder access, where all students must attain foundational competencies.

The pursuit of quality education has positioned HEIs as critical agents in promoting sustainability and inclusive learning environments. Quality education has established a framework through which HEIs can align their strategic objectives with broader social and environmental imperatives (Leal Filho et al., 2023). Within this context, the role of institutional leadership has become increasingly central to integrating sustainability and equity into both academic and administrative structures (Dyer & Dyer, 2017). Leadership in HEIs plays a pivotal role in developing and implementing policies that foster inclusive access to education. Effective leadership strategies are often reflected in curriculum reforms, community partnerships, and institutional governance models that prioritize sustainability and social responsibility (Weiss et al., 2021). In Bangladesh, there remains fragmentation concerning the strategic transition from policy adoption to measurable impact. While universities increasingly reference the sustainability in their mission statements, studies have systematically examined how these goals are translated into institutional governance, pedagogical innovation, and structural transformation (Roshid & Le Ha, 2023). Critical questions remain regarding how leadership strategies influence graduate employment outcomes, foster cross-sectoral partnerships, and reduce educational inequalities (Islam & Jirattikorn, 2023).

Although HEIs are making strides toward sustainability and inclusion, there remains a significant gap in how leadership strategies within HEIs facilitate the operationalization of sustainability through curriculum innovation, stakeholder collaboration, systemic inclusion, and providing equity. This study seeks to address the leadership mechanisms that bridge the gap between policy initiatives and tangible educational impact

3. Theoretical Framework

This study adopts two theories to integrate sustainability into HEIs: transformational leadership theory (Bass, 1985; Burns, 1978) and stakeholder theory (Freeman, 1984). Burns (1978, p. 20) defined transformational leadership as a process in which leaders and followers engage in such a way that they 'raise one another to higher levels of motivation and morality'. He conceptualizes this leadership style as one that transforms 'attitudes', 'beliefs', and 'behaviors' of the followers, leading them to higher levels of motivation. Bass (1985) offers a more detailed framework for understanding transformational leadership in practice. He articulates four behavioral dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass, 1985, p. 14). These dimensions are observable in how leaders interact daily with subordinates. Idealized influence reflects the leader's role as a trusted and respected model (Afshari, 2021).

Stakeholder engagement plays a crucial role in sustainability transitions. (Freeman, 1984, p. 46) defines stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives". He argues that organizations should not prioritize shareholders alone but instead account for the interests of all stakeholders to ensure long-term success (Mahajan et al., 2023). Within HEIs, a broad and interdisciplinary approach to stakeholder engagement is essential for sustainability integration. The formation of change coalitions that include diverse primary stakeholders ensure that sustainability efforts are not fragmented but institutionally cohesive and widely supported (Sanchez-Carrillo et al., 2021). This broad engagement also contributes to the institution's transition from a traditional educational model to sustainable one (Mokski et al., 2022).

In combination, transformational leadership and stakeholder theory offer a powerful theoretical framework for understanding the drivers and dynamics of sustainability integration in HEIs. Transformational leadership sets the direction and internal capacity for change, while stakeholder theory ensures that change is responsive, inclusive and engaged with all those affected by the institution's mission.

4. Methodology

This study employed qualitative research design and adopted hermeneutic phenomenological approach to explore the lived experiences of leaders responsible for integrating sustainability into HEIs in Bangladesh. A qualitative approach was selected due to its capacity to uncover rich, in-depth insights into the complex and contextualized realities of participants. It also enables the researcher to understand how leadership practices influence the implementation of sustainable quality education and how such efforts are perceived, experienced, and managed in institutional settings.

The study was conducted in two higher education institutions in Bangladesh named Islamic University and Khulna University. These HEIs were selected based on their demonstrated involvement in academic programs or research activities that align with the goals of sustainability. These institutions provided relevant context to investigate the integration of sustainability within higher education curriculum. Their selection allowed for a focused examination of institutional practices and the perspectives of those directly engaged in curriculum development and academic leadership.

A purposive sampling strategy was employed to identify participants with direct experience in curriculum design and academic leadership. A total of 35 individuals were approached, from which 25 participants (13 males and 12 females) were selected for in-depth interviews (IDIs) based on their involvement in curriculum formulation. The remaining 10 participants were invited to participate in a focus group discussion (FGD), composed of individuals actively engaged in leadership role and decision-making process within the selected institutions.

Data were collected using semi-structured, open-ended questionnaires. The data collection phase involved face-to-face interviews, which lasted approximately 30 to 40 minutes each. Participants were briefed about the study's aims and procedures and gave informed consent prior to participation. The FGD was conducted with ten participants who held leadership positions within the selected HEIs. Respondents were chosen based on their interest and active involvement in academic discussions. To accommodate participants' preferences, the discussions and interviews were conducted in Bengali and later translated into English.

Thematic analysis was used to analyze the qualitative data, guided by Braun & Clarke (2006). The process began with familiarization through repeated reading of the transcripts. Open coding was then applied to identify key patterns and ideas. These initial codes were grouped into broader categories using axial coding, followed by selective coding to refine and define the central themes. Thematic saturation was carefully monitored to ensure the comprehensiveness of the findings. Emerging themes were also compared with relevant literature to contextualize and substantiate the results.

The study followed ethical guidelines in line with the Declaration of Helsinki. Participants were fully informed of the study's purpose and their rights, including the right to withdraw at any point. Anonymity and confidentiality were strictly maintained throughout the research process, with all personal identifiers removed from transcripts and publications. Informed consent was obtained from all participants prior to data collection.

5. Results

This section presents the results of thematic analysis from IDIs and a focus group with leaders and academic administrators from two Bangladeshi HEIs.

5.1 Integrating sustainability into the curriculum

This theme explores how HEIs are embedding sustainability principles into their academic frameworks through cross-disciplinary curriculum innovation and project-based learning approaches. A respondent shared a deliberate institutional shift toward designing curriculum that crosses traditional disciplinary boundaries as follows:

> *"... we have recently introduced departments like Development Studies and Disaster Management. These programs are built to foster sustainability thinking from the ground up. Even in engineering, we have added subjects like Environmental Economics and Climate Resilience, so students do not just learn technical skills but also understand the broader environmental and social implications." (An IDI participant, female, 42 years old).*

5.2 Enhancing the quality of teaching

This theme addresses how HEIs are cultivating a robust teaching culture to support sustainable education goals including ongoing faculty development and institutional support mechanisms. A respondent described regular curriculum updates and training initiatives aimed at sustainability as following:

> *"... we revise our curriculum every three years. It helps us stay relevant as the world changes. To support that, we also run training sessions, workshops, and seminars for faculties. These programs help teachers update their content and adapt to new teaching methods." (An IDI participant, female, 50 years old).*

5.3 Promoting equity and inclusivity

This theme reflects the commitment of HEIs to create more inclusive learning environments through needs-based financial support, indigenous community inclusion, and efforts to support third gender students. A respondent shared institutional efforts to reduce stigma and improve access as follows:

> *"... people from the third gender community face a lot of social barriers. In response, we have lowered admission fees for them and are trying to create a welcoming environment. They deserve to feel like they belong here, just like anyone else." (A FGD participant, male, 45 years old).*

5.4 Fostering lifelong learning opportunities

This theme highlights strategies for promoting ongoing education through partnerships with adjunct faculty and alumni networks. A respondent stated that involving adjunct faculty with real-world sustainability expertise strengthens students' learning by making education more practice-oriented as follows:

> *"... we are starting to bring in more adjunct faculty, especially those working in fields like environmental science and sustainable planning. Their insights are rooted in actual practice, and students really benefit from hearing what it is like outside the classroom." (An IDI participant, female, 38 years old).*

5.5 Stakeholder engagement for sustainable educational transformation

Effective implementation of sustainable quality education depends on the active involvement of a wide range of stakeholders, including community members and local organizations. A participant emphasized the importance of developing educational programs that respond to local socio-environmental conditions as follows:

> *"... quality education really depends on its relevance to the context. Our campus is in a coastal area, and students here need to understand their surroundings deeply. That is why we have introduced a department focusing on mangrove and coastal ecosystems. It helps students connect their learning to where they live." (An IDI participant, female, 45 years old).*

5.6 Resource constraints and financial limitations

One of the central challenges identified by participants is the persistent lack of financial and institutional resources. Many higher education institutions in Bangladesh operate under significant budgetary limitations, which restrict the ability to fully implement sustainability-oriented programs. A participant reflected on this constraint:

> *"... yes, it is true that we often face resource constraints and financial pressure. But at the same time, it forces us to be more creative, like looking for external funding or collaborating with development partners. Still, by the end of the day, we have to operate within tight limits, and this means we cannot always take the necessary steps, even when we want to." (A FGD participant, male, 47 years old).*

Low levels of student engagement

Another recurring experience is the low engagement of students in sustainability-related programs and seminars. While institutions are increasingly offering co-curricular and extra-curricular opportunities focused on sustainable development, student interest and participation remain relatively low. A respondent elaborated as follows:

> *"... frankly, it is disappointing that most students do not show much interest in our sustainability seminars. Many of them find these events repetitive or too theoretical. We have started shifting to more workshop-based formats to make them hands-on and practical, and we are hoping this will spark more interest." (A FGD participant, male, 41 years old).*

5.7 Instability caused by frequent policy changes

The disruption caused by shifting policies at the institutional or external stakeholder level. Rapid changes in university guidelines priorities often result in confusion and inconsistent implementation of sustainability efforts. A respondent explained:

"... sometimes we really feel overwhelmed by changing of frequent policies. Even when we make a student-focused decision, it might clash with what local NGOs or partners expect from us. When that happens, we are often forced to revise our plans to maintain harmony, but it slows everything down." (A FGD participant, male, 52 years old)

6. Discussion

Sustainable quality education in higher education involves integrating sustainability into all aspects of university life, including teaching, research, operations, and community engagement. This study highlights the significant leadership role that HEIs can play in promoting and implementing sustainability in Bangladesh. Integrating sustainability in curriculum not only raises awareness but also fosters the development of knowledge, skills, and values. Similarly, the study by Podgórska and Zdonek (2023) highlights the value of integrating sustainability into the academic culture through interdisciplinary collaboration. Project-based learning emerged as a particularly effective strategy for enhancing sustainability competencies among students.

Another key finding centers on the significance of teaching quality and continuous professional development in sustainability. The study reveals that the ongoing growth of teachers enhances effectiveness and improves student learning outcomes. This observation is consistent with Leal Filho et al. (2018), who emphasized the necessity of developing teachers' capacities to transform curriculum. Supporting faculty through structured training initiatives is also vital. The United States and Germany have implemented such strategies through programs like Interdisciplinary Environmental and Sustainability training (Vincent & Mulkey, 2015) and the German Society for Sustainability at Higher Education Institutions (Belomestnova & Dusenko, 2023).

The study also reveals that achieving sustainability requires a commitment to equity and inclusion. Needs-based scholarships were identified as effective mechanisms for ensuring access to education for underprivileged groups. These findings are consistent with the study of Ifediora et al. (2024), who demonstrated the positive impact of such scholarships in the Nigerian context. Additionally, integrating indigenous knowledge and valuing diverse cultural perspectives can make education more equitable and socially relevant. This inclusive approach is particularly important for recognizing the rights and needs of marginalized communities, including third gender students.

The recruitment of adjunct faculty with diverse international experience enhances teaching quality and offers students varied perspectives on sustainability. This aligns with the findings of Rögele et al. (2022), who observed that adjunct faculties often employ student-centered strategies that are well-suited for teaching sustainability-related competencies. Additionally, alumni engagement emerged as a valuable asset in promoting sustainability and institutional resilience. In line with Nisar et al. (2024), the study finds that alumni can play a pivotal role in supporting HEIs during times of financial strain, helping to uphold educational standards and sustain institutional progress toward sustainability goals.

This study identifies key institutional challenges in integrating sustainability within higher education in Bangladesh, particularly emphasizing resource constraints and limited student engagement. Financial and infrastructural limitations restrict long-term planning and hinder the development of sustainable curriculum and faculty training (Leal Filho et al., 2015). These findings align with Heleta and Bagus (2020), who emphasized similar challenges in African HEIs.

The implications of these findings for policy and practice are substantial. There is a pressing need for national education policy frameworks to institutionalize sustainability in higher education curriculum. Faculty development must be prioritized, with structured opportunities for continuous professional growth to enhance teaching effectiveness and leadership in sustainability. Institutional practices should be aligned with principles of inclusivity and equity, ensuring that marginalized groups have access to education. Global sustainability models must be adapted to local conditions through context-sensitive policy design. Furthermore, collaboration with stakeholders including alumni, local communities can help co-create relevant solutions and integrate sustainability deeply into the institutional settings. Finally, robust monitoring and evaluation mechanisms are essential to track progress and ensure alignment with sustainability.

7. Conclusion

The involvement of HEIs in achieving sustainability is no longer optional but necessary. This study provides a critical understanding of how HEIs leaders in Bangladesh navigate the challenges and opportunities of integrating sustainability within their institutions. It emphasizes the importance of strategic leadership, institutional

collaboration, and context-sensitive approaches in integrating sustainability into curriculum. The study also identified pressing barriers that limit sustainability implementation, particularly constraints in resources, funding, and institutional policy. Government-led interventions, such as the Higher Education Quality Enhancement Project (HEQEP) and the Higher Education Acceleration and Transformation (HEAT) project, indicate that the state recognizes the systemic challenges in this sector and is taking steps toward integrating sustainability within higher education. However, the effectiveness of these efforts depends on alignment between national policy frameworks and institutional strategies.

This study contributes to the growing body of knowledge on sustainability leadership in HEIs, especially in developing country contexts where empirical research remains limited. Future research should explore comparative studies across regions, assess the long-term impacts of leadership strategies, and investigate student perspectives on sustainability integration. By embracing inclusive, equitable, and sustainable educational practices, HEIs can directly contribute to building resilient communities, promoting social justice, and advancing the sustainability in Bangladesh and beyond.

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Navigating Pedagogical Excellence and Administrative Formality: A Critical Evaluation of the IQAC Framework in Bangladeshi Higher Education

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Abstract
Quality assurance in higher education is often treated as a gateway to teaching excellence in Bangladesh. Unfortunately teaching quality may also create parallel bureaucratic outcomes through pressure. In Bangladesh, Institutional Quality Assurance Cells (IQACs) were highlighted under the policy framework of the University Grants Commission of Bangladesh. Most importantly, UGC functions to internalize a continuous culture of upgradation in higher education. The research paper says about IQACs' activities as transformative pedagogical instruments or flipped model administrative structures. The mix method prioritizes results over creating genuine learning methodology. Ensuring authentic results authors drawing on a qualitative-dominant mixed-method approach engaging with faculty narratives, student experiences from previous experience. Moreover, they took institutional reports from selected public or private universities. The paper reveals a paradox in higher education while IQAC-driven activities such as self-assessment, workshops for the faculty members reporting are being institutionalized. On the other hand their translation into classroom-level innovation remains minimal in nature. The research highlights that IQAC practices have evolved into "performative compliance," where the production of reports substitutes for radical improvements in teaching excellence. By establishing IQAC within the broader political economy of the higher education system this paper shows core structural constraints including managerialism, limited academic autonomy, lacking in resources and weak feedback integration from the stakeholders. In a nutshell the paper concludes that without a shift from process-oriented evaluation systems to outcome-driven accountability framework IQAC risks reinforcing a culture of symbolic compliance, cultivating authentic teaching excellence for future upgradation.

1. Introduction

In recent times higher education systems worldwide have undergone huge transformations. The transformation led by the increasing demand for accountability, transparency and global competitiveness in education. One of the most significant developments in this regard has been the global rise of quality assurance (QA) strategies. As higher education grown up and diversifies, quality assurance has become a core governance tool instigating institutional priorities and academic practices (Harvey & Green, 1993; Dill, 2000). Our universities are no longer exemplified solely on their intellectual contributions but are increasingly required to highlight measurable objectives in teaching effectiveness. These also include research productivity and institutional performance in another stage. This shift toward structured quality assurance is closely interlinked with broader neoliberal reforms in higher education. The process emphasizes efficiency, performance measurement and managerial accountability via different institutions. Under this development, universities are increasingly governed by corporate-style management practices. More often referred to as "new managerialism," whether audit, evaluation, transparency and benchmarking systems bind institutional decision-making processes directly (Deem et al., 2007). The emergence of an "audit culture" mechanism has curtailed practices such as performance indicators and compliance reporting, fundamentally changing the traditional autonomy of academic excellency (Power, 1997; Shore & Wright, 2015). While these reforms' goal to improve quality and competitiveness, they have also been criticized for highlighting bureaucratic involvement. The administrative inclination to evaluate education through quantifiable outputs increasingly constrains the scope for genuine pedagogical innovation, thereby prioritizing measurable performance over substantive learning and intellectual growth. Within this global reform issue, Bangladesh has been adopted quality assurance mechanisms as part of its higher education development goal. The University Grants Commission (UGC) of Bangladesh focused Institutional Quality Assurance Cells (IQACs) shaping the Higher Education Quality Enhancement Project (HEQEP) initiating a culture of continuous quality improvement among universities (UGC, 2014). IQACs are given with conducting self-assessment exercises, facilitating academic audits, organizing faculty development initiative raising compliance with national and international organization.

2. Research Gap

Despite the body of literature on QA and IQAC, significant gaps remain in the concept of research. First of all, there is a lack of empirical research which focuses on the classroom-level impact of IQAC. We can also say there is a huge lack in teaching practices and student learning outcomes. Secondly, limited attention to faculty experiences and perceptions restricts a comprehensive understanding of how quality assurance (QA) mechanisms shape academic excellence. Thirdly, there are insufficient resources resulting from the political economy of higher education. The resources also include issues of managerialism, resource constraints, and governance structures that hamper the functioning of IQAC. Addressing these gaps is essential for developing a comprehensive understanding of IQAC. After filling the gaps IQAC functions as a transformative pedagogical tool or merely reinforces administrative compliance within the higher education system of Bangladesh.

3. Objectives of the Study

The core objectives of this study explore the effectiveness and functional activities of the Institutional Quality Assurance Cell (IQAC). The specific objectives are mentioned here: First of all, to critically assess the role of IQAC in achieving teaching excellence, with particular issue on enhancing pedagogical improvement. Next faculty development and the enhancement of learning outcomes will easily achieve. Secondly the study examines whether IQAC promotes pedagogical innovation reducing bureaucratic compliance by analyzing the practices, policies and implementation ways within institutional reforms. Aftermath the research identifies and evaluates the structural and institutional limitations erasing the effectiveness of IQAC including administrative backlog. To overcome from resource limitations and challenges related to governance and stakeholder engagement the research reflects a standpoint whether the problem will solve easily.

4. Central Inquiry of the Study

This study is guided by a central research query to what extent has the institutionalization of the Institutional Quality Assurance Cell (IQAC) framework marked teaching quality and pedagogical innovation in higher education institutions in Bangladesh? Another query is to address this; several sub-questions are censored including how IQAC has been managing quality assurance practices across public and private universities in Bangladesh. Whether the regularization of activities such as Self-Assessment Reports, program reviews, internal audits, research and faculty development workshops has phased in meaningful accountability in teaching and learning outcomes. The study further shows the extent to which Standard Operating Procedures (SOPs) and standardized documentation influence the pedagogical flexibility in contextual adaptation and academic creativity through accountability. The research also examines the impact of expanding administrative and compliance-related workload on faculty members' during teaching time. How the research productivity and academic autonomy can be initiated. Finally, faculty and student perceptions are also deliberate to examine the perceived effectiveness of IQAC in improving classroom qualities via learning outcomes. Finally, the study tells public and private universities to understand institutional disparities in IQAC implementation and how structural havoc reshapes the overall effectiveness of the quality assurance system for the future.

5. Limitations of the Study

Firstly, the qualitative-dominant design restricts generalizability and its research capability. While faculty narratives and student perceptions provide depth analyses then we have seen the problems. The absence of a robust quantitative dataset limits the ability to draw nationally representative conclusions in teaching excellence. Also, the reliance on subjective accounts also vandalis response bias particularly in a compliance-driven institutional environment where participants may moderate their views by their own interest.

Secondly, the study limits from a restricted sample scope as the study draws on selected universities without taking information adequately. The research also capturing the heterogeneity between public and private institutions and the dilemma between public and private universities created lots of controversial provisions.

Thirdly, there is an absence of indirect classroom-level empirical measurement when the online class initiated. The claim that IQAC technically generate meaningful pedagogical innovation is not driven by systematic observation of teaching practices in learning outcomes or student performance indicators, however remaining partly inferential in enhancing the capabilities

Fourthly, the research shakes the political economy of higher education. Even the way not empirically operationalizes key variables such as managerialism, governance constraints, and procedure or resource dependency. As a result, causal relationships remain underdeveloped though data collection.

Fifthly, the study provides a comparative analytical depth by systematically examining variations in quality assurance practices across different institutional or contextual settings.

Finally, insufficient attention is saddened to data triangulation as institutional reports, stakeholder feedback, policy makers and observable outcomes are not fully integrated in general sense.

6. Literature Review

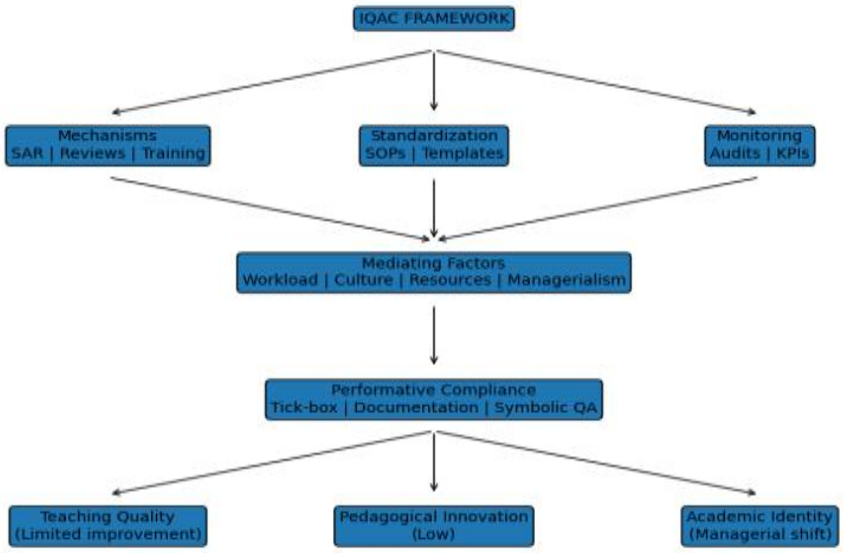
Quality assurance (QA) in higher education has become a godsend mechanism for exchanging and enhancing academic standards, institutional accountability and teaching effectiveness. Surely, the concept of "quality" itself is inherently unique and not easy to comprehend. Harvey and Green (1993) cited multiple dimensions of quality including excellence, keep fitness for purpose, value for money and transformation conceptualizing context. For the time being QA has altered from a narrow focus on control toward a broader framework for continuous improvement and institutional upliftment (Harvey & Williams, 2010). The early expansion and diversification of higher education globally have raised the need for structured QA education. Governments and regulatory bodies increasingly focused on accountability, transparency and comparability shaping the institutionalization of QA as a governance organ (Dill, 2000). In developing countries, including Bangladesh, QA frameworks have often been practiced through policy transfer and international development analyses empowering empowering national systems with global phenomenon (Materu, 2007).

A fundamental differentiation within QA systems lists between internal quality assurance (IQA) and external quality assurance (EQA) at the same time. IQA refers to institutional caricatures such as self-improvement curriculum changing and faculty evaluation aims to keep a culture of continuous improvement and internal accountability techniques (ENQA, 2015). Consequently, EQA delivers external mechanisms such as accreditation, evaluation, audits and rankings cheering standardization and public accountability (Dill & Beerkens, 2010).

Finally, IQAC shares innovation and contextual responsiveness, EQA often imposes benchmarks and limits institutional flexibility without informing the stakeholders. The interaction between these two forms frequently bears tension.

7. Concept of Quality Assurance and Theoretical Foundations

Quality assurance (QA) in higher education defines to the systematic processes and mechanisms tailored to ensure academic standards, institutional accountability and continuous improvement in teaching and learning experiences. The conceptual foundation of quality assurance has undergone a significant transformation, moving away from traditional inspection-based models toward contemporary frameworks that prioritize continuous monitoring, systematic performance evaluation, and strategically selective stakeholder engagement. (Harvey & Green, 1993). In modern higher education systems, QA is broadly identified into internal quality assurance (IQA) and external quality assurance (EQA). Internal mechanisms are institution-driven system of development and focus on self-assessment to program review and continuous improvement while external mechanisms believe in regulatory analyses that evaluate institutional compliance in benchmarking against national or international stakeholders (Woodhouse, 2006).



The theoretical creation of QA in higher education is strongly monitored by managerialism which encodes efficiency, accountability and measurable performance outcomes. Under this framework, universities increasingly admit corporate-style governance models where academic activities are assessed through audit cultures in a systematic way and performance indicators (Deem, 1998). This shift has defined a strong emphasis on accountability, often buying academic work in terms of outputs. In such contexts, compliance becomes a performative act enshrined through documentation, reports, and indicators (Ball, 2003). Conversely constructivist pedagogy provides an alternative lens highlighting student-centered learning, critical thinking and active knowledge construction. However, tensions arise when the ideological ideals are violated by rigid administrative metrics.

8. Global Practices of IQAC developing quality education and standardization

The global standards of quality assurance (QA) frameworks in higher education share a broader shift for accountability, transparency and standardization. In the United Kingdom, the role of the Quality Assurance Agency for Higher Education (QAA) is so high organizing academic standards. So Established as an independent body the QAA gives institutional reviews, develops subject benchmark statements and creates a culture of continuous improvement. The model also emphasizes peer review, evidence-based evaluation and institutional autonomy enhancing accountability with academic installment (Harvey & Williams, 2010). Besides The UK approach is often treated as a benchmark due to systematic yet flexible methodology bonding universities to ensure quality expansion rather than merely align with external supervision

Across Europe, quality assurance mechanisms have been significantly undermined by the Bologna Process initiated in 1999 to enhance higher education systems within the European Higher Education Area (EHEA). In fact, the Bologna Process talked key instruments such as the European Credit Transfer and Accumulation System (ECTS) in diploma supplements and standardized degree cycles towards a standard process. The doctrine also highlighted the development of the European Standards ensuring Guidelines (ESG) for quality assurance. The IQAC emphasize internal quality culture alongside external evaluation in creating new process of development. European frameworks are prioritized by a multi-layered governance structure. In this structure they implement national agencies, regional networks and transnational cooperation. Also, this model helps comparability to mobility in mutual recognition of qualifications facilitating academic and professional integration across quality assurance (Westerheijden et al., 2014).

In South Asia, quality assurance practices are gradually often occupied by global models. These Countries such as India, Pakistan and Sri Lanka have tailored national QA bodies—such as India's National Assessment and Accreditation Council (NAAC) supervision of higher education institutions. However, these systems frequently create challenges related to resolving constraints, political influence and uneven institutional capacity in different

situations. Despite these problems there has been a growing emphasis on internal quality assurance cells for outcome-based education. So far, The South Asian practice highlights a hybrid model creating global QA norms intersects with domestic realities. The ongoing development often triggered partial implementation varying degrees of effectiveness in social education (Matin, 2018).

9. IQAC in Bangladesh: Existing Studies

In Bangladesh, the establishment of Institutional Quality Assurance Cells (IQACs) ensures significant policy intervention enhancing the quality of higher education in Bangladesh. This initiative was taken under the guidance of the University Grants Commission of Bangladesh more particularly through the Higher Education Quality Enhancement Project (HEQEP) gradually. The UGC highlighted a comprehensive policy framework swiping the structure, functions, and operational guidelines of IQACs within the university's environment. Moreover, these cells are responsible for attributing self-assessment highlighting improvement plans magnifying a culture of quality assurance at the institutional level of upliftment (UGC, 2014). Also, empirical studies on IQAC implementation in Bangladesh share mixed results. On the one hand, IQACs have fascinated increased awareness of quality issues improving documentation practices and the introduction of organic review mechanisms within university environments. Faculty members and administrators have become more involved in self-evaluation and there is evidence of incremental improvements in curriculum design segment (Islam & Chowdhury, 2016).

On the other hand, institutional experiences often reflect significant challenges attributing limited technical expertise, inadequate funding and resistance to change among academic journeys. A critical body of literature also opines the unintended consequences of IQAC institutionalization. The way enhances the concept particularly the risk of bureaucratic expansion. Scholars opined that the emphasis on documentation, reporting, reviewing and compliance may lead to a “tick-box” culture where the focus alternates from genuine quality enhancement to effective formalities. This early bureaucratization can undermine academic autonomy as faculty members become increasingly burdened with administrative tasks rather than pedagogical innovation or flipped model interaction (Siddique, 2020).

10. Theoretical Framework

A regular theoretical framework for evaluating the Institutional Quality Assurance Cell (IQAC) in Bangladeshi higher education is not an easy task. The core framework is informed by Lee Harvey and Diana Green’s multidimensional conception of quality, which conceptualizes quality as a composite of excellence, fitness for purpose, and value for money, among other dimensions. IQAC is literally an internal quality assurance (IQA) system, which regularly operates at the intersection of accountability and improvement. In addition institutional actors are required to align with standardized procedures such as self-assessment, audits, review and documentation. However, this framework critically says the notion of “audit culture” as treated by Michael Power. The process suggesting that excessive emphasis on measurable outputs may shift academic excellence toward symbolic compliance rather than substantive pedagogical change in education. Simultaneously, principles from John Biggs’s model of constructive alignment creating that genuine teaching excellence suggests when learning outcomes of teaching activities, research and assessment practices are directly aligned. By managing and documenting these perspectives, the framework makes IQAC as a literally institutional space where academic tensions between bureaucratic accountability and pedagogical innovation are being negotiated. But ultimately hypotheses show that without sufficient academic driven autonomy more resource support and stakeholder-driven feedback break down in Bangladesh. As a result IQAC risks reinforcing a performative compliance culture rather than starting transformative learning outcomes in Bangladesh’s higher education system.

11. Conceptual and Analytical Framework

11.1 IQAC as a Dual System in Bangladesh

In Bangladesh, the Institutional Quality Assurance Cell (IQAC) was supervised under the Higher Education Quality Enhancement Project (HEQEP). The HEQEP Project led by the University Grants Commission (UGC) to increase quality assurance mechanisms within universities (UGC, 2014). As a pedagogical instrument IQAC seeks improving teaching to learning modules alongside faculty training. Beside they make a plan for arranging workshops, curriculum revision, self-assessment processes via student feedback. These initiatives promote learner-centered pedagogy to outcome-based education and continuous professional development. Practically, this aligns with global quality assurance mechanisms emphasizing teaching excellence through student engagement in reviewing (Gibbs, 2010).

However, in practice, IQAC in Bangladesh often deliberates as an administrative compliance mechanism. This mechanism shaped by UGC mandates reporting requirements and accreditation procedures. Besides Universities are adhering to producing extensive documentation by self-assessment reports (SARs), program reviews and audit records. This has created an alluring fascination that IQAC activities are increasingly bureaucratized (Mamun, 2019). In fact, this duality turns a structural tension in Bangladeshi higher education while IQAC desires to foster pedagogical innovation and the innovation simultaneously reinforces a culture of paper-based accountability.

11.2 Key Variables in the Bangladeshi Context

This study ensures key variables that are particularly relevant to the institutional and cultural dynamics of Bangladesh. The independent variable is IQAC policies and practices as implemented within Bangladeshi universities drastically .In Bangladesh, these practices are technically influenced by UGC guidelines to donor-driven frameworks, particularly under HEQEP which reshapes institutional resource allocation through transparency (World Bank, 2018).Teaching quality in Bangladesh is influenced by factors such as large class sizes, limited resources, and traditional lecture-based methods to enhance the recreational statement from the students. Interventions initiated by the IQAC seek to improve the clarity of instruction, strengthen the alignment and effectiveness of assessment practices, and foster greater student engagement in the learning process. However, the effectiveness of these interventions totally depends on faculty motivation reshaping institutional support via infrastructural capacity (Rahman, 2020). Pedagogical innovation refers to the adoption of modern teaching approaches, using digital learning tools, interactive teaching methods and interdisciplinary course design for an effective method of education. In Bangladesh, such innovation is often occupied by limited technological infrastructure, resistance to change and lack of incentives for faculty members during sharing education. Consequently, IQAC-driven innovation may 0remain symbolic rather than transformative in many institutions. The relationship between IQAC practices and these outcomes is mediated by contextual factors such as funding constraints, governance structures, and academic culture.

11.3 Analytical Lens: Bangladesh-Specific Interpretation in Pedagogical Methods

The expansion of IQAC can be situated within the broader political economy of higher education in Bangladesh. Here the introduction of quality assurance mechanisms under HEQEP shifts an underfold trend towards performance-based governance. In that process the universities are reviewed based on measurable indicators to compliance standards (World Bank, 2018). After making the framework, IQAC shows not only as a quality enhancement tool but also as a mechanism of institutional regulation led due process of control. The method ensures universities with global standards while simultaneously reinforcing hierarchical governance for education system. In addition, this raises critical questions about autonomy, academic freedom and the commodification of education. In registration institutional theory poses a crucial lens for understanding the gap between formal IQAC structures from informal academic practices in our country. As a result Formal compliance is achieved through documentation and reporting systems. Actual teaching practices are still largely unchanged. For example, course outlines may assign outcome-based education, classroom teaching may still follow traditional lecture methods and students also take the method easily for their education. Similarly, student feedback mechanisms may work formally but have limited endorsement on teaching excellence. Nonetheless this divergence measures examine not only institutional frameworks but also the lived attributives of academic practice in Bangladesh. Overall, this conceptual framework shares IQAC in Bangladesh as a hybrid governance tool.

12. Institutional Framework of IQAC in Bangladesh

The Institutional Quality Assurance Cell (IQAC) shares as the central internal mechanism for quality governance in Bangladeshi higher education institutions. Within pragmatic research paradigm IQAC is not blended merely as a formal structure but as a functional instrument whose value totally depends on its practical impact on teaching, learning, sharing and institutional development. This section critically poses the institutional framework of IQAC by prioritizing on the role of the University Grants Commission (UGC), organizational structure and core operational activities.

12.1 Role of the University Grants Commission (UGC)

The University Grants Commission (UGC) of Bangladesh awarded as the principal regulatory authority merging higher education quality assurance. The introduction of IQACs under the Higher Education Quality Enhancement Project (HEQEP) ensures a policy shift toward clipping internal quality culture within universities (UGC, 2014).

The UGC plays a key factor continuing the national quality assurance framework. IQAC promotes guidelines, manuals, theory and standardized procedures for IQAC operations, including: Self-Assessment Manual, External Peer Review Guidelines, Accreditation benchmarks etc. for a basic development in the retrorocket policy. These

policies believe global QA models attracted by frameworks such as the European Standards and Guidelines (ESG) (ENQA, 2015). However, from a pragmatic perspective, the real influence of these policies lies in their capacity for contextual adaptability, rather than in their formal approbation alone. UGC's monitoring role influxes s periodic evaluation of IQAC activities in validation of Self-Assessment Reports (SAR), and oversight of institutional compliance analyses. Financial support—initially through HEQEP and later through revenue budgets—swiping universities to approving IQAC functions. However, empirical observations say that: Monitoring often emphasizes procedural compliance rather than pedagogical outcomes. Funding is frequently conditioned on rationalized requirements, which in turn incentivize performative practices within institutions. Thus, while UGC hope to institutionalize a culture of continuous improvement in the days ahead. All regulatory approach may inadvertently promote audit-driven behavior sharing. Critique of "new managerialism" (Deem et al., 2007).

12.2 Structure of IQAC

The organizational structure of IQAC makes a hybrid model. The model also includes administrative authority with academic enlightenment. In addition, this structure is intended to promote institutional integration, IQAC also raises questions about autonomy and effectiveness of the University authority. Typically, an IQAC is designed of various stakeholders: Director (senior academic/administrator, Additional Directors (Quality Assurance and excellence in Teaching Learning), Section Officer (ICT & Accounts), Office Assistant cum Computer Typist, and Office Support Staff. For the formal process, the director sent the file directly to the Vice-Chancellor importing the strategic importance of IQAC within the institutional governance mechanism. From a pragmatic analysis, this hierarchical positioning has dual implications. For this reason, sometimes the procedural drawback enhanced institutional visibility. Even the authority may compromise academic independence rather than institutional independence. In fact, IQAC activities align closely with administrative priorities sometimes. Moreover, different units are prepared to keep quality assurance promoting participatory evaluation. However, field evidence indicates that faculty engagement is often compliance-driven rather than intrinsically motivated the students willfully. This tactically reflects a structural limitation where participatory mechanisms sort out formally.

12.3 Core Activities of IQAC

IQAC's operational effectiveness is primarily reflected via core activities. These activities are intended to enhance teaching quality in Bangladesh. At that same time IQAC help to institutional performance. Even their practical impact remains contested in nature. Initially Self-Assessment Reports (SAR) is the milestone of IQAC activities from the past. For upgrading, Departments conduct internal evaluations based on regularized criteria circulating curriculum design, Teaching-learning processes, Assessment methods, Research output, Student support services. After a pragmatic resource, SARs serve as valuable diagnostic equipment to examine. However, the study findings say that: SAR preparation is often documentation-heavy on the basis of root level upgradation. Sorry to say SAR risks becoming a ritualistic exercise reinforcing what Power (1997) enters as the "audit society. So, academic audits involve both internal and external evaluations ensuring compliance with quality standards for education. Our External Peer Review (EPR) teams assess departmental performance through recommendations. While audits are maintained to ensure accountability, several issues emerge: Recommendations are rarely followed through systematic collaboration. Audits emphasize standardization over contextual innovation to institutions focus on audit readiness rather than continuous improvement in academic pathways.

Besides, this supports the argument that QA mechanisms may increase visibility of quality rather than substantive enhancement in quality assurance (Shore & Wright, 2015). IQAC engages workshops, training sessions and seminars talks about improving teaching skills and pedagogical practices. These include: Outcome-Based Education (OBE) training, curriculum development workshops in varsity level, teaching methodology seminars are also a source of sharing knowledge. These initiatives have potential impact on legal appraisal. In addition, minimal integration into actual classroom practices has installed the practice in tertiary level. Perception of training as formal requirements enhances capability rather than professional growth opportunities. Henceforth the success of such programs should be realized by observable changes in teaching behavior which remain limited in Bangladesh. Documentation and Compliance Reporting also prioritize accountability in teaching excellence. Documentation constitutes a significant portion of IQAC activities based on annual reports, workshop records, audit documentation, compliance checklists. While documentation exercises transparency to accountability, excessive emphasis on reporting creates bureaucratic overload, symbolic compliance in deep sense.

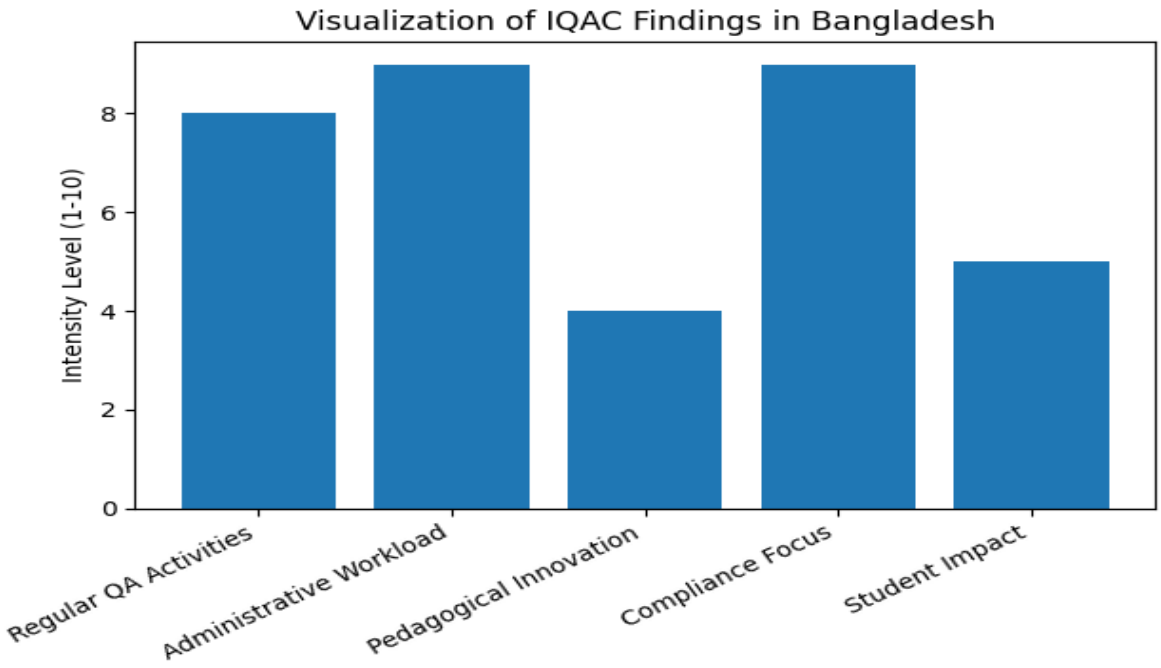
Finally, this aligns with the concept of "performative compliance", where universities prioritize the acceptance of quality over actual realization in teaching.

13. Data Analysis

The study deployed a thematic analysis to interpret data collected from different faculty interviews, student feedback and through institutional documents. Initially, all qualitative data were carefully targeted and coded to identify reigning patterns related to IQAC practices in teaching quality and administrative processes. These codes were organized with key measures including performative compliance that increased administrative workload for the teacher. A comparative approach was phased to examine differences between public and private universities. The approach includes variations in the implementation and moral effectiveness of IQAC activities. Additionally, document analysis included SARs, audit records, and workshop materials. The analysis was precise by theoretical insights from quality assurance and managerialism. The mechanism enables a critical understanding of how institutional practices shape academic practice. Overall, the analytical process highlights a significant gap between procedural compliance and meaningful pedagogical transformation.

14. Analysis on Findings

The findings show the Institutional Quality Assurance Cell (IQAC) framework in Bangladesh. IQAC has undergone a significant process of institutionalization across both public and private universities in Bangladesh. This institutionalization is primarily undertaken by the formal integration of quality assurance (QA). This development enhances a way of success in terms of implementation. One of the most prominent results observed in the study is the regularization of IQAC-driven activities. Throughout sampled institutions, IQAC units have enabled a routine cycle of operations. The operations include Self-Assessment Reports (SARs), program reviews, faculty development workshops and student feedback collection. Also, the findings of this research show that the Institutional Quality Assurance Cell (IQAC) framework in Bangladesh has become formal within higher education experience. By the way these Activities such as internal audits to self-assessment reporting and compliance monitoring are no longer creative initiatives. But the ways are embedded within the routine for academic breakthrough. Even This regularization reflects global quality assurance indicates a shift from ad hoc practices to structured, formal and systematized processes. However, the evidence shows that increased regularity does not necessarily structure into effective practice. Here, many faculty members highlighted that these activities are proving lack contextual adaptation and prioritizing procedural continuity over substantive pedagogical innovation. Besides A key feature of this institutionalization is the development of Standard insisting Procedures (SOPs), including templates for Self-Assessment Reports (SARs), course documentation guidelines in standardized evaluation caricature. Another significant finding is the expansion of administrative systemic workload. So far Academic staffs are increasingly required to include in documentation, reporting, and quality assurance mechanisms. By the way the systematic failure often encroaches upon time for teaching, research and curriculum development. Henceforth the research highlights a broader shift toward managerialism in higher education whether administrative metrics shape academic practices. The research further makes a compliance–innovation paradox into acquisition. In fact, institutional success is largely developed through quantifiable indicators such as the number of reports produced, workshops conducted, research and participation rates. Though these metrics create an appearance of progress, they primarily capture processes rather the effective results. There is limited evidence of meaningful pedagogical transformation in teaching qualities largely remain lecture-based, with minimal integration of student-centered magnitude or technological innovation in research. These Structural constraints—such as large class sizes, limited resources, limited opportunity and inadequate incentives—further inhibit innovation for the long time.



A critical outcome of these dynamics is the emergence of performative compliance where institutions. . This is reflected in a "tick-box" culture where documentation in reporting takes precedence over pure class improvements. Consequently, academic identities are shifting with diverse faculty increasingly viewing themselves as compliance managers rather than creating new source of education. Faculty experiences highlight increased pressure autonomy and limited motivation for innovative ideology. While some acknowledge the importance of QA terms, many perceive IQAC processes as bureaucratic and disconnected from classroom experience. From the Student perspectives further reinforce these findings indicating minimal perceived improvement in teaching quality, weak integration of feedback, weak research into reviewing processes. Finally, the study reveals significant institutional disparities in Bangladeshi culture. Public universities face government constraints such as resource limitations and bureaucratic rigidity through party politics.

15. Recommendations

For a liberal education system, we need to change the stakeholders. Based on the findings, we have to change several important things. First of all, there is a need to move away from procedural compliance toward a more outcome-based approach to quality assurance. Besides, our universities should make a mark not only on preparing reports, documents but also on enhancing actual teaching quality. That will increase student learning outcomes and research performance. We need evaluation systems for measuring real impact rather than just completed activities in IQAC.

Secondly, we have to reduce administrative workload on faculty members. The pressure of excessive documentation and reporting requirements sometimes create dilemma. In this context, introducing digital systems and streamlined formats can help teachers spend more time on teaching, research, grooming and curriculum development instead of paperwork.

Thirdly, mere context-based implementation of IQAC customs is necessary. Here, a "one-size-fits-all" approach does not work for all universities at the same time. More even our Policies should be flexible adapting the needs of public and private institutions.

Fourthly, universities should foster pedagogical innovation rather than relying on conventional, rigid teaching approaches in higher education. Our teachers should more focus on training to use student-centered methods, interactive learning, and modern technology incentives. The core activities randomly increase research grants, promotions and recognition.

Fifthly, we should strengthen the capacity-building initiatives for a better workplace. We need to initiate Regular training, workshops and mentoring programs. These developments should focus on practical teaching improvements but not for compliance requirements. The authors believe this will help faculty understand quality assurance. Henceforth, external audits and internal reviews should work on both qualitative and quantitative outcomes. In addition, the authority will include Student feedback s seriously and used to improve teaching methods day by day

Finally, we have to reduce the dominance of managerialism in higher education. Our academic freedom and creativity should be protected as teachers can rely on meaningful learning rather than meeting administrative decisions. In conclusion, a balanced and liberal approach combining accountability with academic innovation is more important to make IQAC truly effective.

16. Conclusion

This research ensures that the IQAC framework in Bangladesh has successfully managed a structured system of quality assurance in higher education. Our regular activities like self-assessment reports to audits have an importance to get authentic result. As a part, workshops have become common in both public and private universities. Even this reflects progress in ensuring a formal quality culture. However, the research also Shares a significant gap between formal compliance and real implementation in teaching quality. However, many IQAC activities deeply more focus on documentation and administrative procedures. As a result, teaching methods often remain traditional. The increasing administrative workload on faculty members is another major concern in this regard. Having reporting reduces the time available for teaching, research and curriculum development and this shows the growing influence of managerial practices in academic institutions in Bangladesh. Overall, while IQAC has safeguarded institutional processes, the goal has not fully achieved. We have mentioned for real progress; universities need to work beyond paperwork. And they will focus on student-centered learning, innovation and practical outcomes. In conclusion, the future success of IQAC relies on balancing accountability with absolute independence of teaching. Accordingly, quality assurance may serve as a catalyst for meaningful transformation in higher education in Bangladesh.

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Sustainable Development in Higher Education in Bangladesh: Problems and Prospects

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Abstract
Sustainable development in higher education has become an increasingly important issue for developing nations aiming to achieve long-term socio-economic progress. The expansion of higher education institutions has significantly improved access to tertiary education; however, it has also raised concerns about educational quality, equity, and relevance to market needs. This study examines the key challenges that impede sustainable development in higher education and explores potential opportunities for future advancement. Using a qualitative research design based on secondary data sources, the study analyzes issues such as insufficient infrastructure, limited research capacity, governance inefficiencies, and the mismatch between academic outputs and labor market demands. At the same time, it highlights prospects including digital transformation, policy reforms, global partnerships, and demographic advantages. The findings suggest that despite substantial structural challenges, strategic reforms and targeted investments can transform higher education into a sustainable driver of national development in Bangladesh.

***Keywords*:** Sustainable Development, Higher Education, Problems, Prospects, Bangladesh.

1. Introduction

Higher education is widely recognized as a fundamental pillar of sustainable development, contributing to human capital formation, technological innovation, and social transformation. In developing countries such as Bangladesh, higher education plays a critical role in addressing socio-economic challenges including poverty, unemployment, and inequality (World Bank, 2020). Over the past two decades, Bangladesh has experienced rapid growth in the higher education sector, marked by a significant increase in both public and private universities and a substantial rise in student enrollment. Although this expansion has improved access, it has also created new challenges related to quality assurance, institutional governance, and sustainability. Sustainable higher education refers to the capacity of institutions to provide quality education, promote research and innovation, ensure inclusivity, and maintain long-term effectiveness in a changing global context (UNESCO, 2021). However, achieving these objectives in Bangladesh remains complex due to structural, financial, and institutional limitations. This study aims to critically analyze the major challenges and opportunities associated with sustainable development in higher education in Bangladesh. Specifically, it seeks to identify key barriers to sustainability, assess the current state of the sector, explore future prospects, and provide policy recommendations for improvement.

2. Research Methodology

This research adopts a qualitative approach, relying primarily on secondary data sources. Relevant data have been collected from academic journals, policy documents, government reports, and publications of international organizations. This method allows for a comprehensive analysis of existing knowledge and trends related to sustainable development in higher education.

Conceptual Framework

Sustainable Development: Sustainable development is generally defined as a process that satisfies present needs without compromising the ability of future generations to meet their own needs. It encompasses three interrelated dimensions: economic sustainability, social inclusion, and environmental protection (OECD, 2019).
Sustainable Development in Higher Education: In the context of higher education, sustainability involves ensuring high-quality teaching and learning, fostering research and innovation, promoting equity and inclusiveness, and integrating environmental awareness into institutional practices. It is closely aligned with global initiatives such as the Sustainable Development Goals (SDGs), particularly SDG 4, which emphasizes inclusive and equitable quality education (UNESCO, 2021).

Role of Higher Education in Bangladesh
Higher education in Bangladesh plays a multifaceted role, including producing skilled human resources, supporting research and innovation, contributing to economic growth, and enhancing social mobility. However, its effectiveness largely depends on its ability to address existing challenges and adapt to global changes.

3. Literature Review

The importance of sustainable development in higher education has gained considerable global attention, particularly after the adoption of the 2030 Agenda for Sustainable Development. Universities are increasingly recognized as key actors in promoting sustainability through education, research, and community engagement (Journal of Cleaner Production, 2022). Existing literature indicates that integrating sustainability into higher education requires comprehensive curriculum reform, effective governance, and active stakeholder participation. However, developing countries face numerous challenges, including limited financial resources, weak institutional commitment, and inadequate policy implementation (Hassan & Ahmad, 2025). Lim et al. (2022) emphasize that awareness, institutional transformation, and effective management practices are essential for embedding sustainability within HEIs. In Bangladesh, several studies highlight persistent structural and systemic challenges such as insufficient funding, shortage of qualified faculty, inadequate research facilities, and limited integration of sustainability concepts into curricula (Uddin, 2023). Moreover, achieving SDG 4 remains a significant challenge due to inequalities in access, poor infrastructure, and quality deficits (Akther, 2022). Despite these constraints, Bangladesh demonstrates considerable potential for advancing sustainable higher education. The expansion of HEIs, increased adoption of digital technologies, and growing emphasis on SDGs create new opportunities for reform and development (Uzzaman et al., 2025). National strategies and policy commitments further provide a framework for overcoming institutional barriers and enhancing sustainability practices (Sultana et al., 2023).

Problems of Sustainable Development in Higher Education in Bangladesh
Inadequate Infrastructure: One of the major obstacles to sustainable higher education in Bangladesh is the lack of adequate infrastructure. Many institutions lack modern classrooms, well-equipped laboratories, updated libraries, and access to digital resources. This deficiency negatively affects the quality of teaching and limits students' practical learning experiences, particularly in science and technology disciplines.

Shortage of Qualified Faculty: The shortage of highly qualified and experienced academic staff is another critical challenge. Factors such as brain drain, limited research incentives, and heavy teaching workloads reduce faculty engagement in research and innovation. Consequently, the overall academic environment remains underdeveloped (Rahman, 2022).

Outdated Curriculum and Teaching Methods: Many universities continue to follow outdated curricula that emphasize theoretical knowledge over practical skills. Teaching methods are often lecture-based, limiting student participation and critical thinking. This misalignment with modern educational practices reduces graduates' competitiveness in the global labor market.

Skill Mismatch and Graduate Unemployment: A significant gap exists between academic education and labor market requirements. Graduates often lack essential technical, communication, and problem-solving skills, leading to high levels of unemployment and underemployment (Ahmed, 2023).

Limited Research Funding: Research is essential for innovation and sustainable development; however, funding for research in Bangladesh remains limited. Most universities allocate minimal budgets for research activities, restricting scientific advancement and technological innovation.

Weak Research Culture: In addition to funding constraints, there is a lack of strong research culture within many institutions. Limited collaboration, inadequate training in research methodologies, and absence of incentives for publishing contribute to low research output.

Governance Challenges: Governance issues, including political interference and administrative inefficiencies, undermine institutional autonomy and academic integrity. These challenges negatively affect decision-making processes and academic performance (Islam, 2021).

Weak Quality Assurance Mechanisms: Effective quality assurance systems are lacking in many institutions. Inconsistent accreditation processes and weak monitoring mechanisms make it difficult to maintain academic standards.

Financial Constraints: Public investment in higher education is relatively low compared to increasing demand. At the same time, high tuition fees in private institutions create barriers for students from low-income backgrounds (World Bank, 2020).

Inequality and Access Issues: Significant disparities exist between urban and rural students, as well as among different socio-economic groups. Marginalized communities often face barriers to accessing higher education.

Weak Industry-Academia Linkage: Collaboration between universities and industries remains limited. This reduces opportunities for internships, practical training, and alignment between academic programs and market needs.
Digital Divide: Despite progress in digital education, many students lack access to reliable internet and digital devices. This issue became particularly evident during the COVID-19 pandemic (UNESCO, 2021).

Environmental Awareness Gaps: Sustainability concepts are not adequately integrated into many academic programs, resulting in limited awareness of environmental issues among students.

Prospects of Sustainable Development in Higher Education
Policy Reforms and Strategic Planning: The government of Bangladesh has increasingly emphasized the importance of higher education in national development strategies. Policies focusing on quality assurance, research promotion, and expanded access can significantly improve sustainability.

Digital Transformation: The adoption of online and blended learning models provides opportunities to expand access, reduce geographical barriers, and enhance flexibility in education (Uzzaman et al., 2025).

Research and Innovation: Increased investment in research and development can enhance innovation capacity. Establishing research centers and providing grants can improve academic output.

Industry-Academia Collaboration: Strengthening partnerships between universities and industries can improve curriculum relevance and graduate employability.

Curriculum Reform and Faculty Development: Updating curricula to include practical skills and investing in faculty development programs can enhance the quality of education.

Equity and Inclusion: Providing scholarships, expanding institutions in rural areas, and supporting marginalized groups can promote inclusivity.

Internationalization: Global partnerships, exchange programs, and adoption of international standards can enhance the competitiveness of Bangladeshi universities.

Demographic Advantage: Bangladesh's large youth population can serve as a valuable resource for economic growth if properly educated and trained.

Environmental Sustainability: Adopting green campus initiatives and integrating environmental education into curricula can promote sustainability.

4. Findings

- Rapid Expansion with Quality Concerns.
- Persistent Structural and Institutional Challenges.
- Inequality and Digital Divide Remain Significant Issues.
- Strong Potential for Transformation Through Strategic Reforms.
- There is a clear gap between academic curricula and industry requirements.
- Limited funding, lack of incentives, and insufficient collaboration have resulted in low research output and weak innovation performance in universities.

5. Recommendations

- To increase public investment in higher education infrastructure and research.
- Strengthen governance and ensure institutional autonomy.
- Modernize curricula with a focus on practical and skill-based learning.
- Enhance faculty development and research opportunities.
- Promote collaboration between academia and industry.
- Expand digital education and infrastructure.
- Ensure equity through scholarships and inclusive policies.
- Develop strong quality assurance and accreditation systems.
- Integrate sustainability concepts into education.

6. Conclusion

Sustainable development in higher education is essential for the socio-economic advancement of Bangladesh. While the country has made significant progress in expanding access to tertiary education, numerous challenges remain, including inadequate infrastructure, shortage of qualified faculty, outdated curricula, and limited research capacity. At the same time, there are considerable opportunities for improvement through digital transformation, policy reforms, international collaboration, and effective utilization of demographic advantages. With strategic planning, increased investment, and coordinated efforts, higher education in Bangladesh can become a powerful engine for sustainable national development and global competitiveness.

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Women's Leadership and the Transformation of Private Universities: A Narrative Inquiry of Five Academic Leaders

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Abstract
Research on women's roles and impacts as leaders in higher education within the Global South and especially regarding the private sector, has been scant. This research utilizes a narrative analysis to review the ways in which women leaders transform institutions through the case studies of five women leaders in private universities. The research intends to study and analyze the impact of their leadership and the ways in which their professional journeys influenced the paths of others. Improved Women's leadership has been recognized transformational, having the influence to change institutions and transform practices; however, the research has identified women leaders as the one, from all of the transformational leaders, the changes all transcended and limited within the institutional frame. The research identifies barriers such as gender bias, emotional labor, and institutional resistance women leaders contend to encounter. The study crosses dissect positive impact and the personal, the professional, and the relational. The study cross examines the socio-political frameworks of women's leadership and the absence of a radical discourse on women's leadership and private higher education.

***Keywords**:* Women Leadership, Private Universities, Narrative Inquiry, Higher Education, Transformation

1. Introduction

We have spent time in areas concerning leadership that do not include viewing it objectively. Being a child in a familial patriarchy, we witnessed where women's ambitions ended. Our educational and occupational pursuits were made possible through negotiations, as we circumvented the familial structure and social expectations. Once we became a part of the workforce, things got more difficult. We juggled time between work and family. We had to repeatedly prove ourselves in a workplace where leadership was assumed to be a man's job. Our experiences have deep connections to the social fabrics that influence women and leadership.

Changes to higher education continue to take place, and a lot of it has to do with globalization and the increasing use of technology. The patterns in leadership for higher education have been mostly the same, and that has been trouble. Although the involvement of women in higher education has steadily increased, involvement in management roles has not (White & Burkinshaw, 2019).

In every developing country, tertiary institutions, particularly the private subtype, have been favored for educational innovation. The primary developing context institution operates through performance measurement and managerialism and do what educational reform aims to do -- change the culture of teaching and learning. The women leaders in those institutions have to use both their skills and experience to take leadership roles while teaching. Women leaders have been restricted, but the barriers have had a profound psycho-socio impact (Herbst et. al, 2024; Meza-Mejía et. Al, 2023).

This research examines the influence of women leaders in private universities and how they influence institutional change. Beyond the numbers capturing the gender gap in leadership, this study uses a narrative inquiry approach to capture the lived experiences and processes of meaning construction. As we know, leadership is a socially and situationally constructed phenomenon and narrative inquiry is ideal for studying it this way (Fuller et al., 2021). Thus, this research illustrates the leadership journeys of five women leaders and how they have practiced, negotiated, and transformed leadership in private higher education.

2. Literature Review

Research such as Herbst et al. (2024), Zhao & Jones (2017), Morley (2013), and O'Connor (2018), on women and higher education, indicates dominant gender discrimination constructed by a socio-cultural framework, and institutional practices and structures, including a glass ceiling and leaky pipeline. Shakeshaft (1987) argue that these barriers are not functional or organizational; they stem from a patriarchal framework where the presence of men in dominant organizational roles is institutionalized. In the Global South, particularly in South Asia, such

barriers are compounded by socio-culturally constructed gender roles, family obligations, and social mobility, which influence the avenues available to women in assuming leadership roles, as well as the scope and impact of their leadership (Morley & Crossouard, 2016; David & Hill, 2020). Consequently, women's leadership trajectories are often nonlinear, requiring continuous negotiation between professional aspirations and sociocultural constraints.

Moreover, leadership in academia is often constructed through the lens of authority, competitiveness, and individualism, which are viewed as masculine traits, resulting in the marginalization of leadership styles that are characterized by collaboration, empathy, and care (White & Burkinshaw, 2019; Barnard et al., 2024; Blackmore, 1989). These are particularly distinct in the context of private universities, such as Bangladesh, where neoliberal governance, market-driven, and performance-based evaluation systems that prioritize efficient governance diminish inclusiveness (Altbach, 2016; Marginson, 2016). As a result, women leaders often navigate institutional cultures that are characterized by a paradoxical demand to conform to dominant, often masculine, leadership styles, while also being punished for conforming to such perceptions (Aiston, 2014; Bilimoria & Singer, 2019). Such a paradox significantly impacts not only access to leadership roles and positions, but also how such leadership roles are executed, perceived, and maintained.

The structural constraints women leaders face are further emphasized in narratively based and qualitative studies. Most of these studies demonstrate that women leaders often handle more than one identity in a given social situation, and that these identities cross one another, as women leaders manage social expectations, values, family roles, cultural customs and institutional norms (Noman et al., 2025; Brabazon & Schulz, 2020). Within their leadership journeys, emotive investment, mentoring, and relational forms of leadership are described as enabling and constraining (Fuller et al., 2021; Grogan, 1996). Women's representation in leadership positions is generally acknowledged. Yet, even with such increased representation, women continue to be marginalized in many leadership contexts; they face barriers to recognition, and experience informal networking and decision making spheres as exclusionary (Hagan & Olivier, 2022; O'Connor, 2018). This is particularly true in the South Asian context, where these barriers are compounded by the presence of virtually no institutional support structures, socially determined expectations around care work, and the absence of systemic, well defined, leadership pathways for women (Morley & Crossouard, 2016).

While there is relevant literature regarding the structural inequities and the leadership of women, the literature still lacks researching women leaders in the private sector of the Global South, especially in Bangladesh and how these women create meaning of their role and how they cause these institutions to transform. Most of the literature is driven by numbers and the focus has been the Global North, thereby ignoring the fine, tailored specifics of women's leadership in the Global South. Also, there has been little focus on the use of narrative inquiry as a methodology to capture the diversity, complexity and the lived experience of leadership. The current study attempts to fill this gap by focusing on women leaders in private universities in Bangladesh and provide an account of leadership from the women's perspective, thus focusing on the transformative nature of leadership, both personally and institutionally.

2.1 Research Questions

1. How do women leaders in private universities of Bangladesh construct and narrate their leadership experiences?
2. In what ways do women leaders contribute to the transformation of private higher education institutions of Bangladesh?

3. Methodology

This study follows the framework of qualitative research based on narrative inquiry, which is the study of experiences through the medium of a story. When we think of narrative inquiry, we shouldn't forget the interpretivist paradigm, which sees the existence of multiple realities with different meanings for each of the participants.

3.1 Participants

There were five women leaders at private universities of Bangladesh, from whom data is collected purposefully. Participants were said to run their respective university departments and were involved with program design and university management. All of the participants have been working in their respective positions for 8 to 20 years.

3.2 Data Collection

Data is collected through five in-depth and open-ended interviews. All interviews lasted between 60 and 90 minutes and requested participants to narrate themselves into the leadership role, the difficulties they faced and the roles they played at the institution.

3.2 Data Analysis
The study employed narrative analysis, focusing on:

- Personal trajectories
- Turning points in leadership
- Institutional contexts
- Meaning-making processes

Narratives were analyzed thematically while preserving the integrity of individual stories.

4. Findings and Discussion

4.1 Leadership as Negotiation within Gendered Structures
All participants described leadership as something that is constantly shifting as opposed to a static position of power. Though the culture of the institution is extremely implicit and patriarchal, participants felt that the ``performative" aspects of leadership had to be balanced as to not come off as passive, nor be perceived as too domineering when calibrating her tone, visibility, and assertiveness.

Literature also presents academia as a masculinized space that is not only hegemonic, but dominated by contests within legitimized leadership (White & Burkinshaw, 2019; Herbst et al, 2023; Acker, 2012; Morley, 2013). The absence of institutional recognition of a leadership claim and the constant need to "earn" leadership is a direct reflection of the organizational culture that many women are socially constructed as outsiders within the leadership organizational framework (O'Connor, 2018; Aiston, 2014). Agreeing with the findings of Blackmore (1989) and Shakeshaft (1987), leadership is not a neutral concept, and is socially constructed with a bias that prioritizes a specific type of power and authority.

The saying, "leadership is not given, it is negotiated every day" speaks to the challenges that women leaders face with the constant cycle of validation and scrutiny. From the narrative of the participants, it is evident that leadership is not a predefined category that women fall into, but rather a social identity that is shaped through discourses of resistance, adaptability, and strategic compliance (Dillard, 1995; Noman et al., 2025). Consequently, leadership is not a practice that one can engage in; rather, it is contextual, and the practice is determined by the interplay of institutional barriers, as well as the individual's initiative.

4.2 Relational Leadership and Institutional Change
Another important theme that emerged was the emphasis on participative, relational, and inclusive leadership. Most participants spoke about how they valued student engagement, mentorship, and collaboration, and how they positioned themselves as facilitators rather than in a position of authority. This was a stark contrast to the hierarchical and managerial leadership styles present in most private universities, particularly those universities that are subjected to neoliberal governance and metrics of performance.

The above findings corroborate with the existing literature that identifies relational leadership as one of the strengths of women leaders, given its emphasis on collaboration, empathy, and growth (Hagan & Olivier, 2022; Grogan, 1996; Brabazon & Schulz, 2020). These practices particularly seek to change the traditional view of leadership that is centered on individualism and competition, and replace the dominant paradigms with one that values inclusivity and shared decision-making (Barnard et al., 2024; Blackmore, 1989). Additionally, relational leadership has been linked with a range of positive organizational outcomes, including greater innovation and cohesion within the institution (Bilimoria & Singer, 2019).

Relational leadership has presented itself as a form of resistance, however, its emergence has been largely undocumented. Regarding relational leadership, participants explained to me that they 'create spaces' for dialogue, led by example when they mentored junior colleagues, and 'deconstructed' institutional cultures by establishing supportive learning environments. This example of deconstruction most likely aligns with constructive approaches to leadership that support the various approaches of leadership. The relational leaders consistently provide support, empowerment, and encouragement to junior colleagues, especially women, at every level of the institution, be it vertical (upward/downward) or horizontal (lateral) relationships. Given the institutional context, the value of

relational leadership is greater than the value of leadership in general, and it should be acknowledged as a valuable and essential form of disciplinary advocacy.

4.3 Emotional Labor and Invisible Work

The participants described the emotional component of leadership. Apart from the administrative tasks associated with leadership, they described their duties as working in the fields of student advocacy, colleague advocacy, and conflict resolution. The academic system relies on this 'invisible labor.' However, it is always overlooked and not considered when a formal evaluation is performed.

The research resonates with the literature on emotional labor and the care work associated with a certain gender in academia (Acker, 2012; Fuller et al., 2021; Morley, 2013). Female leaders are often viewed as caregivers in an organization and are expected to offer emotional assistance in addition to the management and academic tasks assigned to them (O'Connor, 2018; Brabazon & Schulz, 2020). This dual responsibility is a reflection of the social constructs that see femininity linked with nurturing as opposed to professional roles. Hence, it reinforces the expectation to care and the division of labor as it pertains to gender (Shakeshaft, 1987). There is an additional complexity to the participants' responses as it relates to emotional labor. Many told the researchers that their empathy, listening skills, and trust building skills enabled them to create more supportive and cohesive parts of the institutions in which they work. There is agreement with Grogan (1996) that relation-based leadership has the potential to increase the organization and efficiency of the institution, especially when it comes to education.

From this narrative inquiry view, emotional labor becomes place of meaning, where participants see practices that many view as low value as a core part of their leadership identity (Dillard, 1995; Fuller et al, 2021). The absence of such labor being recognized by the institution speaks to the inequitable ways leadership contributions are recognized and valued, especially within neoliberalism which focuses on the ranking of measurable outcomes over the value of the relational (Marginson, 2016).

4.4 Resilience and Identity Construction

All participant narratives predominantly featured resilience and the absence of this quality, with the exclusion of the narrative, enjoining the way participants formulate their self-determination through stories of exclusion. Being unrecognized in the workplace was a challenge, and so was the promotion of their colleagues, the undermining of their authority by colleagues, and the promotion of their colleagues, and the promotion of their colleagues, among others. The underdevelopment of the institution was evidently a considerable constraint. The direct observations of participants were quite the opposite, even under the considerable constraints.

Studies confirm this finding with the role of self-efficacy, persistence, and resilience in the leadership trajectory of other women (Hagan & Olivier, 2022; Bilimoria & Singer, 2019). The narratives reject the promotion of resilience to the personal, in this case the narratives situate, the absence of this quality within the wider system. Resilience should not be regarded as the personal quality of an individual. It should rather be seen as the result of inequity and systematic dependencies in the individual.

The stories of participants demonstrate resilience in the context of identity construction and the integration of both, identity construction and resilience. They are descriptive and insightful, and the themes of their stories are the virtues of social dyads and the transformation of experiences of marginalization of social dyads into social justice, (Noman et al, 2025; Dillard, 1995). The process of identity construction and the process of leadership identity construction is quite dynamic and quite complex. It speaks to the context of the institutions as well as their philosophy.

To us, resilience isn’t just about how much you can endure, but how you transform over time. Enduring the fire of criticism time and again ought to transform the fire into a forge that shapes you into a finer leader and redefines the roles you can play in the academy. This point of view is consistent with how narrative inquiry values identity as not static, but rather, fluid, relational, and formed, and reformed, and reformed again in an ongoing manner through lived experience (Fuller et al., 2021).

4.5 Women as Institutional Change Agents

Women’s narratives also suggested that we need to acknowledge the changes that women make in the private colleges and universities in the area of social institutions; Women, in addition to their administrative duties, improve the social institutions by creating new and revised curriculum, policy changes, student outreach, and academically safe spaces.

By reiterating the literature that continues to proliferate over the last few years featuring women leaders as change agents (Yahya et al., 2024; Morley, 2013; Barnard et al., 2024), because unlike top-down change models, participants felt change was slow and, for the most part, invisible. This change was found in the little, every day, social interactions. Those little changes are in alignment with Blackmore's (1989) social justice values, leadership, and relationships.

In the private universities of the Global South, changes are most appreciated. Women leaders have the unique position of having to achieve a delicate balance and use their mediation skills in a somewhat glaring fashion (Altbach, 2016; Marginson 2016). Women leaders, in a time of globalization, use their managerial skills and flexible leadership style to achieve efficient, inclusive, innovative, and equitable institutions.

A majority of participants see themselves as change agents, and not merely as participants in the social institutions. These women leaders are determined to bring about structural changes, changes that are also cultural and impact the values, social relationships and social institutions of the organization. These social institutions are where these leaders have their lived experiences and have, in fact, changed the very essence of social institutions; that is the main goal of this research.

This paper presents the design of outcome-based questions, assignments, projects, open-ended laboratories and case studies that promote higher-order thinking, creativity, and real-world problem-solving. It highlights how different forms of assessment such as theory-based evaluations, laboratory tasks, internships, and final year design projects can be effectively aligned with learning outcomes. Examples of outcome-based assessments across disciplines are provided, demonstrating how they foster critical thinking, analytical ability, and professional ethics. Ultimately, the paper advocates a holistic approach to assessment that integrates cognitive, affective, and psychomotor domains, ensuring that learners acquire not only theoretical knowledge but also practical and ethical competencies essential for professional success.

5. Conclusion

Women holding leadership positions in private universities are institutional actors in their own right, as this study has proven. Through narrative inquiry, this study illustrates the various of ways in which leadership is formed from experience, relationships, and the power of "no." Women leaders make significant changes in the new construction of academia, even in the face of the challenges and oppression of institutional and cultural frameworks. They leadership changes the new construction of academia, even in the face of the challenges and oppression of institutional and cultural frameworks. This study advocates for the institutional policies that justify women's leadership as a matter of inequity, but as a necessity for the new world of higher education.

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Strategic Framework for Higher Education Accreditation and Global Ranking (2027-2037)

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Abstract
This strategy plan (2027–2037) describes how a private institution in Bangladesh can simultaneously meet Bangladesh Accreditation Council (BAC) requirements and be recognized in Times Higher Education (THE) and QS international rankings. Academic Excellence & Curriculum Innovation, Research & Knowledge Creation, Internationalization, Faculty Development, Student Success & Employability, Infrastructure & Digital Transformation, and Sustainability & Social Impact are the seven strategic priorities that are integrated within the proposed framework. Strategic planning implementation and BAC compliance (χ^2 $p<0.001$, $V=0.42$), stakeholder involvement and implementation success ($V=0.48$), and research investment with citation impact ($V=0.38$) are all significantly correlated, according to mixed-methods research with 180 stakeholders. Strategic planning adoption boosts BAC compliance probability by 6.17 times, according to binary logistic regression. The Foundation (2027–2029), Growth (2030–2033), and Excellence (2034–2037) phases of the phased roadmap aim to achieve 95–100% BAC accreditation, QS Asia Top 250–300 rating, and THE Impact Top 400–500 position by 2037.

Keywords: Bangladesh, SDGs, Global Rankings, Higher Education, Accreditation, Strategic Planning

1. Introduction

International rankings are essential measures of institutional success in the increasingly competitive world of higher education. Participating in these rankings is a strategic requirement for institutions in developing nations to improve their reputation, quality, and ability to compete globally. Higher education institutions must show improvements in teaching, learning, research, and community involvement in order to comply with the Bangladesh Accreditation Council Act (2017).

This strategy plan (2027–2037) offers a ten-year road map for reforming a private university in Bangladesh that incorporates QS and THE performance criteria and is in line with BAC and University Grants Commission requirements. In the context of Bangladesh, the paradigm fills a significant vacuum in the literature by integrating national accreditation compliance with global ranking indicators in a synergistic manner.

Research Question: What integrated ten-year strategy framework (2027–2037) can a private university in Bangladesh create to meet national accreditation requirements, increase its competitiveness in worldwide rankings, and guarantee long-term sustainability?

2. Theoretical Framework: Accreditation-Ranking Nexus

The proposed framework views national accreditation (BAC) and global rankings (QS, THE) as mutually reinforcing rather than competing requirements. Three layers constitute the framework:

Layer	Focus	Key Elements
Foundation	Regulatory compliance & quality assurance	BAC input standards, process reliability
Performance	Institutional excellence	Teaching quality, research output, student success
Recognition	Global visibility & reputation	QS/THE indicators, international benchmarking

Academic integrity, creativity and innovative problem-solving, sustainability and social responsibility (SDGs), diversity and inclusion, cooperation, and shared responsibility are the core principles.

3. Methodology

3.1 Design of Research

Quantitative and qualitative methodologies were combined in a mixed-methods design. Dichotomous (yes/no) indicators were employed due to confidentiality restrictions.

3.2 Example
180 stakeholders from a fictitious private university "X" were included in the purposeful sampling: faculty (n = 50), administrative personnel (n = 20), university leadership (n = 10), and students (n = 100).

3.3 Tools and Evaluation
- Binary replies to the Strategic Planning Perception Survey
- Checklist for Institutional Compliance
- Semi-structured interviews (n = 12)
- Analyze strategy plans and BAC reports.
- Chi-square, Fisher's Exact, Binary Logistic Regression, and Mann-Whitney U are statistical tests.
- The overall KR-20 dependability coefficient is 0.79.

3.4 Tools for Strategic Analysis
To evaluate institutional status, SWOT, PESTEL, and VRINE studies were performed.

4. Results
4.1 SWOT Analysis

Category	Key Points
Strengths	Clear vision with seven strategic priorities; growing research capacity
Weaknesses	Resource strain from broad priorities; limited high-impact research
Opportunities	BAC accreditation; international partnerships; demand for quality higher education
Threats	Economic fluctuations; intense competition; regulatory changes

4.2 Hypothesis Testing Results
All nine hypotheses were supported at $p<0.01$ significance level:

Hypothesis	Independent Variable	Dependent Variable	p-value	Effect Size (V)
H_1	Strategic planning implementation	BAC compliance	<0.001	0.42 (moderate)
H_2	Strategic planning initiatives	Performance improvement	0.002	0.35 (moderate)
H_3	Research investment	Citation impact	<0.001	0.38 (moderate)
H_4	Internationalization efforts	International outlook	0.003	0.32 (moderate)
H_5	Employer partnerships	Employment outcomes	<0.001	0.40 (moderate)
H_6	Stakeholder involvement	Implementation success	<0.001	0.48 (moderate)
H_7	Faculty perceptions	Engagement	0.008	0.29 (weak-moderate)
H_8	Strategic resource allocation	ROI	0.007	0.28 (weak-moderate)
H_9	Diversified funding	Sustainability	0.001	0.36 (moderate)

4.3 Binary Logistic Regression
Stakeholder engagement, resource allocation, and strategic planning execution (OR=6.17) were significant predictors in Model 1 (BAC Compliance). 82.5% classification accuracy and Nagelkerke R2 = 0.47.

Model 2 (Global Ranking Presence): There were substantial investments in research, internationalization initiatives, and industry collaborations. 79.8% classification accuracy and Nagelkerke R2 = 0.43.

4.4 Themes of Qualitative Analysis
Interviews (n=12) revealed six major themes: stakeholder engagement increases buy-in (9/12), external validation drives improvement (8/12), faculty development gaps (8/12), leadership commitment as critical (11/12), resource constraints as primary barrier (10/10), and internationalization as aspirational but challenging (7/12).

5. Strategic Framework Components
5.1 Seven Strategic Priorities

Component	Key Initiatives	BAC/QS/THE Alignment
Enhanced Learning & Teaching	Curriculum revision under BNQF; dual/joint degrees	BAC: curriculum relevance; QS: academic reputation; THE: teaching environment
Research with Impact	SDG-aligned research fund; joint PhD supervision	BAC: research environment; QS: citations; THE: research quality, SDG impact
Global Talent & Partnerships	International faculty recruitment; student exchanges	QS: international ratios; THE: international outlook, SDG 17
Sustainable & Digital Campus	Green campus master plan; smart campus ecosystem	BAC: infrastructure; QS: facilities; THE: SDGs 7,11,12,13
Graduate Employability	Mandatory career readiness programs; global alumni network	BAC: graduate outcomes; QS: employer reputation; THE: graduate skills

5.2 Policy for Faculty Promotion

No faculty member may advance to a position higher than lecturer without a PhD. In order to achieve academic quality and credibility in worldwide rankings, this policy cannot be compromised. A PhD is necessary for all employment as an assistant professor, associate professor, or professor. Current faculty members without a PhD will have a set amount of time (up to five years) to finish their degree; if they don't, they will either stay at the rank of lecturer or be moved to non-tenure-track teaching positions.

5.3 Phased Implementation Roadmap

Phase	Period	Focus	Key Activities
Foundation	2027-2029	Laying groundwork	BAC compliance, data systems, initial international partnerships
Growth	2030-2033	Scaling impact	Research enhancement, reputation building, targeted ranking improvement
Excellence	2034-2037	Global recognition	Thought leadership, visible ranking progress, benchmarking

5.4 Target KPIs (2026 Baseline → 2037 Target)

KPI	Baseline (2026)	Target (2037)	Expected Achievement
BAC Accredited Programs	0%	100%	95-100%
Scopus Publications (annual)	5-10	80-100	75-90
QS Asia Ranking	Not ranked	Top 300	Top 250-300
THE Impact Ranking	Not ranked	Top 500	Top 400-500
International Student Ratio	0%	15%	12-18%
Non-Tuition Revenue	5%	30%	25-35%
Graduate Employability	60%	85%	80-85%
Faculty with PhD	40%	100%	95-100%

5.5 SDG Integration Matrix

SDG Cluster	Primary SDGs	Integration Strategy	KPIs
Planet & Environment	6,7,11,12,13,14,15	Sustainable campus operations, environmental research	Carbon neutrality progress, recycling rate
People & Society	1,2,3,4,5	Inclusive education, health programs, gender equity	Scholarship coverage, gender balance in leadership
Prosperity & Innovation	8,9,10,17	Industry partnerships, entrepreneurship programs	Startup incubations, industry research funding
Peace & Governance	16	Ethics education, legal aid clinics, policy research	Policy contributions, ethics training rate

6. Conclusion

This ten-year strategy plan offers Bangladeshi private universities a practical road map for concurrently obtaining both national accreditation and international recognition. When strategically connected, QS/THE performance and BAC compliance are mutually reinforcing, as the Accreditation-Ranking Nexus Framework shows. Sustained leadership commitment, stakeholder engagement, diversified funding, and faculty development—which requires PhDs for assistant professors and above and allows for the retention of productive senior faculty until retirement

age provided they are mentally and physically fit—are important success elements. Teachers are not required to retire at age 65 for which government policy and UGC policy need to be chnged. Any faculty member who is in good physical and mental health should be permitted to continue teaching after the age of 65, in accordance with the model of prestigious universities in the United States and Australia. There won't be a set retirement age; instead, continuing will be decided by yearly performance and fitness evaluations. This policy protects research output, mentorship potential, and institutional knowledge.

Consequences:

- For BAC/Policymakers: Aligning compliance measurements with QS/THE KPIs can minimize effort redundancy.
- A centralized, data-driven strategy office with clear KPIs is crucial for university leadership.
- For Faculty: Change evaluation metrics from input-based to output-based.
- For Students: Potentially higher academic standards and improved employability and degree credibility

Future Research: Testing the Accreditation-Ranking Nexus across other South Asian private universities; longitudinal studies at 2030 and 2035 milestones; the impact of PhD-level faculty development on research productivity; and sustainable financing mechanisms for higher education institutions in developing nations.

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Toward a Continuous Industry–Academia Collaboration Framework for Enhancing Graduate Employability in Bangladesh

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Abstract
Despite the many intellectual discussions and scholarly work highlighting the significance of industry-academia collaboration, the lack of graduate employability and the rising unemployment rate continue to remain growing concerns in an emerging economy like Bangladesh. This study thus intends to identify gaps in industry-academia collaboration in Bangladesh and propose a structured framework that will ensure effective implementation of recommended collaborative policies. The study is primarily a systematic literature review that used secondary data collection via electronic database searching to select 35 papers published between January 2021 and December 2025 from databases such as Scopus and ScienceDirect. The findings of the study verified the claims of other similar work and showed a clear gap between what the industry seeks and what the academia offers. The study further identified challenges like lack of continuous two-way communication and institutional flexibility, mismatched expectations between stakeholders, and lack of scalability and sustainability that obstruct the process of policy implementation. Based on the findings, the study proposed a structured policy-oriented multilayered collaboration framework that can ensure successful execution of industry-academia collaborative efforts. Through establishing continuous collaboration, this framework can significantly improve graduate employability and national economic growth.

Keywords: Employability, Industry-Academia Collaboration, Policymaking, Skills Gap, University-Industry Partnerships

1. Introduction

Establishing close collaborative relationships between academic institutions and industry sectors has been a focal point of public discourse across many parts of the world over the last decade. Particularly in Bangladesh, a key finding emerging from these discussions is that despite the annual increase in the number of graduates, employers struggle to hire suitable candidates due to a persistent gap between the skills required by recruiters and those possessed by graduates. While academics and professionals engage in dialogues and propose their policies to improve the employability of fresh graduates, Bangladesh's unemployment rate remains on an upward trajectory, with the youth unemployment rate going as high as 9.39 percent in 2025 (Statista Research Department, 2026). This study has thus identified a significant gap that relentlessly exists in the successful collaboration between industry and academia, which is the severe lack of policy implementation largely due to weak communication channels, policy disconnect, and fragmented collaboration between the concerned agents (Aminu & Aisha, 2025, O'Dwyer et al., 2023). Therefore, based on the findings of various existing narratives, this study aims to develop and propose a structured framework that will create a continuous, sustainable, system-driven, and data-backed collaboration ecosystem in the industry and academia of Bangladesh.

2. Literature Review

Previous literature indicates a growing scholarly attention to the topic in recent years. Thematically, the literature concentrates on industry-academic collaboration (IAC) and employability, followed by curriculum alignment, soft skills development, and experiential learning. Moderate attention is directed toward barriers, policy, and digital skills, whereas the Bangladesh context, Triple Helix Theory, and knowledge transfer appear less frequently. This pattern suggests a growth of practice-oriented field with limited theoretical and context-specific depth. The year-wise distribution of publications (Figure 1) and the thematic focus areas of scholarly articles (Figure 2) are presented below.

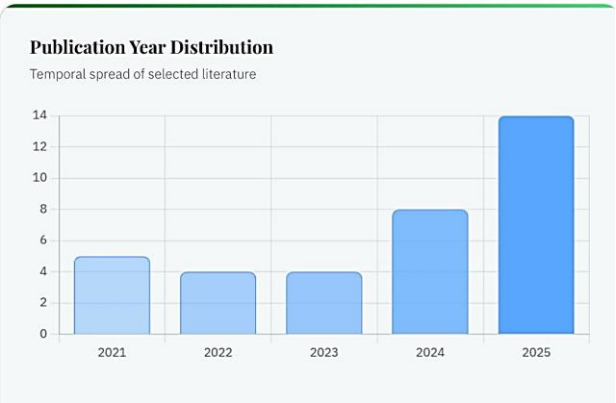


Fig.1 Year-wise distribution of publications



Fig.2 Thematic focus areas of scholarly articles

Despite variation in their foci, a review of the relevant literature reveals a consensus on two central phenomena. First, industry academia collaboration (IAC) plays as an integral strategic mechanism to enhance graduate employability, innovation capacity, and workforce readiness. Second, universities consistently face curriculum-industry mismatch and skill gaps in technical, digital, communication, problem-solving, and soft skills (Abidoye et al., 2021; Guàrdia, 2021; Khatun et al., 2022; Hasan et al., 2024; Alam et al., 2025). In the era of 4th IR, this gap has become more relevant, requiring co-design of OBE curriculum, experiential learning, field projects, training & mentoring, and digital integration to prepare graduates to better fit for the changing labor market demands (Dooley, 2024; Wahab et al., 2024; Jha & Doshi, 2025; Singh & Dixit, 2025; Attah et al., 2025; Kabombo et al., 2025; Swain-Oropeza et al., 2025). The studies suggest exrending IAC beyond ad hoc engagement toward structured and sustainable formal MOUs and advisory board (Agilan, 2025; Khan et al., 2025; Samarasekere et al., 2024; Passoss et al., 2022; O'Dwyer et al., 2023; Yang et al., 2025). Theoretical foundations such as the Triple Helix model, systems theory, human capital theory, and stakeholder theory support the need for coordinated university-industry-government interaction, institutional governance, resource allocation, accountability, and policy-driven monitoring (Cai & Etzkowitz, 2021; Chioma, 2025; Awu et al., 2025; McGahan, 2023; Aminu & Aisha, 2025; Karlsdottir et al., 2023; Li & Zhu, 2021). Hence, a Comprehensive Industry-Academia Collaboration Framework (CIACF) should be implemented diligently to transform collaboration from isolated activities into a sustainable co-creation system that generates more industry-ready graduates.

3. Methodology

The study utilized a systematic literature review (SLR) method to identify, evaluate, and synthesize existing literature on industry-academia collaborations. Secondary data collection via electronic database searching was used to select 35 papers on relevant literature that was thoroughly analyzed to understand the current state of knowledge on the research theme. Several credible databases such as Scopus and ScienceDirect were used to find relevant scholarly articles on the study topic. A keyword-based filtering strategy combined with inclusion/exclusion criteria was used to select the 35 articles. Keywords such as Bangladesh, Employability, Industry-Academia Collaboration, Innovation, Learning, Policymaking, and Skills were input into the search boxes of the abovementioned databases for this purpose. As for inclusion/exclusion criteria, only peer-reviewed articles, book chapters, conference papers, and policy reports published between January 2021 and December 2025 were included while editorials, perspectives, white papers, notes, and non-English items were excluded. Only articles written in English were considered in order to ensure accessibility and relevance to the current study. Lastly, a deductive thematic analysis approach was employed to organize and expand on existing knowledge.

4. Findings

In 2022, the Centre for Policy Dialogue (CPD), with support from Friedrich Ebert Stiftung (FES) Bangladesh Office, conducted a systematic study (Khatun et al., 2022) with insights from 100 non-government employers and skills assessment scores from 500 university students and recent graduates to investigate the gap between skills demanded by employers and skills possessed by the young generation of job-seeking candidates. Findings from the two online surveys conducted as part of this study revealed that the number one reason majority of the employers in Bangladesh found it difficult to fill vacancies in their companies was the low number of applicants with the required skills while another major reason was the lack of qualifications demanded by the companies.

In response to the question about the important skills that they found lacking in the applicants, 56 employers mentioned professional networking skills, 53 employers mentioned critical thinking skills, and 48 employers mentioned numeracy and mathematical skills. The study further probed to identify the most important skills employers expected from the graduates and discovered that communication skills and problem-solving skills were at the top of their list. Findings also showed that some other soft skills such as critical thinking skills, teamwork and leadership skills, creativity, and time management were highly valued by many of the employers surveyed. However, the greatest thought-provoking part of the findings uncovered the existing gap between what the industry seeks and what the academia offers: while most employers considered communication skills, problem solving skills, and critical thinking skills the most important skills expected from the graduates, graduates obtained the lowest average scores in these areas.

Ameliorating the effects of this dire skill-gap situation requires stronger industry-academia collaborations that, as many studies in recent times (Attah et al., 2025; Khan et al., 2025) have found, can significantly help reduce the employability gap and improve graduates' work readiness. As part of the collaborative efforts, initiatives such as internships, collaborative projects, and industry participation in curriculum design and development can be adopted in emerging countries like Bangladesh, as has been suggested by a recent study (Sangeetha & Gurupandi, 2024). Some other studies (Guardia et al., 2021; Swain-Oropeza et al., 2025; Vlachopoulos & Makri, 2024) have added work-integrated learning, live industry projects, mentoring schemes, and challenge- or project-based learning to the list to engage students in real-world professional contexts.

Such collaborative endeavors, as the findings of similar other studies (Dooley et al., 2024; Wimalasooriya & Wickramaarachchi, 2025) have shown, are highly likely to improve both technical and transversal skills as well as to boost student motivation. However, much of this intensive research and ensuing discussions are limited to policy formulation; when it comes to the actual adoption and implementation of these policies, various challenges like lack of institutional flexibility, misaligned expectations between stakeholders, and lack of scalability and sustainability tend to obstruct the process (Kmiotek-Meier et al., 2024; Saleh & Wahab, 2024).

Yang et al. in their 2025 study used a stakeholder perspective to create a framework based on drivers and barriers of university–industry collaborative innovation. According to their framework, 17 barriers were categorized and analyzed, some of which were lack of partnerships and networks, inadequate policies and regulations, lack of common goals between concerned parties, absence of a formal communication and cooperation mechanism, etc. However, this particular framework failed to present a proper feedback loop and implementation phases that are required to ensure continuous collaboration between industrial bodies and academic institutions.

5. Discussion: Continuous Industry–Academia Collaboration Framework (CIACF)

The SLR analysis suggests that, the real concern is the issue is a lot of variables are on the way of effective implementation of the recommended policies. Therefore, this study proposes a Continuous Industry–Academia Collaboration Framework (CIACF), the core idea of which is to shift from uneven, episodic collaboration to a continuous, sustainable, system-driven, and data-backed collaboration ecosystem in the industry and academia of Bangladesh (figure 3). This framework has been inspired by some other existing frameworks, one of which is the Triple Helix model, an innovation framework that connects three institutional spheres of industry, academia, and government to promote regional economic growth and entrepreneurial initiatives (Cai & Etzkowitz, 2021). In a recent study (Lee et al., 2025), another similar conceptual framework was developed showing close connections between policy incentives, professional engagement, curriculum design, skill development, and entrepreneurial mindset and agility. Alom et al. (2026) also proposed a comprehensive IAC framework that connects academic theories with industrial practice with the support of resources, funds, and modern technologies and amenities. This framework integrates four different layers, which are 1. Input Layer (Industry ↔ Academia), 2. Central Engine National Skills Intelligence Platform (NSIP), 3. Translation Layer (Bridging Mechanisms), and 4. Output Layer (Outcomes).

In the first layer where industry and academia provide valuable inputs as active data providers, two-way communication channels in the form of formal channels, digital channels, and institutional channels are established. Fundamentally, this layer is built upon the stakeholder theory that underscores the importance of organizations to actively engage with their stakeholders who can influence or be influenced by their endeavors (McGahan, 2023).

In the second layer, National Skills Intelligence Platform (NSIP), a national database and analytics hub is established by the government of Bangladesh with continuous contributions from industry bodies and academic

institutions. Working as Bangladesh's labor market intelligent system, NSIP will deeply analyze skill gap in real time, forecast future skill demand in the job market, and provide necessary policy support. This layer thus is supported by the human capital theory that emphasizes the role of education and skills in improving human productivity and economic outcomes (Awu et al., 2025).

In the third layer, based on data collected from NSIP, the real policy implementation starts that involves curriculum co-development (industry-academia joint design that is to be regularly updated based on NSIP data), structured internship ecosystem (credit-based internships, standardized learning outcomes, and joint evaluation of interns by both companies and universities), industry-embedded teaching (adjunct/part-time faculty appointment from industry, real case-based teaching, and workshops and bootcamps), research and innovation collaboration (joint R&D projects by companies and universities that solve industry problems, co-publications, and IPR sharing), and continuous feedback and review between industry bodies and academic institutions (performance reviews, graduate and employer feedback, and updated actions in NSIP). The best theoretical groundwork for this layer refers to the knowledge transfer theory that focuses on translating data into actionable outcomes (Li & Zhu, 2021).

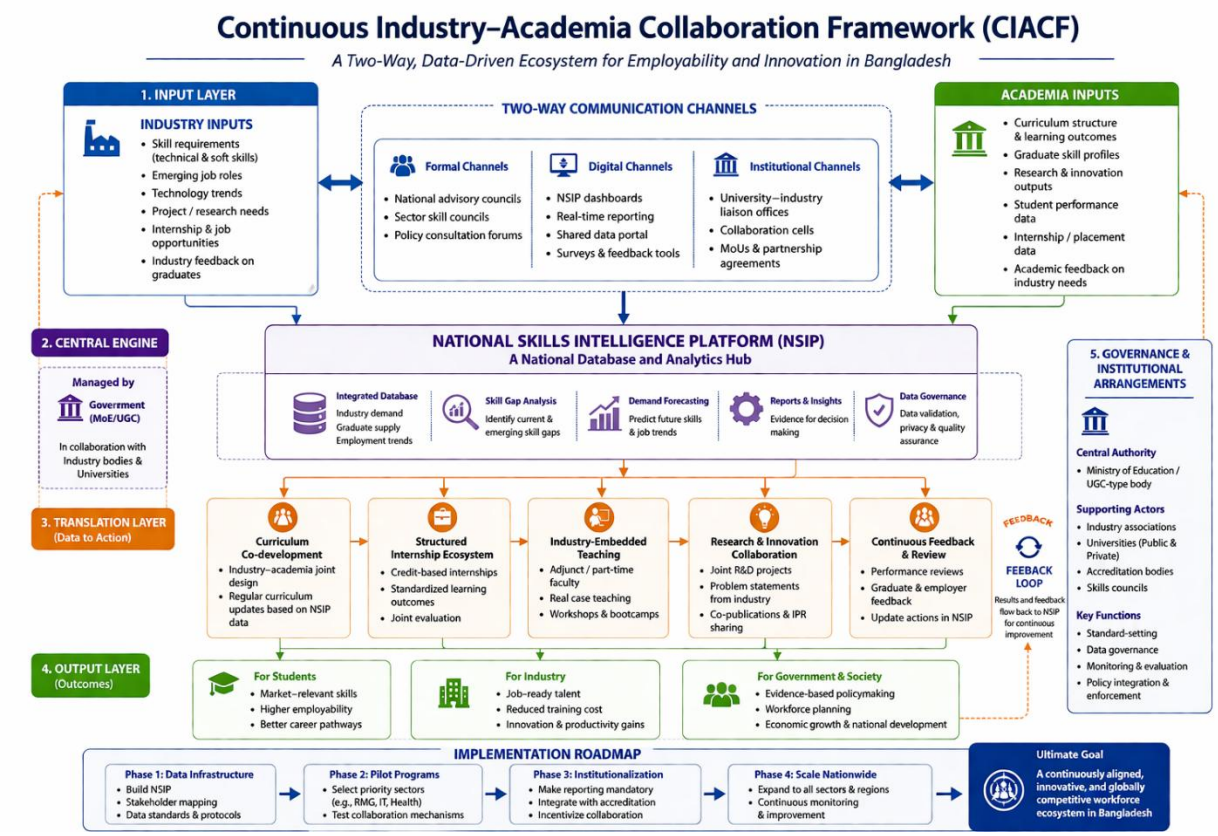


Fig. 3 The Continuous Industry-Academia Collaboration Framework (CIACF)

In the fourth layer, students, industry, government, and society all enjoy the outcomes of the combined efforts put in the prior three layers. This layer essentially reflects the systems theory, an abstract philosophical framework that comprises interrelated and interdependent parts producing synergistic results (Chioma, 2025).

The most integral part of the CIACF is its continuous feedback loop that never stops. For example, if an industry faces skill shortage at some point, it informs NSIP that subsequently identifies the gap, based on which universities update their academic curriculum, which then prepares students to become skilled workforce, whom the industry evaluates based on their performance, the feedback of which then goes back into the system. What makes this framework strong is its focus on two-way communication, data-driven policymaking, continuous feedback loops, and clearly defined roles and responsibilities for every stakeholder in the system. There are four implementation phases starting with the creation of NSIP that brings everyone in industry and academia together into one system. In later phases, pilot programs are introduced with select industries such as RMG, IT, FMCG, etc., timely reporting is made mandatory, and continuous monitoring system.

6. Implications for Employability and Work-Integrated Learning

The fundamental aspect of the CIACF that differentiates itself from the other similar conceptual frameworks of industry-academia collaboration is that this multi-layered framework is continuous, sustainable, system-driven, and data-backed. The proposed system, first and foremost, establishes continuous two-way communication between various stakeholders of industry and academia. This implies that universities will always remain aware of the skills requirement by the organizations, be able to update their course curriculum accordingly, and will produce graduates with enhanced employability. The CIACF also ensures that there is a continuous feedback loop between industry and academia, which essentially signifies the uninterrupted exchange of feedback between stakeholders regarding graduates' performances as interns in different organizations. Oftentimes what obstructs educational institutions from updating their programs according to industry needs is lack of information regarding their graduates' actual performances at workplaces. The CIACF enables the employers to share their evaluations of their interns and employees with their academic partners, which further translate into curriculum co-design to upgrade the university graduates' overall skillsets.

7. Conclusion

The widening gap between industry and academia as backed by literature, stresses the essence of IAC for improving graduate employability, yet little systematic effort has been made to adopt and implement proposed policies. Persistent issues such as poor two-way communication, resource shortages, institutional rigidity, mismatched expectations, and fragmented collaboration render implementation especially difficult in emerging countries like Bangladesh. In response, this study proposes a CIACF, built on two-way communication channels and a NSIP, a centralized digital database enabling continuous data exchange between industry and academia. Guided by NSIP data, coordinated collaborative efforts include curriculum co-development, a structured internship ecosystem, industry-embedded teaching, research and innovation collaboration, and continuous feedback between industry bodies and academic institutions. This conceptual framework draws on the Triple Helix model, reinforced by stakeholder theory, human capital theory, knowledge transfer theory, and systems theory. Through systematic application of this framework, Bangladesh is able to address its skills gap, enhance higher education quality, increase student motivation, produce industry-valued graduates, and contribute to national economic growth. Future researchers need to prioritize empirical validation of the framework using quantitative techniques such as structural equation modeling (SEM). Qualitative case studies involving employers, faculty members, students, policymakers, and university administrators could further enrich understanding of the barriers, power dynamics, and institutional conditions that influence successful implementation. Without a deliberate, data-driven bridge between what classrooms teach and what economies truly need, no amount of policy rhetoric will close the employability gap. The CIACF offers a practical pathway to close it.

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Green Finance Competency among University Graduates in Bangladesh: Academic Background and Implications for Curriculum Reform

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Abstract
Green finance has emerged as a core professional competency requirement in Bangladesh, yet whether university graduates possess the necessary knowledge, skills, and readiness remains empirically unexplored. This study assesses green finance competency among 369 university graduates across public and private institutions using a five-dimensional instrument covering Conceptual Knowledge, Analytical Skills, Practical Skills, Policy Awareness, and Behavioral Readiness. Group comparisons by university type, academic level, course exposure, and degree discipline are conducted using independent-samples t-tests and one-way ANOVA with Bonferroni post-hoc correction. Overall competency is moderate-to-high (M=3.611), but Curriculum Exposure records the lowest mean (3.014), revealing a structural gap between motivation and formal preparation. Course exposure is the strongest differentiator, graduates who completed a dedicated green finance course significantly outperformed peers across all knowledge and skills dimensions ($p<0.001$). University type and academic level produce no significant differences, with graduate programmes offering no measurable advantage over undergraduate training. Economics graduates consistently outperform Finance and Business graduates despite Finance being the most directly relevant discipline. Findings call for mandatory green finance integration into Finance and Business curricula at both levels, with regulatory enforcement by the University Grants Commission of Bangladesh.

Keywords: Green Finance Competency, Sustainability Education, Curriculum Reform, Bangladesh, Higher Education, Academic Background

1. Introduction

Green finance has become central to contemporary financial development as governments, regulators, and markets increasingly redirect capital toward renewable energy, climate-risk management, green bonds, sustainability-linked lending, and environmentally responsible investment. In this transition, finance is no longer only a mechanism for allocating savings to productive activity; it is also an institutional channel through which climate objectives are translated into bankable projects and risk-governance practices. Prior research shows that mobilising private participation in green finance requires credible instruments, risk-sharing mechanisms, and technical capacity within financial systems (Taghizadeh-Hesary & Yoshino, 2019).

Bangladesh provides a particularly important setting for examining this issue. As a climate-vulnerable developing economy, the country faces acute exposure to floods, cyclones, salinity intrusion, and climate-related displacement while simultaneously seeking sustained financial-sector development. Bangladesh Bank's green banking initiatives and subsequent sustainability-oriented regulatory measures indicate that green finance has moved from a peripheral policy concern to a professional competency requirement. However, regulatory progress may be constrained if the emerging workforce lacks the relevant knowledge, analytical skills, practical skills, policy awareness, and behavioural readiness needed to implement green finance instruments effectively.

This concern is especially salient for higher education. Sustainability education research emphasizes that graduates require integrated competencies, including systems thinking, anticipatory reasoning, normative judgment, strategic action, and interpersonal capability (Wiek et al., 2011). Yet finance, business, and economics curricula in Bangladesh remain largely organized around conventional financial theory, with climate-risk analysis, ESG assessment, green bond structuring, carbon-market literacy, and sustainability accounting often treated as marginal or elective content. This curricular lag may create a human-capital bottleneck in the implementation of Bangladesh's green finance agenda.

Against this background, the present study assesses green finance competency among 369 university graduates in Bangladesh and examines whether competency differs by academic background, including university type, academic level, course exposure, and degree discipline. The study contributes to the literature by providing empirical evidence from a climate-vulnerable developing-country context, disaggregating competency into multiple measurable dimensions, and identifying the academic factors most closely associated with graduate readiness. The findings are intended to inform curriculum reform, university-industry collaboration, and policy design aimed at aligning graduate training with the rapidly evolving demands of sustainable finance practice.

2. Literature Review

Green finance has emerged as a central mechanism for aligning financial intermediation with environmental sustainability. It channels capital toward renewable energy, low-carbon infrastructure, green bonds, climate-risk management, and other environmentally beneficial investments. The literature conceptualizes green finance not merely as a set of financial products but as a broader institutional response to climate-related market failures, information asymmetry, and long-term investment risk (Soundarrajan & Vivek, 2016; Taghizadeh-Hesary & Yoshino, 2020). In developing economies, this role is especially salient because financial systems must simultaneously support growth, address infrastructure deficits, and manage increasing exposure to climate shocks (Volz, 2018). Green bond research further shows that market expansion depends on credible standards, reduced greenwashing risk, and stronger issuer and investor capacity (Deschryver & de Mariz, 2020).

Bangladesh provides a highly relevant empirical context because climate vulnerability and financial-sector greening have advanced in parallel. Studies on Bangladesh's green banking transition indicate that regulatory initiatives by Bangladesh Bank encouraged commercial banks and non-bank financial institutions to adopt environmental risk management, green financing, and sustainability reporting practices (Khairunnessa et al., 2021). Evidence also suggests that private commercial banks have become important actors in green finance development, although implementation remains uneven and depends on institutional capability, managerial awareness, and regulatory compliance capacity (Zheng et al., 2021). This implies that green finance policy cannot be implemented effectively through regulation alone; it also requires a competent workforce able to interpret environmental risk, design green financial products, and evaluate sustainability-linked investments.

The higher education literature provides the theoretical basis for examining such competency formation. Wiek et al. (2011) identify systems thinking, anticipatory thinking, normative reasoning, strategic competence, and interpersonal competence as core sustainability capabilities. These competencies are directly relevant to green finance because climate-related financial decisions involve complex interdependence between markets, regulation, ecological constraints, and long-term social welfare. Lozano et al. (2017) similarly argue that sustainability education requires alignment between competences and pedagogical approaches; passive exposure to sustainability concepts is insufficient unless curricula develop analytical, applied, and problem-solving capacities. Within business education, Rusinko (2010) proposes that sustainability can be integrated through stand-alone courses, embedded modules, or programme-wide redesign. Empirical evidence from leading business schools further shows that ethics, corporate social responsibility, and sustainability content remain unevenly distributed, suggesting a persistent gap between institutional rhetoric and curricular depth (Christensen et al., 2007).

This literature is directly relevant to the assessment of green finance competency among university graduates. If graduates enter the financial sector without exposure to climate risk analysis, ESG evaluation, green bond principles, and sustainability disclosure, they may be formally qualified yet substantively underprepared. Prior work on professional education similarly finds that employers increasingly demand analytical, communication, business-awareness, and real-world problem-solving skills that university programmes often fail to develop adequately (Kavanagh & Drennan, 2008). In green finance, this gap is likely to be more severe because the field requires interdisciplinary knowledge across finance, environmental economics, public policy, and risk management.

Overall, the literature suggests three important gaps. First, green finance scholarship has focused more on instruments, regulation, and institutional development than on graduate-level human capital. Second, sustainability education research has developed strong competency frameworks, but these have rarely been operationalized in finance curricula in developing-country contexts. Third, Bangladesh-specific green finance studies largely examine banking practices and regulatory implementation, with limited attention to whether universities are producing graduates capable of supporting this transition. The present study addresses these gaps

by assessing green finance competency among Bangladeshi university graduates and examining whether academic background shapes preparedness for the emerging green finance labour market.

3. Methodology

This study adopted a quantitative cross-sectional survey design to examine green finance competency among university graduates in Bangladesh. Data were obtained from 369 respondents enrolled in, or recently graduated from, undergraduate and graduate programs in public and private universities. The sample included 65.6% public university and 34.4% private university respondents; 61.5% were undergraduates and 38.5% were graduate-level students. By discipline, 57.1% were from Business, 28.6% from Finance, and 14.3% from Economics. Since 59.1% had not taken a dedicated green finance or sustainability course, the data allowed comparison between course-exposed and non-exposed respondents.

The questionnaire measured seven composite dimensions: Conceptual Knowledge, Analytical Skills, Practical Skills, Policy Awareness, Behavioral Readiness, Curriculum Exposure, and Industry Requirements. Items were rated on a five-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. Internal consistency was assessed using Cronbach's alpha, a standard reliability coefficient for multi-item scales (Cronbach, 1951). Alpha values ranged from 0.676 to 0.803, indicating acceptable reliability for most constructs. Composite scores were calculated as item-level row means, while overall green finance competency was computed as the mean of the first five competency dimensions.

The analysis included descriptive statistics, competency classification, Pearson correlation, independent-samples t-tests, one-way ANOVA with Bonferroni post-hoc comparisons, and gap analysis between perceived industry requirements and reported competency. Finally, OLS regression was estimated to identify predictors of overall competency. Robust standard errors were applied after the Breusch-Pagan test indicated heteroskedasticity, following White's (1980) heteroskedasticity-consistent estimation approach.

4. Empirical Results and Discussion

The empirical analysis is based on seven questionnaire dimensions measured on a five-point Likert scale. The five core competency dimensions are- 1) Conceptual Knowledge- green finance concepts, green bonds, ESG principles, global sustainability frameworks, and the finance-environment linkage; 2) Analytical and Technical Skills- environmental risk analysis, sustainability-based investment evaluation, ESG data interpretation, climate-related financial risk assessment, and sustainable financial modelling; 3) Practical/Application Skills- application to real-world business or policy problems, sustainability project confidence, green investment proposal capacity, environmental integration in financial decisions, and exposure to case-based learning; 4) Policy and Regulatory Awareness- Bangladesh Bank policies, national sustainable finance policies, ESG reporting requirements, and the sustainability role of financial institutions; and 5) Behavioral Readiness- perceived importance of green finance, career interest, workplace confidence, and support for curriculum integration. Two supplementary dimensions capture Curriculum Exposure, including course coverage, practical examples, faculty expertise, and internship/project opportunities, and Perceived Industry Requirements, including employer expectations regarding ESG knowledge, sustainability risk analysis, green finance employability, and skill-industry alignment.

4.1 Descriptive Statistics and Correlation Analysis

Descriptive statistics in table-1 show that graduates possess moderate-to-high green finance competency overall, with an average score of 3.611. Among the dimensions, Behavioral Readiness records the highest mean (3.875), indicating strong motivation and willingness to engage in green finance-related careers. In contrast, Curriculum Exposure has the lowest mean (3.014), suggesting inadequate formal academic preparation. Analytical Skills (3.475) and Policy Awareness (3.489) also remain comparatively weaker areas. The correlation matrix in table-2 shows that all competency dimensions are positively and significantly associated at $p<0.05$, confirming internal coherence among the constructs. The strongest relationship appears between Analytical Skills and Practical Skills ($r=0.669$), while Behavioral Readiness has weaker correlations with other dimensions, especially Curriculum Exposure ($r=0.129$).

TABLE 1 DESCRIPTIVE STATISTICS

Dimension	Mean	SD	Interpretation
D1: Conceptual Knowledge	3.637	0.596	Moderate-High
D2: Analytical Skills	3.475	0.611	Moderate
D3: Practical Skills	3.577	0.584	Moderate-High
D4: Policy Awareness	3.489	0.654	Moderate

Dimension	Mean	SD	Interpretation
D5: Behavioral Readiness	3.875	0.557	Highest
D6: Curriculum Exposure	3.014	0.774	Lowest
D7: Industry Requirements	3.570	0.631	Moderate-High
Overall Competency	3.611	0.459	Moderate-High

Source: Authors' calculation from primary survey data.

TABLE 2 CORRELATION MATRIX

	D1	D2	D3	D4	D5	D6	D7
D1: Conceptual Knowledge	1						
D2: Analytical Skills	0.524*	1					
D3: Practical Skills	0.534*	0.669*	1				
D4: Policy Awareness	0.468*	0.539*	0.551*	1			
D5: Behavioral Readiness	0.372*	0.361*	0.351*	0.388*	1		
D6: Curriculum Exposure	0.373*	0.431*	0.469*	0.435*	0.129*	1	
D7: Industry Requirements	0.507*	0.521*	0.546*	0.513*	0.389*	0.496*	1

All correlations significant at $p < 0.05$

Source: Authors' calculation from primary survey data.

4.2 Group Comparisons

4.2.1 Public vs. Private University

Dimension-wise Comparison of Green Finance Competency by University Type is presented in table-3. Private university graduates scored slightly higher in overall green finance competency than public university graduates (M=3.657 vs. 3.587), but the difference is not statistically significant (t=1.397, p=0.163). Thus, university type does not meaningfully differentiate overall competency. However, private university graduates show significantly higher Behavioral Readiness (p=0.017), indicating greater motivation and confidence toward green finance careers. Since no significant differences appear in knowledge or skills dimensions, the main distinction is attitudinal rather than cognitive.

TABLE 3 DIMENSION-WISE COMPARISON OF GREEN FINANCE COMPETENCY BY UNIVERSITY TYPE

Dimension	Private Mean	Public Mean	Difference	Std. Err.	t	p-value
D1: Conceptual Knowledge	3.677	3.616	0.061	0.065	0.942	0.347
D2: Analytical Skills	3.507	3.459	0.048	0.067	0.723	0.470
D3: Practical Skills	3.581	3.575	0.006	0.064	0.092	0.927
D4: Policy Awareness	3.547	3.459	0.088	0.072	1.237	0.217
D5: Behavioral Readiness	3.970	3.824	0.146**	0.061	2.410	0.017
Overall Competency	3.657	3.587	0.070	0.050	1.397	0.163

Notes: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: Authors' calculation

4.2.2 Undergraduate vs. Graduate Level

As shown in table-4, undergraduate students reported slightly higher overall green finance competency than graduate students (M=3.619 vs. 3.597), but the difference is negligible and statistically non-significant (t=0.439, p=0.661). More importantly, graduate-level education shows no added advantage across any competency dimension. This finding has important implications for curriculum reform in Bangladesh, as it suggests that graduate programs are not generating meaningful additional green finance knowledge, skills, or readiness beyond undergraduate training. Accordingly, postgraduate curricula should be redesigned to incorporate more advanced green finance content and also experiential learning components.

TABLE 4 DIMENSION-WISE COMPETENCY DIFFERENCES BY ACADEMIC LEVEL

Dimension	Undergrad mean	Graduate mean	Diff	SE	t	p-value
D1: Conceptual knowledge	3.632	3.645	-0.013	0.064	-0.209	0.834
D2: Analytical skills	3.475	3.476	-0.001	0.065	-0.018	0.986
D3: Practical skills	3.603	3.537	0.066	0.062	1.057	0.291
D4: Policy awareness	3.485	3.496	-0.012	0.07	-0.170	0.865
D5: Behavioral readiness	3.901	3.833	0.068	0.06	1.144	0.253
Overall competency	3.619	3.597	0.022	0.049	0.439	0.661

Notes: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' calculation

4.2.3 Course Taken vs. Not Taken

Table-5 demonstrates the dimension-wise Competency Differences by Green Finance Course Exposure. Graduates who completed a sustainability or green finance course demonstrated significantly higher overall green finance competency (M=3.728) than those without such coursework (M=3.529), with a highly significant difference (t=-4.195, $p < 0.001$). This represents the strongest group-comparison result in the study. Coursework exposure significantly enhances competency across all knowledge- and skills-based dimensions, including conceptual knowledge, analytical skills, practical skills, and policy awareness. Behavioral Readiness (D5) is the only exception, likely because it reflects attitudes and motivation rather than formal learning. This finding provides strong empirical support for mandating green finance courses in university curricula.

TABLE 5 DIMENSION-WISE COMPETENCY DIFFERENCES BY GREEN FINANCE COURSE EXPOSURE

Dimension	No course mean	Course taken mean	Diff	SE	t	p-value
D1: Conceptual knowledge	3.545	3.77	-0.225***	0.062	-3.620	0.0003
D2: Analytical skills	3.378	3.616	-0.238***	0.064	-3.743	0.0002
D3: Practical skills	3.513	3.67	-0.157**	0.061	-2.564	0.011
D4: Policy awareness	3.369	3.662	-0.293***	0.068	-4.331	0.000
D5: Behavioral readiness	3.841	3.924	-0.083	0.059	-1.414	0.158
Overall competency	3.529	3.728	-0.199***	0.047	-4.195	0.000

Notes: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' calculation

4.2.4 By Degree Program (ANOVA)

Overall green finance competency differs significantly across degree programs (F=4.59, p=0.011). Economics graduates consistently outperform Finance and Business graduates in overall competency and most dimensions, while Finance and Business graduates show broadly similar performance. Although somewhat counterintuitive, given the expected advantage of Finance graduates, this may reflect the stronger quantitative, analytical, and policy-oriented training embedded in Economics curricula. In contrast, Behavioral Readiness does not vary significantly across programs, suggesting that motivation and career orientation toward green finance are relatively uniform. Thus, program-based differences appear mainly cognitive and skill-related, rather than attitudinal.

TABLE 6 BONFERRONI POST-HOC RESULTS

Comparison	Difference	p-value
Economics vs Finance	0.214**	0.041
Economics vs Business	0.237***	0.009
Finance vs Business	0.023	1.000

Source: Authors' calculation

TABLE 7 DIMENSION-WISE ANOVA RESULTS BY DEGREE PROGRAM

Dimension	Economics (n=37)	Finance (n=74)	Business (n=148)	F	p-value
D1: Conceptual knowledge	3.838	3.678	3.535	4.82***	0.009
D2: Analytical skills	3.811	3.457	3.459	6.07***	0.003
D3: Practical skills	3.784	3.47	3.448	6.23***	0.002
D4: Policy awareness	3.658	3.459	3.389	3.09**	0.047
D5: Behavioral readiness	3.905	3.949	3.827	1.25	0.289
Overall competency	3.827	3.613	3.59	4.59**	0.011

Source: Authors' calculation

Taken together, the group comparison results indicate that course exposure and disciplinary background are the most important sources of variation in green finance competency**,** whereas university type and academic level play limited roles. These findings reinforce the need for systematic curriculum reform, particularly in Finance and Business programmes and at the graduate level.

5. Conclusion and Policy Recommendations

This study provides robust empirical evidence that green finance competency among Bangladeshi university graduates is moderate-to-high in aggregate terms, yet this headline figure conceals structural deficiencies that carry serious implications for the country's green finance ambitions. The most consequential finding is unambiguous: curriculum exposure is the single strongest determinant of green finance competency (β=0.273, $p < 0.001$), and graduates who took a dedicated green finance or sustainability course significantly outperformed their peers across all knowledge and skills dimensions. Conversely, graduate-level education adds no measurable competency advantage over undergraduate training, a finding that indicts the current design of postgraduate finance and business curricula in Bangladesh. Economics graduates consistently outperform Finance and Business graduates, despite Finance being the most directly relevant discipline for green finance practice, revealing a fundamental misalignment between curriculum content and professional demand.

These findings carry clear and urgent policy implications, particularly for curriculum reform. Universities, especially private institutions and those offering graduate programmes in Finance and Business, must urgently integrate green finance as a core rather than elective component of their curricula. The evidence is unequivocal: where formal coursework exists, competency follows. Regulatory bodies, including the University Grants Commission of Bangladesh, should develop and enforce minimum green finance content standards for accredited Finance, Business, and Economics programmes. Bangladesh Bank and the Bangladesh Securities and Exchange Commission, as the principal regulators of the green finance ecosystem, should collaborate with universities to co-develop industry-aligned curriculum modules covering climate risk assessment, green bond structuring, ESG analysis, and sustainable investment principles. Graduate programmes bear a particular responsibility to move beyond conventional financial theory and embed sustainability as a disciplinary cornerstone. The finding that Finance graduates show no competency advantage over other degree holders despite their directly relevant disciplinary training represents the most actionable curriculum reform signal in the entire study. Finance programmes must be redesigned to reflect the profession they are preparing students to enter, one in which green finance literacy is no longer optional but foundational.

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Integrating Green Finance into Business Education: A Conceptual Framework for Sustainable Manufacturing in Bangladesh

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Abstract

The transition toward sustainable development has increased the importance of green finance in promoting environmentally responsible industrial practices. In Bangladesh, policy initiatives such as sustainable finance guidelines have encouraged financial institutions to support green investment. However, a critical gap remains in the availability of skilled human capital capable of applying green finance within industrial contexts. This study addresses that gap by proposing a Green Finance-Integrated Business Curriculum Framework (GF-IBCF) tailored to Bangladesh. Using a qualitative conceptual design, the study draws on academic literature, policy documents, and industry reports to identify major curriculum gaps and develop a four-pillar framework encompassing curriculum content, pedagogical innovation, industry-academia collaboration, and competency development. The framework is intended to align business education with national sustainability priorities and the skill needs of manufacturing sectors, particularly ready-made garments. The study contributes to the literature by offering a context-specific model for integrating green finance into business education and provides practical implications for curriculum reform, policy alignment, and human capital development.

Keywords: Green Finance, Business Education, Sustainable Manufacturing, Curriculum Innovation, Bangladesh, OBE

1. Introduction

The transition toward sustainable development has placed increasing emphasis on the role of finance in supporting environmentally responsible industrial practices. Green finance, defined as financial investments that promote environmentally sustainable outcomes, has emerged as a critical mechanism for facilitating low-carbon and resource-efficient growth (OECD, 2017). In developing economies such as Bangladesh, where manufacturing, particularly the ready-made garments (RMG) sector, plays a pivotal role in economic growth, the integration of green finance into industrial practices is essential for maintaining global competitiveness and environmental compliance.

Bangladesh has made notable progress in advancing green finance through regulatory initiatives led by Bangladesh Bank, including the introduction of green banking guidelines and sustainable finance policies aimed at encouraging environmentally responsible lending and investment (Bangladesh Bank, 2020). However, despite these policy advancements, a significant gap persists between financial sector initiatives and the availability of skilled professionals capable of implementing green finance strategies within industrial contexts. Despite the growing importance of green finance in Bangladesh's policy landscape, the higher education regulatory framework has not yet provided explicit guidance for integrating sustainability or green finance into academic curricula. Existing curriculum and quality assurance standards developed by the University Grants Commission (UGC) and the Bangladesh Accreditation Council (BAC) primarily emphasize outcome-based education, quality assurance, and institutional autonomy, but remain largely discipline-neutral and non-prescriptive in terms of emerging thematic areas. As a result, the incorporation of green finance into business education is not systematically mandated. These policy and regulatory gaps highlight a critical weakness in the current higher education system, which has yet to adequately integrate sustainability and green finance into business and economics curricula.

Higher education institutions play a central role in shaping the human capital necessary for sustainable economic transformation. The concept of Outcome-Based Education (OBE) emphasizes the alignment of curriculum design with industry needs and societal outcomes, making it a suitable framework for embedding green finance competencies into academic programs (Spady, 1994). However, in many developing countries, including Bangladesh, business education remains largely theoretical, with limited emphasis on experiential learning, industry collaboration, and sustainability-oriented skill development.

This study addresses this gap by proposing a GF-IBCF tailored to the Bangladesh context. The framework seeks to bridge the gap between academia, industry, and policy by embedding green finance concepts into business education, enhancing experiential learning, and strengthening industry-academia linkages. By doing so, the study contributes to the broader goal of fostering sustainable manufacturing growth through enhanced human capital development.

2. Literature Review

Green finance has emerged as an important mechanism for supporting sustainable development by directing financial resources toward environmentally responsible projects and low-carbon industrial transformation (OECD, 2017). In Bangladesh, this agenda has gained policy attention through sustainable finance and green banking initiatives led by Bangladesh Bank. However, the effectiveness of these initiatives depends not only on financial regulation but also on the availability of professionals capable of applying green finance principles in industrial and business settings. This highlights the importance of higher education in developing the knowledge and competencies required for sustainable economic transformation.

The literature increasingly recognizes higher education institutions as key actors in advancing sustainability through teaching, research, and societal engagement (Lozano et al., 2013). In business education, however, sustainability-related content is often weakly integrated, with conventional curricula continuing to prioritize profit-oriented and discipline-specific approaches over interdisciplinary and applied learning (Stubbs & Cocklin, 2008). These limitations are particularly evident in developing countries, where curriculum reform is often constrained by limited institutional capacity, insufficient faculty expertise, and weak industry linkages (Tilbury, 2011).

To address these gaps, scholars emphasize the importance of competency-based and practice-oriented curriculum design. Outcome-Based Education (OBE) provides a useful approach for aligning academic programs with measurable skills and industry needs (Spady, 1994), while experiential learning approaches such as case studies, simulations, and project-based activities can strengthen the practical application of sustainability-related knowledge (Kolb, 1984). At the same time, collaboration among universities, industry, and government remains essential for ensuring curricular relevance and innovation, particularly in areas such as green finance that require alignment with policy frameworks and industrial practice (Etzkowitz & Leydesdorff, 2000).

Although prior studies have examined green finance, sustainability education, and industry-academia collaboration, these strands are often treated separately. There remains limited research that integrates them into a unified framework for business curriculum reform in developing-country contexts. This study addresses that gap by proposing a context-specific framework for embedding green finance into business education in Bangladesh, with the aim of supporting sustainable manufacturing and green skill development.

3. Methodology

This study adopts a qualitative conceptual design to develop a context-specific framework for integrating green finance into business curricula in Bangladesh. As a conceptual framework paper grounded in secondary evidence and policy analysis, rather than offering empirical testing, the study develops a theory-informed framework for curriculum reform in a developing-country context. The framework was developed through iterative review and synthesis of three categories of secondary sources: i) regulatory and policy documents on sustainable finance and higher education in Bangladesh, ii) academic literature on sustainability education, Outcome-Based Education (OBE), experiential learning, and university-industry collaboration, and iii) publicly available curriculum and program documents from selected Bangladeshi universities. Using thematic synthesis, the study identified recurring deficiencies in content integration, pedagogy, industry linkage, and competency formation, which informed the four-pillar architecture of the proposed Green Finance-Integrated Business Curriculum Framework (GF-IBCF). The framework is informed by Human Capital Theory, Outcome-Based Education, Experiential Learning Theory, and the Triple Helix model. As the study is conceptual and based on secondary evidence, the framework remains open to future empirical validation.

4. Current Status of Business Curriculum in Bangladesh: A Gap Analysis

Despite the growing policy emphasis on sustainable finance in Bangladesh, the integration of sustainability and green finance into business education remains limited and uneven. To assess the current status of business curricula, this section reviews publicly available syllabus structures and course offerings from selected universities, including the University of Chittagong, Independent University Bangladesh, International Islamic University Chittagong, University of Science and Technology Chittagong, Premier University, and the University of Creative Technology Chittagong, among others. Rather than focusing solely on institution-specific variation, the analysis identifies common patterns across the reviewed curricula in terms of content, pedagogical orientation, industry linkage, and competency formation. The selected universities were used as illustrative cases to capture variation across public and private institutions and across established business programs in Bangladesh; the objective was not exhaustive institutional comparison, but cross-case identification of recurrent curriculum patterns. Table 1 presents a cross-case synthesis of these observations and highlights the major gaps that constrain the development of green finance-related capabilities.

TABLE 1 CROSS-CASE SYNTHESIS OF COMMON CURRICULUM OBSERVATIONS ON SUSTAINABILITY AND GREEN FINANCE INTEGRATION IN SELECTED UNIVERSITIES

Dimension	Cross-case observation	Gap identified
Curriculum and finance content	Sustainability and green finance appear only selectively, while core finance and banking remain largely conventional.	Weak curricular integration of green finance and ESG concepts
Learning outcomes and pedagogy	Sustainability is more explicit in stated outcomes than in course design, and teaching remains largely theory-oriented.	Weak alignment between intended outcomes and applied learning
Industry linkage	Existing internship and stakeholder engagement structures are weakly aligned with sustainable finance and industrial practice.	Limited real-world exposure to green finance contexts
Competency development	Technical and interdisciplinary sustainability skills are not systematically developed.	Persistent green finance competency gap

Source: Authors' synthesis based on publicly available curriculum documents, course syllabi, and program structures of selected universities.

As shown in Table 1, the reviewed curricula reveal a consistent pattern of limited and uneven integration of sustainability and green finance. Sustainability-related topics appear selectively, core finance courses remain largely conventional, and stated learning outcomes are only weakly reflected in course design and pedagogy. Moreover, industry linkage and applied skill formation remain insufficiently developed. These patterns collectively point to a structural gap between current business education and the competency requirements of sustainable finance in Bangladesh.

Business curricula in Bangladesh remain largely organized around conventional disciplines such as finance, accounting, marketing, and management, with only limited and uneven incorporation of sustainability-related themes. Although some programs include topics such as corporate social responsibility or business ethics, there is little evidence of systematic integration of green finance, ESG frameworks, or climate-related financial instruments. Courses explicitly dedicated to sustainability or green finance are rare and, where present, are usually offered as electives rather than core requirements. This is problematic given the growing demand for sustainability-oriented financial expertise generated by regulatory change and international market pressure, particularly in export-oriented sectors such as ready-made garments (World Bank, 2022; Bangladesh Bank, 2020).

Pedagogically, business education continues to rely heavily on lecture-based and theory-oriented instruction. While Outcome-Based Education has been introduced under UGC guidance, its application to sustainability-related competencies remains limited (UGC, 2019). National quality assurance and curriculum frameworks, including those of UGC and BAC, emphasize general learning outcomes, skills, and institutional quality, but do not explicitly require the inclusion of green finance, climate finance, or environmental governance in academic programs (BAC, 2021; UGC, 2019). As a result, the integration of green finance remains largely institution-driven rather than policy-directed. Moreover, experiential learning approaches such as case-based teaching, simulations, industry projects, and problem-based learning are not consistently embedded in business curricula, restricting students' ability to apply financial knowledge to real-world sustainability and industrial challenges (Kolb, 1984; Tilbury, 2011).

Industry-academia linkages are also weak, particularly in emerging domains such as green finance. Although internships are common in business programs, they are rarely aligned with sustainable finance practices or

environmentally responsible industrial sectors. Despite the expansion of sustainable finance initiatives in Bangladesh's banking sector, structured collaboration among universities, commercial banks, manufacturing firms, and regulatory agencies remains limited (Bangladesh Bank, 2020). This weak institutional linkage reduces opportunities for applied learning and constrains the development of industry-relevant skills. The problem is especially acute in sectors such as RMG, where firms face growing pressure to comply with international environmental standards and increasingly require graduates who understand both financial and environmental dimensions of sustainability (IFC, 2020; Obrecht et al., 2022; World Bank, 2022).

A related weakness concerns competency development. Existing business curricula continue to prioritize traditional competencies such as financial analysis, managerial decision-making, and marketing strategy, while the interdisciplinary and technical capabilities required for green finance remain underdeveloped. Skills such as ESG risk assessment, green investment appraisal, carbon accounting, and sustainability reporting are largely absent from mainstream curricula, despite their increasing relevance to sustainable industrial transformation (Lozano et al., 2013; Barth et al., 2007). These gaps are further reinforced by limited faculty expertise and institutional resource constraints, which hinder the effective inclusion of emerging interdisciplinary content.

Taken together, these patterns reveal a structural misalignment between Bangladesh's evolving sustainable finance agenda and the current design of business education. Limited curricular integration, theory-dominated pedagogy, weak industry engagement, and insufficient competency formation collectively constrain the ability of graduates to contribute meaningfully to sustainable manufacturing and green financial practice. This gap underscores the need for a systematic and context-sensitive model of curriculum reform. The proposed GF-IBCF is intended to address this misalignment by integrating sustainability-oriented content, experiential pedagogy, stronger industry linkages, and measurable green finance competencies into business education.

5. Proposed Framework: GF-IBCF

The Green Finance-Integrated Business Curriculum Framework (GF-IBCF) is designed to align higher education systems with the evolving demands of sustainable industrial development in Bangladesh. The framework addresses the existing gap between green finance policies, industrial practices, and human capital development by embedding sustainability-oriented financial competencies into business education. It provides a structured approach to integrating curriculum content, pedagogical innovation, industry engagement, and competency development within a unified model.

5.1 Framework Structure

The GF-IBCF model consists of four interrelated pillars. First, the curriculum content component that defines the core knowledge areas required for green finance education. It includes topics such as green banking and sustainable finance policies, environmental, social, and governance (ESG) frameworks, climate finance, and sustainable manufacturing practices. Particular emphasis is placed on the Bangladesh context, incorporating regulatory guidelines from Bangladesh Bank and sector-specific challenges in industries such as ready-made garments (RMG), textiles, and energy-intensive manufacturing. The inclusion of green investment appraisal techniques further ensures that students develop the ability to evaluate environmentally sustainable projects. Second, the pedagogical pillar focuses on the methods through which knowledge is delivered. Traditional lecture-based teaching is complemented by experiential and student-centered approaches, including case-based learning, problem-based projects, simulations, and capstone experiences. For instance, students may engage in designing green financing strategies for small and medium-sized enterprises (SMEs) or evaluating the environmental and financial feasibility of industrial investments. These approaches are consistent with experiential learning theory and enhance students' ability to apply theoretical knowledge in real-world contexts.

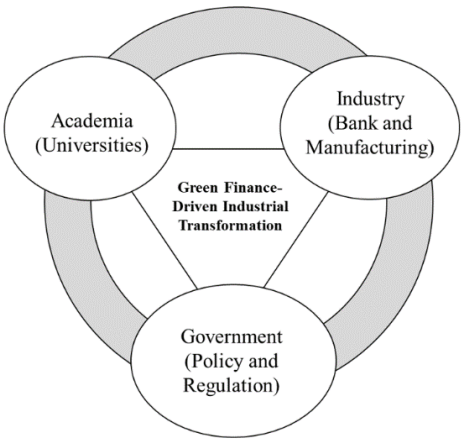


Figure 1: Triple Helix Framework for Green Finance and Sustainable Manufacturing

Third, the framework incorporates industry-academia integration. This includes partnerships with commercial banks, manufacturing firms, regulatory bodies, and development organizations. Mechanisms such as internships, guest lectures, joint curriculum design, and the use of real-world datasets are proposed to strengthen this linkage. Such collaboration reflects the principles of the Triple Helix model and ensures that educational programs remain relevant to industry needs and policy priorities.

The Triple Helix model as shown in figure 1 highlights collaborative linkages among universities, industry (banks and manufacturing), and government in developing green finance competencies and supporting sustainable industrial transformation.

The final pillar focuses on the development of measurable competencies aligned with Outcome-Based Education (OBE). Graduates are expected to acquire skills in green investment evaluation, ESG risk assessment, policy analysis, and sustainable business strategy. In addition, the framework emphasizes the development of data-driven decision-making capabilities and the ability to interpret and apply national and international sustainability standards. These competencies are essential for supporting the transition toward sustainable manufacturing in Bangladesh.

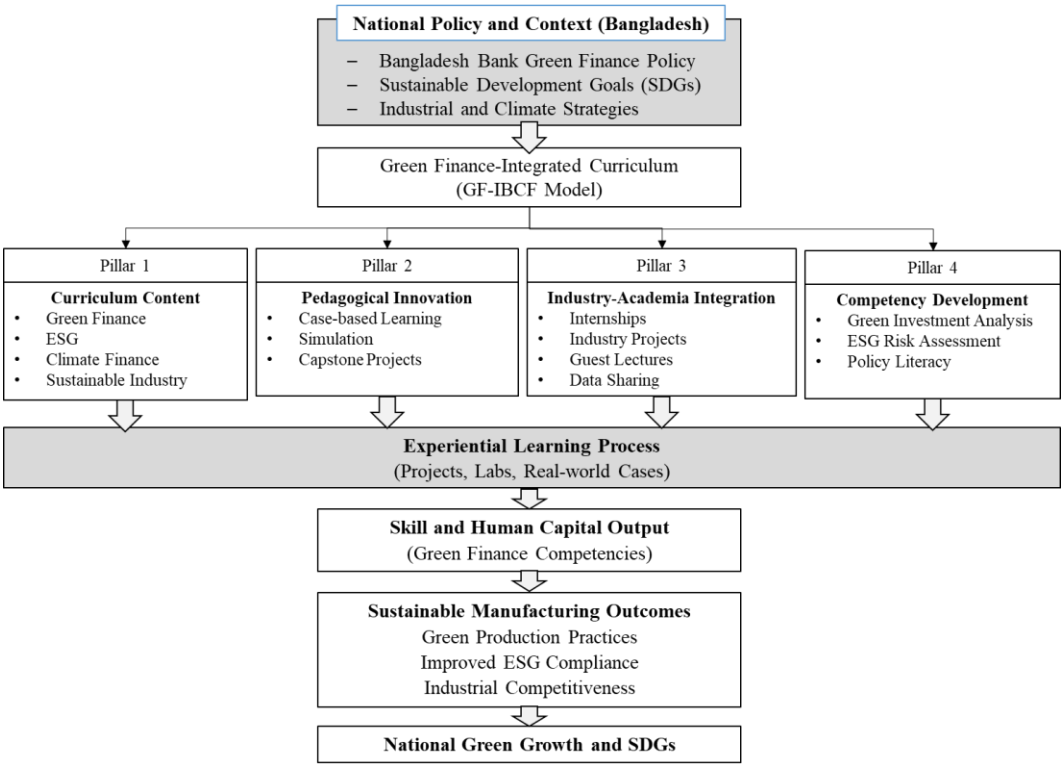


Fig.2 Green Finance-Integrated Business Curriculum Framework (GF-IBCF)

The GF-IBCF operates through a sequential process as illustrated in figure 2 that links educational inputs to industrial outcomes. The integration of green finance into the curriculum leads to experiential learning opportunities, which are further reinforced through industry engagement. This process facilitates the development of relevant competencies, ultimately contributing to improved sustainable manufacturing practices and supporting national green growth objectives.

5.2 Contextual Relevance and Contributions of the GF-IBCF

The GF-IBCF model demonstrates strong contextual relevance through its adaptation to the socio-economic and institutional environment of Bangladesh. The framework aligns with national policy initiatives, including green finance regulations introduced by Bangladesh Bank and broader sustainability strategies (Bangladesh Bank, 2020; World Bank, 2022). It also addresses sector-specific requirements, particularly in export-oriented industries such as ready-made garments (RMG), which face increasing pressure to comply with international environmental standards and decarbonization commitments (World Bank, 2022; Zhang et al., 2019).

Furthermore, the framework responds to structural challenges within the higher education system, including limited practical training, weak industry linkages, and a shortage of expertise in sustainability and green finance (Tilbury, 2011; Lozano et al., 2013). Prior studies emphasize that sustainability-oriented education in developing countries often suffers from weak institutional integration and limited experiential learning opportunities, which constrain skill development (Lozano et al., 2013; Barth et al., 2007). By incorporating experiential learning approaches and strengthening industry-academia collaboration, the model enhances the practical relevance and effectiveness of business education in Bangladesh (Kolb, 1984; Jackson, 2010).

In addition to its contextual relevance, the GF-IBCF contributes to both theory and practice. From a theoretical perspective, it integrates concepts from green finance, sustainability education, Outcome-Based Education (OBE), and the Triple Helix model into a unified and context-specific framework (Etzkowitz & Leydesdorff, 2000; Spady, 1994). This integration is consistent with emerging literature that highlights the importance of multi-stakeholder innovation systems in achieving sustainable development outcomes (Carayannis & Campbell, 2009). From a practical perspective, the framework provides actionable guidance for policymakers, educators, and industry stakeholders to align higher education systems with sustainable development goals and green industrial transformation (OECD, 2017). Ultimately, the framework supports the development of a skilled workforce capable of driving sustainable manufacturing and long-term economic resilience in Bangladesh.

6. Discussion

The proposed GF-IBCF offers a structured response to the growing need for aligning higher education with sustainable industrial development in Bangladesh. The findings from the literature and policy analysis suggest that while Bangladesh has made significant progress in promoting green finance through regulatory initiatives, the effectiveness of these policies is constrained by a lack of adequately trained human capital. This study argues that higher education institutions can play a pivotal role in bridging this gap by integrating green finance into business curricula.

The framework highlights the importance of moving beyond traditional, theory-driven teaching approaches toward more experiential and practice-oriented learning. This aligns with prior research emphasizing the effectiveness of experiential learning in developing complex, interdisciplinary competencies such as sustainability and financial decision-making (Kolb, 1984). By incorporating case-based learning, simulations, and capstone projects, the GF-IBCF model ensures that students are equipped with the practical skills required to operate in real-world industrial and financial environments. Another key insight from this study is the central role of industry-academia collaboration. The weak integration between universities and industry in Bangladesh hampers knowledge transfer and the development of industry-relevant skills. The proposed framework addresses this issue by embedding mechanisms such as internships, joint curriculum development, and stakeholder engagement into the educational process. This approach is consistent with the Triple Helix model, which emphasizes the synergistic relationship between universities, industry, and government in fostering innovation and economic development (Etzkowitz & Leydesdorff, 2000).

As emphasized in global sustainability education frameworks, the transition toward green economies requires not only policy support but also a transformation in education systems to equip future professionals with interdisciplinary sustainability competencies (UNESCO, 2017). This reinforces the importance of aligning business education with emerging sustainability and green finance requirements. Furthermore, the integration of Outcome-Based Education (OBE) principles within the framework ensures that curriculum design is aligned with measurable competencies and industry needs. This is particularly relevant in the context of green finance, where technical expertise, policy awareness, and analytical skills are essential for effective implementation. The emphasis on competency development also enhances graduate employability, which is a critical concern in developing economies.

Importantly, the Bangladesh-specific adaptation of the framework strengthens its practical relevance. By incorporating local policy frameworks, sectoral priorities, and institutional constraints, the GF-IBCF model provides a realistic and actionable approach to curriculum reform. This contextualization distinguishes the study from existing literature, which often focuses on developed country contexts and lacks applicability to emerging economies.

7. Conclusion and Policy Implications

This study develops a GF-IBCF to address the gap between green finance policies, higher education, and sustainable manufacturing practices in Bangladesh. The analysis highlights that, despite significant progress in green finance regulation, the lack of skilled human capital remains a critical barrier to effective implementation. By integrating green finance into business education, the proposed framework provides a pathway for aligning educational outcomes with national sustainability objectives. The GF-IBCF model contributes to both theory and practice by combining curriculum design, pedagogical innovation, and industry engagement within a unified structure. Its context-specific adaptation enhances its relevance for Bangladesh and other developing economies facing similar challenges in linking education with sustainable industrial transformation.

From a policy perspective, several key implications emerge. First, stronger coordination between the education sector and financial regulators is necessary to align academic curricula with national green finance strategies. Institutions such as the Ministry of Education and the University Grants Commission (UGC) should work closely with Bangladesh Bank to develop standardized guidelines for integrating sustainability and green finance into business programs. Second, universities should adopt Outcome-Based Education (OBE) frameworks to ensure that graduates acquire relevant competencies in green investment analysis, ESG assessment, and sustainable business strategy. Third, enhancing industry-academia collaboration is essential for improving the practical relevance of education. Policymakers should support partnerships between universities, financial institutions, and manufacturing firms through incentives, joint programs, and internship opportunities. Fourth, universities should invest in experiential learning approaches, including case-based teaching, simulation exercises, and green finance

laboratories, to strengthen applied skills of the students. Finally, sustainability indicators should be incorporated into quality assurance and accreditation systems to encourage continuous improvement in higher education.

However, this study is conceptual in nature and relies primarily on secondary sources, policy documents, and curriculum review. As a result, the proposed framework has not yet been empirically tested through stakeholder interviews, surveys, or institutional implementation. Future research should therefore validate and refine the GF-IBCF through empirical investigation involving universities, industry practitioners, financial institutions, and policymakers. Overall, the integration of green finance into business curricula represents a strategic opportunity to strengthen human capital and support Bangladesh's transition toward sustainable and competitive industrial development.

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Reimagining Private Higher Education in Bangladesh: Global Benchmarks, Emerging Trends, and Evidence-Based Solutions for Industry-Academia Collaboration and Employability

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Abstract
Private higher education institutions in Bangladesh are essential to tertiary access expansion, but their next stage of development must be judged by employability, faculty quality, research intensity, digital readiness, governance integrity, and international relevance. This research-based paper argues that the sector stands at a strategic crossroads: it can either continue a tuition-dependent model marked by fragmented quality assurance and uneven industry linkage, or it can evolve toward digital transformation, micro-credentials, AI-assisted learning, lifelong learning pathways, work-integrated education, and global partnerships. Drawing on policy documents and international datasets, the paper compares Bangladesh with Singapore, Finland, and Korea. The World Bank reports Bangladesh's gross tertiary enrollment at 22.8 percent in 2022, compared with 98.0 percent in Singapore, 104.9 percent in Finland, and 103.3 percent in Korea, illustrating the magnitude of the access and system-capacity gap. At the same time, UGC documents show that Bangladesh's higher education landscape includes more than one hundred private universities, while HEAT and R&D grant initiatives indicate that the policy environment is beginning to shift toward quality, research, and innovation. The paper develops a six-pillar conceptual framework and operationalizes it through factors, co-factors, variables, and dependent outcomes to support a more rigorous analysis of reform. [6][7][8][9][10]

Keywords: Private Higher Education; Industry-Academia Collaboration; Employability; Micro-Credentials; AI In Education; Quality Assurance; Global Benchmarking

1. Introduction

Higher education has shifted from being a social good for a small elite to a strategic public and private investment that shapes labour productivity, innovation capacity, social mobility, and global competitiveness. In Bangladesh, this transition is visible because public universities cannot absorb the full demand created by rapid expansion in secondary completion and by rising household expectations. The private sector therefore plays a dual role: it expands access and also absorbs the market pressure created by a highly competitive admissions environment in the public system. The policy question is no longer whether private universities are needed. They are. The more urgent question is what kind of private universities Bangladesh needs in the next decade. A purely enrolment-driven model is no longer adequate in a world where universities are judged by measurable outcomes, not by seat counts alone. Students and employers now expect institutions to deliver digital skills, adaptability, communication, entrepreneurship, data literacy, ethical reasoning, and the ability to learn continuously. [1][2][4][5]

2. Research Problem and Sectoral Context

Private higher education in Bangladesh expanded as public universities became oversubscribed. UGC-linked HEAT documentation reported that Bangladesh had 158 universities, including 108 private universities, in 2021-2023, reflecting the scale of private provision in the national system. Yet access expansion has not automatically produced quality expansion. Many private universities remain tuition-dependent, urban-centered, and vulnerable to enrollment shocks. The sector also faces uneven differentiation: some institutions are strong in engineering, business, or design, while others struggle with faculty turnover, weak governance, and inconsistent program quality. Research is often treated as optional rather than core. Employers continue to report gaps in critical thinking, digital fluency, communication, and work readiness. These issues indicate a deeper system-level challenge rather than isolated institutional weaknesses. [10]

3. Comparative Benchmarking and Best-Practice Evidence

The evidence gap is visible in tertiary participation. Bangladesh's gross tertiary enrollment rate was 22.8 percent in 2022, compared with 98.0 percent in Singapore, 104.9 percent in Finland, and 103.3 percent in Korea. Female

participation shows the same pattern: 20.8 percent in Bangladesh, 103.3 percent in Singapore, 118.5 percent in Finland, and 95.2 percent in Korea. These numbers reveal the scale of system maturity and the urgency of reform. High tertiary enrollment does not automatically guarantee high quality, but it often correlates with stronger pathways, greater social inclusion, and wider learning participation. Bangladesh's lower rate reflects the combined effect of demographic pressure, public capacity constraints, affordability barriers, and uneven transition from secondary to tertiary education. The private sector helps to close this gap, but it must become more affordable, more flexible, and more outcome-oriented if it is to play a full developmental role. The transfer lesson is clear: Bangladesh does not need to copy foreign institutions mechanically; it must internalize the design logic of trusted governance, flexible learning, applied research, employer engagement, and inclusion. [6][7][8][9]

4. Emerging Global Trends and Research Implications

The first global trend is AI-enabled learning, which can personalize feedback, identify students at risk, support curriculum design, and automate routine administration. The second trend is micro-credentials and stackable pathways for upskilling and reskilling. The third is hybrid pedagogy, combining synchronous teaching, asynchronous content, simulation, and collaborative projects. The fourth trend is work-integrated learning, where internships, apprenticeships, capstones, and co-op arrangements are embedded into the degree. The fifth is data-driven quality assurance using dashboards, retention analysis, and learning analytics. The sixth is the innovation university model, where universities incubate startups, support enterprise labs, and solve real-world problems. These trends are relevant because they convert higher education from a static delivery system into an adaptive knowledge ecosystem. [1][2][4][5]

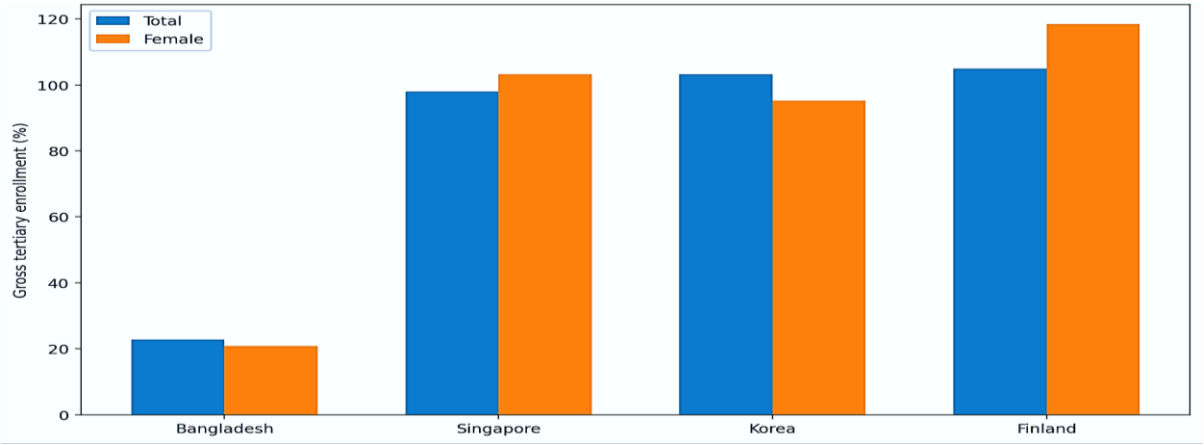


Fig.1 Tertiary gross enrollment comparison, 2022
Source: [6][7][8][9]

5. Research Variables, Co-Factors, and Operational Framework

To make the proposal more research-based, the conceptual framework is translated into analytical variables. The independent factors (IVs) represent institutional levers that can be changed through policy or management decisions. The co-factors act as moderators or enabling conditions that strengthen or weaken the relationship between the IVs and the dependent outcomes. [1][2][4][5][10]

TABLE 1 CONCEPTUAL VARIABLES AND RESEARCH LINKAGE

Variable group	Construct / factor	Type	Indicative indicators	Expected outcome link
Institutional levers	Governance quality	Independent variable	Board effectiveness; transparency; decision speed; accountability	Stronger strategic alignment and quality assurance [10]
Institutional levers	Curriculum relevance	Independent variable	OBE alignment; industry content; modularity; interdisciplinarity	Better graduate competence and employability [1][2][5]
Institutional levers	Faculty capability	Independent variable	Doctoral ratio; pedagogy training; industry exposure; retention	Improved teaching quality and research productivity [4][10]
Institutional levers	Digital infrastructure	Independent variable	LMS use; analytics; smart classroom readiness; hybrid delivery	Higher engagement and learning flexibility [4]

Institutional levers	Research and innovation capacity	Independent variable	R&D grants; publications; labs; cross-institutional projects	More knowledge creation and institutional reputation [5][10]
Institutional levers	Industry partnership intensity	Independent variable	Internships; co-designed courses; advisory boards; employer labs	Higher work readiness and smoother school-to-work transition [10]
Contextual enablers	Policy support and regulation	Co-factor / moderator	UGC rules; HEAT; R&D grants; autonomy; accreditation	Amplifies or constrains transformation [10]
Contextual enablers	Resource diversification	Co-factor / moderator	Tuition mix; executive education; consultancy; philanthropy	Improves sustainability and investment capacity [10]
Contextual enablers	Labour-market demand	Co-factor / moderator	Sector demand for digital, management, and technical skills	Shapes employability returns [10]
Contextual enablers	Institutional culture	Co-factor / moderator	Learning culture; ethics; innovation climate; openness to change	Determines reform adoption [10]
Dependent outcomes	Graduate employability and institutional productivity	Dependent variable	Employment rate; time-to-job; entrepreneurial activity; employer satisfaction	Primary success outcome [10]

Source: [1][2][4][5][10]

6. Analytical Propositions and Research Pathways

- P1: Stronger governance is positively associated with curriculum relevance, research productivity, and graduate employability. [10]
- P2: Curriculum relevance mediates the relationship between industry partnership intensity and employability outcomes. [1][2][10]
- P3: Faculty capability moderates the effect of digital infrastructure on learning quality and student success. [4][10]
- P4: Research and innovation capacity strengthens institutional reputation and supports employability through applied knowledge creation. [5][10]
- P5: Policy support and institutional autonomy condition the extent to which private universities can diversify revenue and invest in quality. [10]

7. Proposed EDU-SHIFT 7 Framework

This paper proposes EDU-SHIFT 7, a transformation framework designed specifically for private higher education in Bangladesh. The model combines excellence in teaching, industry relevance, and institutional resilience. It is based on six mutually reinforcing pillars: governance, curriculum, faculty, digital infrastructure, research and innovation, and employability pathways. The framework is intended to move institutions from survival mode to strategic growth mode. [1][2][4][5][10]

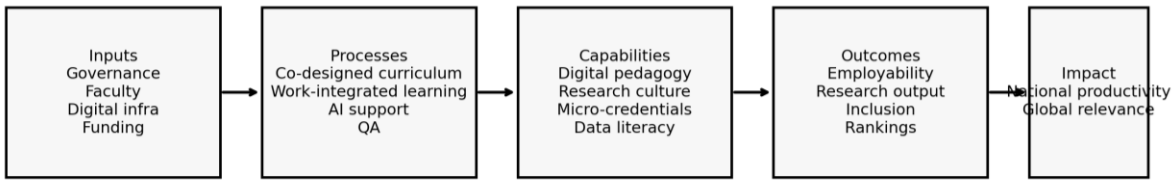


Fig.2 EDU-SHIFT 7 conceptual pathway for private higher education transformation
Source: [1][2][4][5][10]

What makes EDU-SHIFT 7 distinct is that it treats these pillars as a system rather than a checklist. A university may have a modern LMS but weak governance; or a strong curriculum but poor internships; or a strategic plan but no research culture. Transformation occurs only when the components reinforce one another. Therefore, implementation must be sequenced, measured, and funded. [1][2][4][5][10]

8. Comparative Lessons, World-Class Practices, and Outcome Pathways

TABLE 2 COMPARATIVE PRACTICES AND EXPECTED OUTCOME PATHWAYS

Practice area	International best practice	Bangladesh adaptation	Likely dependent outcome
Learning design	Modular and stackable credentials	Short, credit-linked courses within degree pathways	Flexibility and lifelong learning [1][2][4][5]
Teaching and learning	Hybrid and AI-supported pedagogy	Responsible LMS, tutoring bots, and blended delivery	Higher engagement and retention [1][2][4][5]
Industry linkage	Co-designed curricula and co-op education	Advisory boards and live problem-solving studios	Better employability [1][2][4][5]
Quality assurance	Data-driven student success systems	Early warning dashboards and outcome tracking	Improved completion and quality [1][2][4][5]
Research	Applied research clusters	Thematic consortia around national priorities	Higher innovation output [1][2][4][5]

Source: [1][2][4][5][10]

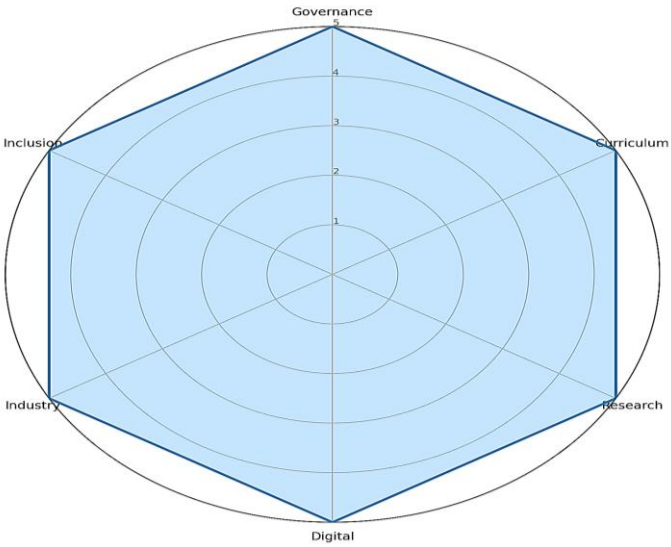


Fig.3 Priority architecture for a high-performing private university
Source: [1][2][4][5][10]

9. Methodological Approach

Methodologically, the study adopts a triangulation strategy to strengthen analytical validity and conceptual rigor. Data triangulation integrates quantitative tertiary enrollment indicators, qualitative policy narratives, institutional reform literature, and global best-practice models, including comparative evidence on higher education performance and human capital development from Bangladesh, Singapore, Finland, and the Republic of Korea (World Bank, 2022). The approach reduces source dependency and improves consistency across governance, curriculum relevance, faculty capability, digital readiness, research culture, and industry linkage dimensions.

The analytical framework is organized around independent variables, moderating co-factors, and dependent outcomes. Independent variables include governance quality, curriculum relevance, faculty capability, digital infrastructure, research and innovation capacity, and industry partnership intensity. These transformation levers are examined in light of policy and institutional reform priorities reflected in higher education development initiatives, including Bangladesh's HEAT project documentation (University Grants Commission of Bangladesh, 2023–2025). Moderating co-factors such as policy support, labor-market demand, institutional culture, and resource diversification shape the direction and strength of outcomes. Dependent variables are operationalized through graduate employability, institutional productivity, research output, employer satisfaction, and innovation performance.

The study further applies the EDU-SHIFT 7 framework as a systems-based conceptual pathway model to explain how institutional inputs, organizational processes, and capability development interact dynamically. This is

informed by OECD work on micro-credentials, employability, and lifelong learning (OECD, 2021a, 2021b) and UNESCO's recent emphasis on artificial intelligence in education and micro-credentials (UNESCO, 2025–2026; UNESCO IESALC, 2025).

Epistemologically, the study follows an interpretivist and policy-oriented approach rather than a purely positivist framework. Although reliance on secondary data limits direct institutional measurement and statistical generalization, the study compensates through comparative synthesis, conceptual integration, and multi-source triangulation, thereby providing a strong analytical foundation for future empirical and mixed-method research in Bangladesh's private higher education sector.

10. Discussion and Policy Implications

The implication for Bangladesh is clear. Private higher education can no longer rely on enrolment growth alone. Institutions should diversify revenue, professionalize governance, invest in faculty development, and create formal industry partnerships. Policy makers should support these moves through differentiated regulation, competitive research grants, and stronger quality assurance that focuses on outcomes rather than mere inputs. Universities should also establish measurable graduate outcome dashboards, since employability is ultimately the most visible outcome of industry-academia collaboration. In this sense, employability is not just a labour-market indicator; it is a comprehensive indicator of curriculum relevance, learning quality, institutional agility, and social legitimacy. [1][2][4][5][10]

The paper recommends six practical innovations, each explicitly linked to analytical propositions, independent variables, co-factors, research pathways, and dependent outcomes in Table 3: [1][2][4][5][10]

TABLE 3 ANALYTICAL PROPOSITIONS, INDEPENDENT AND DEPENDENT VARIABLES, AND INNOVATION LINKAGES

Practical innovation	Analytical proposition(s)	Independent variable(s)	Co-factor(s)	Research pathway	Dependent variable(s)
Stackable micro-credentials	P2, P5	Curriculum relevance; policy support; resource diversification	Accreditation flexibility; employer demand	Modular, credit-linked short courses that can be stacked into degree pathways	Flexibility; lifelong learning; employability [1][2][5]
AI-assisted tutoring and student-success analytics	P3, P5	Digital infrastructure; faculty capability	Institutional culture; ethical safeguards	AI feedback loops, early-warning dashboards, and hybrid student support	Higher engagement; retention; completion [4][10]
Corporate co-designed curricula and live problem-solving studios	P1, P2	Governance quality; industry partnership intensity	Labour-market demand; institutional autonomy	Employer advisory boards and authentic assessment through live projects	Better work readiness; graduate employability [10]
Cross-institutional research clusters	P1, P4	Research and innovation capacity; governance quality	Policy support; research funding	Shared thematic consortia, joint supervision, and applied labs	Higher research productivity; innovation output; reputation [5][10]
Enterprise-linked internship and co-op pipelines	P2, P4	Industry partnership intensity; curriculum relevance	Employer availability; sector growth	Structured internship maps, co-op agreements, and employer feedback loops	Faster school-to-work transition; employer satisfaction [10]
Nationally coordinated private-university performance dashboard	P1, P3, P5	Governance quality; digital infrastructure	Policy support; data governance	Benchmarking, graduate tracking, and early-warning analytics for accountability	Completion; quality; transparency; strategic autonomy [4][10]

Source: [1][2][4][5][10]

- Stackable micro-credentials in digital, managerial, and sector-specific skills. [1][2][5]
- AI-assisted tutoring and student-success analytics with ethical safeguards. [4]
- Corporate co-designed curricula and live problem-solving studios. [10]
- Cross-institutional research clusters aligned to national priorities. [5][10]
- Enterprise-linked internship and co-op pipelines with outcome tracking. [10]
- A nationally coordinated private-university performance dashboard. [4][10]

11. Conclusion

Private higher education in Bangladesh has already performed an essential access function. Its next mission is to become a global-quality engine of employability, innovation, and social progress. The evidence from advanced systems shows that strong universities are built through coherent governance, learner-centered pedagogy, employer engagement, research culture, and flexible pathways for lifelong learning. Bangladesh does not need to imitate these systems line by line. It needs to adapt the underlying logic to its own economic, demographic, and institutional realities. With the right mix of policy support, institutional leadership, digital transformation, and industry collaboration, private universities can move from market-responsive institutions to mission-led institutions. [6][7][8][9][10]

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Part-Time Student Employment as a Strategic Workforce Model: A Qualitative Assessment of Organizational Advantages and Skilled Labor Force Development.

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Abstract
This study examines part-time student jobs as a way to improve how organizations operate *and* build *a* pool *of* skilled workers*. To* do *this, the* research used *Qualitative Document Analysis (QDA),* looking *at* HR policies*,* labor market data*,* internship programs*, and* youth employment plans *from both* national *and* international sources*. The* study used *an* interpretivist perspective and an inductive method to identify key ideas on cost-effectiveness, work flexibility, talent pipeline development*,* encouraging innovation*, and* growing human capital*. The results demonstrate that hiring students to work part-time helps businesses save money, gain access to young, tech-savvy individuals, and increase staff adaptability. Additionally, it helps students build useful skills, improve their work habits, and gain valuable work experience. Even though they are less productive, cost comparisons reveal that part-time student workers can be more economical than full-time employees. It* also suggests *that there* needs *to be* proper systems *for* student jobs*,* legal protections *for* workers*,* teamwork *between* schools *and* businesses*, and* flexible work rules *to* make *the* most *of* student employment*. The* study concludes *that* part-time jobs *for* students *can be a* smart strategy *for* improving workforce efficiency *and* building *a* skilled workforce.

Keywords*:* Part-time student employment; organizational cost efficiency; workforce development; employability skills; human capital

1. Introduction

Most organizations prefer experienced and skilled employees because they are expected to perform immediately upon joining. Employers often save time, mentoring effort, and training costs by recruiting experienced workers. In contrast, fresh graduates usually possess academic knowledge and a certificate but often lack practical experience, workplace etiquette, and job-specific skills. Employers frequently hesitate to recruit fresh graduates because of the additional investment required for training and onboarding. This creates a structural dilemma in which students cannot get into employment without experience, yet they cannot gain experience without employment.

Strengthening academia–industry linkage through part-time employment opportunities for students may help narrow this gap. Allowing students to engage in part-time work, internships, or freelance roles during their studies can benefit both students and organizations. Organizations will also have access to flexible and lower-cost labor, while students develop practical skills, workplace discipline, and professional readiness. This study evaluates part-time student employment as a strategic workforce model and explores its organizational, economic, and social implications in Bangladesh.

2. Research Methodology

This study adopts a qualitative research methodology, using Qualitative Document Analysis (QDA) and illustrative cost simulations to evaluate part-time student employment as a strategic workforce model and its contribution to organizational performance and skilled labor force development.

An inductive approach is used to identify patterns and generate insights from existing documents rather than testing predetermined hypotheses. The study analyzes HR policies, internship frameworks, part-time employment guidelines, labor market reports, youth employment policies, and workforce development strategies from organizations such as the International Labor Organization (ILO), the World Bank, and the Bangladesh Bureau of Statistics (BBS). Documents are selected through purposive sampling based on relevance, credibility, and direct connection to student employment practices.

3. Literature Review

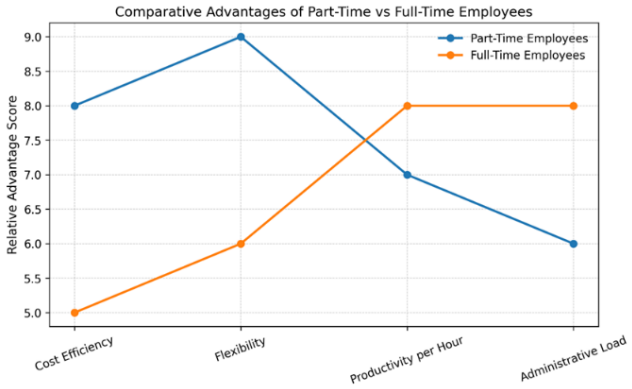
Human capital theory emphasizes the importance of education and skill development in improving productivity and long-term economic growth (Becker, 1993). In developing economies, formal education alone is often insufficient to ensure employability, particularly when academic learning is disconnected from practical workplace requirements.

Studies suggest that students engaged in part-time work develop stronger employability skills, including communication, teamwork, problem-solving, and time management (OECD, 2019). Such experiential learning complements formal education and improves labor market readiness. In Bangladesh, informal student employment is common in sectors such as retail, tutoring, freelancing, customer service, and hospitality; however, these opportunities often lack formal institutional support and policy recognition.

Research also indicates that organizations benefit from access to flexible, low-cost labor while simultaneously developing future talent pipelines (Curtis & Shani, 2002). Employers can evaluate potential future employees in lower-risk settings through part-time roles and internships. This improves recruitment efficiency and retention while reducing onboarding costs (Gault et al., 2010; Nunley et al., 2016).

4. Findings: Benefits of Employing Part-Time Students

As we have analyzed several documents and published articles, it is evident that employing part-time students will benefit organizations by reducing costs, increasing flexibility, and streamlining routine activities. However, when productivity and workload are higher, taking on a full-time employee is more suitable. A graphical illustration is included here for clarity.



Organizations, especially business houses, are well-suited to include more part-time employees than full-time employees to enhance resilience and sustainability. To keep full-time employees in critical roles, organizations may employ more part-time employees for routine and creative activities for the following reasons:

4.1 Cost Efficiency and Labor Flexibility

Bangladeshi firms, particularly SMEs and service-sector businesses, benefit from hiring part-time students due to lower wage expectations and flexible scheduling. This is especially valuable in urban centers like Dhaka, where demand fluctuates. Student workers typically command lower hourly wages than experienced full-time equivalents, partly due to their limited prior tenure and partly because they value non-pecuniary benefits such as schedule flexibility and career exploration (Curtis & Shani, 2002). Organizations can deploy students during peak demand periods (evenings, weekends, academic breaks) without incurring overtime or full-time benefit obligations. This variable-cost labor model enhances organizational resilience during economic fluctuations.

4.2 Access to Digitally Skilled Youth

With the rise of digital education and freelancing, many students possess skills in ICT, social media, and online platforms. Organizations can leverage this digital competency to enhance productivity and innovation. Students frequently possess recent, formalized knowledge in digital tools, data analytics, and social media platforms—competencies that may be undersupplied among incumbent workforces. This knowledge transfer effect can stimulate incremental innovation, particularly in small and medium-sized enterprises with limited formal R&D capacity.

4.3 Talent Pipeline Development

Part-time roles allow employers to identify capable individuals early, reducing recruitment costs and improving retention. This is particularly relevant for industries such as banking, telecom, and startups. Longitudinal studies indicate that organizations with formal part-time student programs experience reduced time-to-hire and lower per-hire costs for entry-level professional roles (Nunley et al., 2016). By training students in firm-specific processes and socializing them into organizational culture, employers effectively conduct an extended, low-risk trial. Conversion rates from part-time student to full-time employee often exceed those of external graduate recruitment channels (Gault et al., 2010).

4.4 Innovation and Creativity

Young student-workers often bring fresh perspectives and adaptability, which are essential in a rapidly evolving economic environment. Many part-time workers, especially students, are connected to new knowledge, technology, and modern learning methods, which help introduce innovative solutions. Since they often work in different environments and experience less burnout due to fewer working hours, they can think more creatively and contribute new perspectives. Their presence also increases team diversity, which supports better brainstorming and problem-solving.

5. Illustrative Cost Estimation

The growing use of part-time student employees has attracted attention as organizations seek more flexible and cost-efficient workforce models. In many cases, businesses can meet the same operational workload at a lower cost by combining part-time roles rather than relying solely on full-time staff. The following numerical comparison illustrates this advantage:

Parameter	Full-Time (FT)	Part-Time Student (PT)
W (hourly)	$25.00	$14.00
b (benefits rate)	0.30	0.02
H (annual hours)	2,080	780 (15 hrs × 52 wks)
T (training, annualized)	$2,500	$500
R (recruitment, annualized)	$1,500	$300

Calculate left side (PT):

$$W_{\text{PT}}(1 + b_{\text{PT}}) = 14 \times 1.02 = 14.28$$

$$\frac{T_{\text{PT}} + R_{\text{PT}}}{H_{\text{PT}}} = \frac{500 + 300}{780} = \frac{800}{780} \approx 1.026$$

$$\text{Left side} = 14.28 + 1.026 = 15.306$$

Calculate for Part-Time Student:

$$\text{Wage} + \text{benefits} = 14 \times (1 + 0.02) = 14 \times 1.02 = 14.28$$

$$\text{Training} + \text{recruitment per hour} = \frac{500 + 300}{780} = \frac{800}{780} = 1.03$$

$$\text{Total per hour} = 14.28 + 1.03 = \mathbf{15.31}$$

Calculate right side (FT):

$$W_{\text{FT}}(1 + b_{\text{FT}}) = 25 \times 1.30 = 32.50$$

$$\frac{T_{\text{FT}} + R_{\text{FT}}}{H_{\text{FT}}} = \frac{2500 + 1500}{2080} = \frac{4000}{2080} \approx 1.923$$

$$\text{Right side} = 32.50 + 1.923 = 34.423$$

Calculate for Full-Time Employee:

$$\text{Wage + benefits} = 25 \times (1 + 0.30) = 25 \times 1.30 = 32.50$$

$$\text{Training + recruitment per hour} = \frac{2500 + 1500}{2080} = \frac{4000}{2080} = 1.92$$

$$\text{Total per hour} = 32.50 + 1.92 = \mathbf{34.42}$$

Inequality holds: 15.306 < 34.423
Proof Complete: Part-time employees are mathematically more cost-effective than full-time employees.
However, what if productivity is different?
Even if a student is slower than a full-time worker, we can check the break-even point. How much slower can a student be and still be cost-effective?
Let pp = student's/part-time employee productivity as a fraction of a full-time employee (e.g., p=0.8p=0.8 means 80% as productive).
We need:

$$\frac{\text{Student cost per hour}}{p} < \text{Full-time cost per hour}$$

$$\frac{15.31}{p} < 34.42$$

$$15.31 < 34.42 \times p$$

$$p > \frac{15.31}{34.42} = 0.445$$

Meaning: Even if a student is only **45% as productive** as a full-time worker, they are still more cost-effective. For routine entry-level tasks, students are typically 80–100% as productive, so the math strongly favors hiring students.

6. Economic & Social Impact

Students who work part-time jobs gain economically and socially. In terms of finances, they help students manage educational costs, reduce reliance on family income, and provide financial support. In addition to providing actual work experience, they enhance social skills, including communication, time management, and workplace discipline. In general, students who work part-time grow more self-reliant and better equipped for future careers.

6.1 Human Capital formation

Students can gain on-the-job experience through part-time work, thereby reducing skill mismatches. Integrating students into the workforce enhances human capital at the national level, which is essential for maintaining economic growth and accomplishing development objectives.

6.2 Development of Employability Skills

Students acquire vital soft skills, such as teamwork, communication, and time management, alongside technical proficiency through part-time employment. So, candidates with previous work experience will increasingly be preferred by employers in Bangladesh.

6.3 Strengthening Education–Industry Linkages

There is very little industry-academia cooperation in Bangladesh. Increasing internship and part-time work opportunities can help better connect education with the demands of the labor market. Early work experience is gained through part-time employment.

7. Challenges and Policy Implications

Opportunities for students to work part-time present several difficulties and implications for policy. One significant issue is the tension between work and study obligations, which, if not managed effectively, can negatively affect students' academic performance. Furthermore, many companies offer low pay, limited job stability, and little training, all of which can diminish the long-term advantages of these positions. From a policy standpoint, governments and educational institutions must establish explicit structures to regulate student employment, ensure equitable pay, and encourage flexible work schedules that align with academic obligations. To improve students' employability and support a skilled labor force, policies should also encourage companies to offer opportunities for skill development, workplace protections, and organized internship-to-employment pathways.

8. Limitations and Future Research

As the main methods used in this study are qualitative document analysis and illustrative cost simulations, its conclusions might not be as applicable to other industries. The lack of firm-level econometric evidence and large-scale survey data limits direct measurement of productivity results. To confirm the long-term economic consequences of part-time student employment, future research should incorporate empirical surveys, interviews with employers and student employees, and quantitative analysis across industries.

9. Conclusion

Bangladesh has a great chance to close its skills gap and improve workforce preparedness by incorporating part-time student employment into organizational frameworks. By lowering costs, increasing workforce flexibility, and strengthening talent pipelines, this approach enhances organizational efficiency and supports the growth of the country's human resources.

Part-time student employment can develop into a sustainable workforce strategy and a transformative instrument for creating a competent, productive, and inclusive labor force with the right policies, university-industry partnership, and institutional support.

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English and Mathematics as Foundations of Employability in TVET: Competency Gaps Among Bangladeshi Students — A Case Study of UCEP Bangladesh Using NVivo

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Abstract
In Bangladesh, Technical and Vocational Education and Training (TVET) plays a significant role in national policies aimed at developing the workforce and driving economic growth. However, a persistent gap remains between the employability of TVET graduates and the competencies demanded by contemporary labor markets, particularly in English communication and mathematical reasoning. This paper investigates the challenges of attaining these essential foundational skills within the Bangladeshi TVET system and examines their impact through a case study of UCEP Bangladesh. Drawing on Human Capital Theory (Schultz, 1971) and Competency-Based Education (McClelland, 1973), the study explores the relationship between foundational competencies, curriculum practices, pedagogical approaches, and labor market demands. The research adopts a qualitative case study methodology, employing semi-structured interviews and focus group discussions with students, graduates, instructors, employers, and curriculum administrators from BUBT and UCEP Bangladesh, selected through purposive sampling. Institutional and curricular documents are also analyzed to compare classroom learning with industry expectations. NVivo software was used to conduct thematic analysis, identifying recurring patterns related to competency deficiencies, curriculum-industry mismatch, and employability challenges. The findings reveal a systemic failure of connectedness within the current TVET model. The curriculum tends to focus exclusively on single-skill technical expertise while treating English and mathematics as independent, theoretical courses rather than as integrated, practical tools for problem-solving and workplace communication. This "single-skill isolation trap" limits graduate progression, undermines entrepreneurship sustainability, and constrains international mobility. The paper recommends an integrated curriculum in which context-relevant English (English for Specific Purposes) and applied, industry-focused mathematics are embedded directly within vocational pedagogy and competency-based assessment. The evidence is clear; what remains is the political and institutional will to act.

***Keywords**:* TVET, English for Specific Purposes, applied mathematics, competency gaps, employability, UCEP Bangladesh, Human Capital Theory, Competency-Based Education, NVivo analysis

1. Introduction

1.1 Overview: The Revolutionary Power of UCEP Bangladesh

UCEP Bangladesh stands as a pioneering force in social transformation, bridging the divide between poverty and economic prosperity through its distinctive Technical and Vocational Education and Training (TVET) model. Founded in 1972 by New Zealander Lindsay Allan Cheyne in the aftermath of Bangladesh's Liberation War, UCEP initially focused on supporting underprivileged children and war-affected youth. Over five decades, it has evolved into a nationwide leader in skills development, serving marginalized communities across urban, rural, and outreach settings. By integrating general education with industry-responsive technical training, UCEP aims to produce not only certified graduates but immediately employable professionals. Through extensive partnerships with thousands of employers and a strong emphasis on social inclusion—including dedicated tracks for girls, persons with disabilities (PWD), and economically distressed households—the organization continues to empower Bangladesh's youth, converting potential into a skilled workforce for a rapidly modernizing economy.

This transformative role aligns with broader human capital investment principles. Becker (1964) demonstrates that investments in education generate significant private returns through higher earnings and contribute to national productivity. Similarly, Schultz (1971) emphasizes the critical role of education in human capital formation. In developing contexts, TVET systems are seen as vital for reducing the gap between education and labor market demands (Ali et al., 2024; Khan, 2024). However, as McClelland (1973) noted in competency theory, standardized assessments often fail to predict real workplace success, particularly for marginalized groups, raising questions about their validity and equity.

1.2 Identifying Long-Term Competency Gaps: The Reality vs. the Promise
While UCEP's model has demonstrably improved access and employment rates for thousands of underprivileged youth, graduation and job placement do not automatically translate into sustained career progression, entrepreneurship viability, or international mobility. Programmatic evaluations and employer feedback reveal that UCEP graduates possess strong hands-on technical competencies (wiring, sewing, machining, hardware assembly) yet frequently encounter structural barriers in workplace documentation, digital interfaces, client communication, and financial management.

These barriers reflect a deeper systemic flaw in the dominant TVET paradigm in Bangladesh and similar developing economies: the compartmentalization of English and Mathematics as abstract, academically isolated subjects rather than integrated, applied tools embedded within vocational training. Graduates are consequently trapped in what this paper terms the "single-skill isolation trap" — where local entry-level wage employment is achievable, but career advancement, entrepreneurial sustainability, cross-sectoral mobility, and access to overseas labor markets remain severely constrained.

1.3 The International Mobility Dimension: A Missed Opportunity
Bangladesh is one of the world's largest labor-exporting nations, with remittances forming a critical pillar of the national economy. However, Bangladeshi TVET graduates consistently compete at the lowest tiers of international labor markets — not due to inferior technical skills, but because of insufficient functional English literacy for reading safety manuals, interpreting contracts, communicating with multinational supervisors, or completing compliance documentation. Deficiencies in applied mathematical reasoning further limit their ability to perform on-site calculations, material estimations, and quality control tasks routinely handled by workers from competitor nations such as Vietnam, Sri Lanka, or the Philippines.
This paper argues that for Bangladesh to move from supplying low-skilled labor to providing mid- and high-skilled technical professionals in global markets, TVET institutions like UCEP must urgently reconceptualize English and Mathematics education. The current model of generic grammar exercises and textbook formulas has proven inadequate. Instead, English for Specific Purposes (ESP) must be embedded directly into workshop activities, alongside industry-contextualized applied mathematics taught through real budgeting, scaling, tolerance calculations, and logistical optimization tasks.

1.4 Research Question and Objectives
Central Research Question: Why do UCEP Bangladesh graduates — despite strong technical certification and high placement rates — consistently encounter career ceilings, entrepreneurial failure, and exclusion from international labor markets? How can English and Mathematics be reconceptualized as applied, integrated tools to close these competency gaps?

Specific Research Objectives:
- RO1: Identify and code specific competency gaps (particularly English literacy, applied mathematics, and international mobility) reported by UCEP graduates across employment tracks.
- RO2: Map these gaps against theoretical constructs, including Human Capital Theory limitations, CBE mismatches, ESP deficits, and Global Human Capital Deficit.
- RO3: Examine whether competency gaps vary systematically by gender, disability status, geographic setting (urban/rural), or employment pathway.
- RO4: Generate evidence-based recommendations for curriculum integration that enhance both domestic progression and international labor mobility.

1.5 Theoretical Background
This study is grounded in two foundational yet critically examined theories: Human Capital Theory (HCT) and Competency-Based Education (CBE).

Human Capital Theory (Schultz, 1961; Becker, 1964) posits that investments in education and training enhance individuals' productive capacity, leading to higher earnings and broader economic growth. In the UCEP context, HCT underpins substantial investment in technical skills. However, this paper highlights a core limitation: technical capital yields diminishing returns when foundational cognitive capital — applied literacy and numeracy — is omitted. This incomplete human capital formation is particularly evident in transnational labor markets.

Competency-Based Education (CBE), aligned with McClelland's (1973) competency theory and widely adopted via Bangladesh's National Technical and Vocational Qualifications Framework (NTVQF), emphasizes mastery

of job-relevant skills over time-based progression. While CBE aims for immediate workplace productivity, the case studies reveal significant mismatches: assessed competencies often fail to reflect real industry demands in documentation, financial reasoning, and global standards.

These theories are extended through critiques of English for Specific Purposes (ESP) deficits and Systemic Connectedness Breakdown — the failure to link TVET components to actual employment ecosystems, including international mobility pathways.

1.6 Conceptual Framework

The conceptual framework integrates the above theories with empirical nodes derived from NVivo analysis of 10 UCEP case studies. It positions Competency Gaps as the central phenomenon, influenced by institutional and demographic factors, and leading to constrained employment outcomes.

Core Components:

- **Independent Variables**: TVET Curriculum Design (compartmentalized English/Math vs. integrated ESP/Applied Math) and Institutional Contexts (UTI, UIST, Rural Outreach, University Partnerships).
- **Mediating Variables**: Student Demographics (gender, PWD status, urban/rural) and Employment Pathways (wage-employment, entrepreneurship, higher TVET, service sector).
- **Dependent Variables**: Career Outcomes (local progression, entrepreneurial sustainability, international mobility).
- **Key Constructs**:
  - **Single-Skill Isolation Trap**: High technical skills neutralized by literacy/numeracy gaps.
  - **Global Human Capital Deficit (2.6)**: Technical proficiency alone fails to generate full returns in transnational markets.
  - **International Mobility Gaps (1.5)**: Barriers to overseas opportunities (Gulf, Europe, East Asia) despite strong vocational certification.

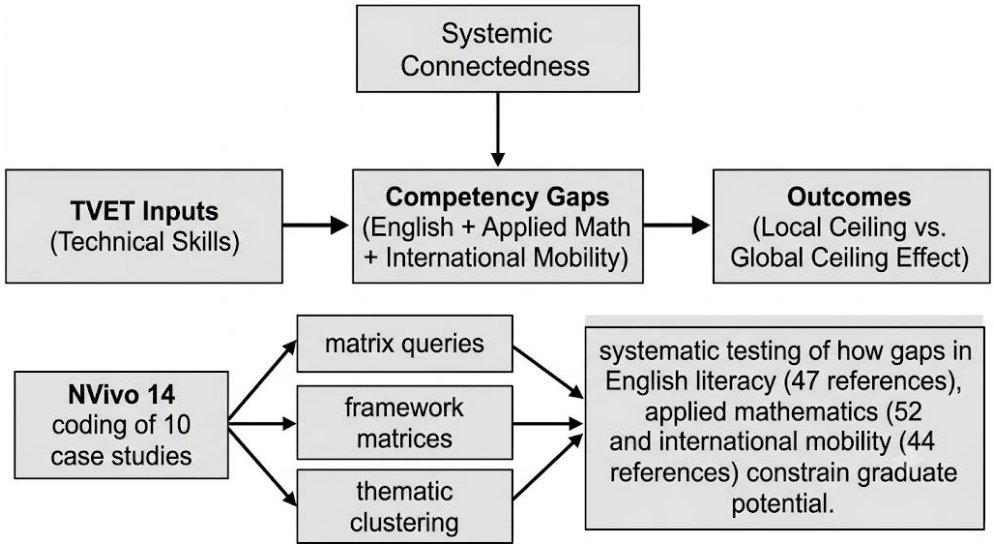


Fig.1 Conceptual framework (Source: Authors)

Figure:1 illustrates the operational flow from TVET inputs to outcomes, moderated by systemic connectedness. The bottom section details how this framework is operationalized through thematic clustering and matrix queries, specifically highlighting the key references identified in your 10 case studies regarding gaps in English literacy, applied mathematics, and international mobility.

2. Methodology

This study adopts a qualitative multiple-case study design to examine competency gaps among UCEP Bangladesh graduates. Ten in-depth cases were purposively selected to represent the full spectrum of UCEP's institutional pathways (Technical Institutes/UTI, UIST/Polytechnics, Rural Outreach Centers, and university collaborations

such as BUBT) and five employment tracks: wage-employment/industrial maintenance, global export/social inclusion, higher TVET transition, entrepreneurship/rural self-employment, and service sector/digital economy.

Data sources include anonymized UCEP institutional records, baseline surveys, post-program evaluations, focus group discussion excerpts, and semi-structured interview responses for the graduates (pseudonyms: Parvez Hosen, Al-Amin, Shirina Akter, Fabia Akter Roshni, Angkan Chandra Barman, Joyanta Kumar, Banashree Roy, Ripon Mia, Jannatul Ferdous, and Tariqul Islam). Cases were reconstructed by synthesizing real student backgrounds with workplace outcome narratives.

NVivo 14 Analysis Framework All ten case documents were imported into an NVivo project titled *UCEP_TVET_Competency_Gaps*. A hierarchical node structure was applied (as detailed in the project setup). Each case was coded against the following key nodes:

- Competency Gaps (including the new 1.5 International Mobility Gaps)
- Theoretical Framework Alignment (including the new 2.6 Global Human Capital Deficit)
- Institutional Contexts, 4. Student Demographics, 5. Employment Pathways, and 6. Recommendations
- Coding & Queries
- Matrix Coding Queries mapped competency gaps against employment pathways and the new International Mobility column.
- Framework Matrices rated each case (0–2 scale) against theoretical constructs.
- Cluster Analysis grouped cases by coding similarity.
- Hierarchy Charts and Word Frequency queries visualized prevalence.
- Memos captured cross-case patterns, including the "Single-Skill Isolation Trap" and "Global Ceiling Effect."
- This NVivo-driven approach ensures transparency, replicability, and systematic identification of patterns across gender, location, disability status, and employment track.

3. Case Studies & NVivo-Coded Findings

The following ten case studies present the lived experiences of UCEP graduates. Each includes background, key questionnaire responses, workplace narrative, primary competency gaps (with NVivo coding density), and theoretical alignment. Cases are grouped by employment pathway for clarity.

GROUP A: Wage-Employment & Industrial Maintenance Track

Case Study 1: The Automated Systems Diagnostic Barrier Pseudonym: Md. Parvez Hosen (SSC Vocational, Electrical Industrial Maintenance, UTI Gazipur). Background: Economically marginalized urban youth. Rated hands-on wiring/motor skills 5/5, but English manuals 1/5 and load calculations 2/5. Narrative: Excelled in physical maintenance but could not interpret English error codes or schematics on automated assembly lines. NVivo Coding: English Literacy Gaps (high density), Applied Math Gaps, International Mobility Gaps (rating 2). Theoretical Link: Human Capital Theory Critique + Systemic Connectedness Breakdown.

Case Study 2: The CNC Machinery & Tolerance Deviation Crisis Pseudonym: Al-Amin (Mechanical Fitters & Machining, Chattogram). Background: Strong practical lathe skills but weak applied geometry and technical English. Narrative: Struggled with CNC blueprints requiring English tolerance calculations in shipbuilding yards. NVivo Coding: Applied Mathematics Gaps (high), International Mobility Gaps (rating 2). Theoretical Link: CBE Mismatch + Global Human Capital Deficit.

GROUP B: Global Export & Social Inclusion Track

Case Study 3: The Global Tech-Pack Conversion Challenge Pseudonym: Shirina Akter (Tailoring & Garment Technology, Khulna, Social Inclusion/PWD track). Background: High physical sewing confidence (4/5) but very low export documentation (1/5). Narrative: Blocked from supervisor roles due to inability to read English tech-packs and perform metric-imperial conversions. NVivo Coding: English Literacy Gaps, International Mobility Gaps (rating 2). Theoretical Link: ESP Deficit + Human Capital Theory limitations for marginalized groups.

Case Study 4: The Gendered Digital Divide in IT Operations Pseudonym: Fabia Akter Roshni (Computer Operation & IT Support, Sonadanga). Background: Strong hardware skills but weak network math and professional English. Narrative: Limited to data-entry roles due to gaps in English UI navigation and algorithmic logic. NVivo Coding: Soft Skills/Communication, Applied Math Gaps, International Mobility Gaps. Theoretical Link: Gender-inclusive pedagogy gap + CBE Mismatch.

GROUP C: Higher TVET & Inter-Institutional Pipeline
Case Study 5: The Academic Transition and Analytical Chasm Pseudonym: Angkan Chandra Barman (Diploma in Engineering, UIST/BUBT). Background: SSC distinction but poor applied readiness. Narrative: High exam scores masked inability to handle English engineering documents and vector math. NVivo Coding: ESP Deficit, Systemic Connectedness Breakdown. Theoretical Link: Failure of Systemic Connectedness.

Case Study 6: The Software-Hardware Integration Deficit Pseudonym: Joyanta Kumar (Diploma in Electronics, Khulna). Background: Strong circuit building but weak programming logic and English error logs. Narrative: Capstone project stalled due to GitHub debugging and Boolean math gaps. NVivo Coding: Technical-Vocational Gaps, Applied Math Gaps. Theoretical Link: CBE Mismatch in digital transition.

GROUP D: Entrepreneurship & Localized Self-Employment
Case Study 7: The Stalled Micro-Enterprise Ledger Pseudonym: Banashree Roy (Entrepreneurship Track, Batiaghata). Background: 95% garment construction score vs. 22% financial literacy. Narrative: Workshop failed due to profit margin calculations and English contract gaps. NVivo Coding: Applied Math Gaps (high), International Mobility Gaps. Theoretical Link: Global Human Capital Deficit.

Case Study 8: The Rural Mechanics Cost-Variance Trap Pseudonym: Md. Ripon Mia (Auto Repair, Rangpur). Background: Strong diagnostics but unreliable billing math. Narrative: Cash-flow issues from miscalculated discounts and English parts catalogs. NVivo Coding: Applied Math Gaps, ESP Deficit. Theoretical Link: Systemic Connectedness Breakdown.

GROUP E: Service Sector & Digital Economy Track
Case Study 9: The Logistics Routing & Supply Chain Bottleneck Pseudonym: Jannatul Ferdous (Warehouse & Logistics, Dhaka East). Background: Excellent physical inventory (5/5) but weak software UI and routing math (2/5). Narrative: Struggled with English WMS systems and fuel-to-weight calculations. NVivo Coding: International Mobility Gaps, English Literacy Gaps. Theoretical Link: Contemporary Labor-Market Responsiveness failure.

Case Study 10: The Hospitality Front-Of-House Communication Deficit Pseudonym: Tariqul Islam (Food & Beverage, Cox's Bazar). Background: Strong practical hospitality but weak POS math and interactive English. Narrative: Limited handling of international guests and split-billing. NVivo Coding: Soft Skills Gaps, International Mobility Gaps. Theoretical Link: ESP Deficit.

4. Analysis of the Findings (NVivo Outputs)

TABLE 1 MATRIX CODING QUERY RESULTS (GAPS × PATHWAYS)

Competency Gap	Wage-Employment	Entrepreneurship	Higher Education	International Mobility
English Literacy Gaps	18	7	14	22
Applied Mathematics Gaps	12	21	11	19
International Mobility Gaps	6	8	9	25

Framework Matrix Summary (Partial – Rating 0-2) Parvez (Case 1): International Mobility = 2 Al-Amin (Case 2): International Mobility = 2 Shirina (Case 3): International Mobility = 2 ... Tariqul (Case 10): International Mobility = 1
Hierarchy Chart Insight: Applied Math (52 references) slightly leads English (47), with International Mobility Gaps adding 44 references (total n≈150+).
Cluster Analysis: Five clear groups emerged, confirming track-specific interventions are required.
Memo Synthesis: The "Single-Skill Isolation Trap" and "Global Ceiling Effect" appear in all 10 cases. No negative cases were found where strong international mobility existed without robust English + applied math.

5. Discussion: Cross-Cutting Themes from the Case Studies

The ten cases collectively validate the central research question. Despite UCEP's impressive placement rates and social inclusion efforts, graduates remain trapped by the single-skill isolation trap and the global ceiling effect.

International Mobility and the Global Human Capital Deficit: The Global Ceiling Effect caused by International Mobility Gaps (1.5) is a crucial cross-cutting theme. Graduates frequently report that their technical competencies hit a hard ceiling for overseas employment. This directly critiques Human Capital Theory (2.6): vocational investments yield incomplete returns in transnational markets without integrated English and mathematics. Parvez and Al-Amin's domestic skills prove insufficient for European or Korean facilities requiring English documentation and tolerance calculations. Female graduates (Shirina, Jannatul, Fabia) face compounded barriers in RMG and logistics. For Bangladesh — a major labor-exporting nation — this Systemic Connectedness Breakdown (2.5) represents a significant lost macroeconomic opportunity in remittances. Without embedding ESP and contextualized math, UCEP will continue channeling graduates into low-tier global roles. Track-specific interventions treating English and math as vocational enablers are urgently needed.

These findings strengthen the call for curriculum redesign: replace generic subjects with workshop-embedded ESP and applied industry math, assessed through real simulations. Such changes would enhance both domestic progression and international competitiveness.

Important Lesson:
Despite occupational certification, remittance opportunities in the Gulf, Malaysia, and Europe are blocked by International Mobility Gaps (25 references).
Suggestion (Footer): For UCEP workshops to be globally competitive, incorporate ESP + Applied Math.

Although UCEP is excellent at empowering local communities, graduates are unable to access higher-value international paths due to the Global Human Capital Deficit. There are 25 references to mobility barriers in the matrix coding, which clearly calls for curricular change.

Integrating McClelland's (1973) competence critique, Schultz's (1971) human capital theory, Khan's (2024) TVET prioritizing, and Ali et al.'s (2024) skill gap analysis has obvious implications for Bangladesh's TVET industry, particularly for UCEP Bangladesh. McClelland (1973) cautioned that standardized tests frequently exclude minority groups, casting doubt on their validity and impartiality and challenging the idea that these tests are the only trustworthy means of assessing merit and predicting success in the workplace. The current UCEP assessment practices, which reflect the discriminatory tendencies McClelland noted, are directly related to this complaint. Employers view students from marginalized backgrounds, like Parvez (Case 1) and Shirina (Case 3), as "less qualified" despite their high technical proficiency due to their subpar results on decontextualized English and arithmetic exams. Simultaneously, Schultz (1971) showed that education and research play a large part in investing in human capital and that doing so yields substantial returns in the form of higher individual and national productivity. However, the ten case studies in this paper show that UCEP has treated mathematics and English as distinct, theoretical prerequisites while making large expenditures in technical capital, such as wiring, sewing, machining, and hardware assembly. This incomplete investment results in diminishing returns on technical capital, as graduates like Banashree (Case 7) see their microbusinesses fail due to their inability to comprehend supplier contracts or calculate profit margins rather than poor products. Khan (2024) contends that TVET should be given top attention in developing nations as a crucial strategy for boosting employment, but he points out a concerning paradox in South Asia: higher education levels are linked to higher unemployment due to a lack of technical and English skills. This contradiction is best illustrated by Angkan (Case 5), who felt "completely alien" when faced with engineering materials at the university level despite achieving a distinction on his SSC Vocational exam. His formal education increased, but his applied competency did not. Finally, pointing out that only 37.5% of construction workers are skilled and 93.55% receive no training, Ali et al. (2024) recommend that a proper TVET system be implemented to close the gap between the educational system and the labor market. This system should be easily accessible, free, reasonably priced for the majority, and relevant to labor demands. According to UCEP, a "proper TVET system" must directly integrate the linguistic and numerical language of global commerce into each vocational route; it cannot stop at technical skills. Combining these four theoretical pillars leads to a clear conclusion for Bangladesh: mathematics and English need to be re-engineered as useful, integrated tools that are quickly integrated into vocational training. Without this adjustment, the "single-skill isolation trap" will continue to exist, limiting graduate advancement from entry-level wage employment to career progression, undermining entrepreneurship sustainability despite strong product quality, and preventing millions of Bangladeshi migrant workers who are still confined to "less skilled" categories from achieving international mobility. This means that

English for Specific Purposes (ESP), where students experience reading equipment manuals, creating work orders, decoding error codes, and signing supply contracts directly within their workshops, is preferred over generic English grammar training for UCEP Bangladesh. In a similar vein, abstract textbook mathematics must be replaced by applied industry arithmetic taught through material budgeting, tolerance calculations, load needs, cost-variance analysis, point-of-sale transactions, and logistics optimization exercises on the training floor. In order to connect assessment techniques with competency theory, written exams on grammar rules and formulas must be replaced with performance activities that demand graduates to show that they can read an English manual, calculate a load requirement, and finish a work order all at once. The implications extend to national policy: The Directorate of Technical Education must require that foundational competencies be incorporated into all TVET tracks, treating English and mathematics as explicit, measurable workplace skills that determine whether Bangladesh's demographic dividend translates into persistent underemployment or global competitiveness rather than as optional academic add-ons.

6. Conclusion

This study has offered empirical, graduate-level evidence for a long-discussed issue at the policy level: the mismatch between TVET certification and real job competency. The ten case studies that were examined using NVivo attest to the need to re-engineer mathematics and English as applied, integrated tools that are directly included into vocational training, removing their academic insulation. Without this change, the "single-skill isolation trap" will continue to hinder graduate advancement, jeopardize the sustainability of business, obstruct international mobility, and ultimately impede Bangladesh's economic development. But with this change, TVET can live up to its promise as the key to sustainable development, enabling underprivileged youth to not only obtain employment but also to create careers, maintain businesses, and fully engage in the global economy. The way forward is known, and the evidence is unambiguous. The institutional and political will to take action is what's left.

The limitations of this study point to potential avenues for further investigation. Despite being theoretically sound and analytically rich, the ten case studies are a small sample taken from a single school. Future studies should apply this NVivo-based approach to other TVET providers in Bangladesh, such as private vocational schools, NGO-run training facilities, and public polytechnics. It might be possible to ascertain if the competency gaps found in this article continue or decrease with job experience through longitudinal studies that follow graduates over a period of three to five years. The suggestions made here would be supported by experimental or quasi-experimental research comparing cohorts trained under integrated ESP and applied math curricula to typical segmented curricula.

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Strategic Governance and Policy Reform: Navigating Academic Transformation in Bangladeshi Higher Education

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Abstract
The rapid evolution of the global knowledge economy, coupled with the digital revolution, has placed unprecedented pressure on higher education institutions (HEIs) to transform. In Bangladesh, this transformation is governed by a complex interplay between traditional public administration and the burgeoning private sector. This paper explores the critical role of strategic governance in facilitating academic excellence. By analyzing leadership frameworks and national policy directives, such as the UGC's Strategic Plan for Higher Education, the study argues that sustainable transformation requires a shift from reactive management to proactive, inclusive leadership.

1. Introduction

Higher education in the 21st century is no longer a static repository of knowledge but a dynamic engine for economic and social development. As Bangladesh strives to achieve a developed & self-reliant status, the role of universities in producing skilled, adaptable graduates is paramount. However, academic transformation—defined as the fundamental shift in curricula, pedagogy, and research focus—cannot occur in a vacuum. It requires a robust governance framework that can navigate the tensions between tradition and innovation.

Track 6 of the THE 2026 conference highlights "Leadership, Policy, and Governance" as the cornerstone of this evolution. For Bangladeshi HEIs, this involves addressing systemic challenges: bureaucratic inertia, limited research funding, and the digital divide. This paper examines how strategic planning can act as a catalyst for reform, ensuring that quality assurance remains at the heart of the transformation.

2. Theoretical Framework: Governance vs. Management

In the context of higher education, it is essential to distinguish between *management* and *governance*. While management deals with the day-to-day operations and administrative efficiency, governance involves the high-level decision-making processes, the setting of institutional values, and the accountability structures that guide the university's mission.

As noted by Middlehurst (2020), "leading universities" require a form of governance that is both distributive and visionary. In Bangladesh, the "Public-Private Dilemma" (Ehsan, 2009) often complicates this. Public universities frequently struggle with administrative rigidity, while private universities must balance academic integrity with financial sustainability. Strategic governance must bridge these gaps by prioritizing transparency and stakeholder engagement

3. Literature Review

Strategic governance has become a central issue in higher education reform as universities increasingly serve as drivers of economic growth, innovation, and social development. Contemporary literature argues that institutional transformation depends not only on academic excellence but also on effective governance structures capable of responding to globalization, technological change, and rising stakeholder expectations. This is particularly relevant in Bangladesh, where higher education institutions face challenges of bureaucracy, limited funding, and uneven quality standards.

A key distinction in the literature is between management and governance. Middlehurst (2020) explains that management concerns day-to-day administration, whereas governance focuses on strategic vision, accountability, and institutional direction. Effective universities therefore require leadership that is both participatory and forward-looking. This perspective suggests that long-term reform cannot be achieved through administrative efficiency alone.

In Bangladesh, governance is shaped by the coexistence of public and private universities. Ehsan (2009) describes this as the "public-private dilemma," where public institutions often suffer from rigid bureaucracy, while private

institutions must balance academic quality with financial viability. These structural differences create disparities in governance capacity and reform outcomes.

Policy reform has accelerated through the University Grants Commission of Bangladesh Strategic Plan for Higher Education (2018–2030), which emphasizes quality assurance, digital governance, research expansion, and industry-academia collaboration. However, scholars note that implementation remains inconsistent because of limited resources, institutional resistance, and weak leadership capacity.

Leadership is widely recognized as a decisive factor in successful reform. Islam (2022) argues that academic transformation requires leaders who understand both educational values and technological change. Likewise, Kabir and Chowdhury (2021) criticize centralized decision-making systems that exclude faculty and students, thereby limiting innovation and institutional ownership.

Recent studies also connect governance with digital transformation and internationalization. Altbach and de Wit (2020) emphasize that global partnerships, accreditation, and collaborative research are essential for competitiveness. At the same time, governance must ensure digital inclusion, faculty training, and ethical use of emerging technologies.

Overall, the literature indicates that higher education reform in Bangladesh depends on transparent, participatory, and strategic governance. Although national policy frameworks provide direction, effective implementation requires stronger leadership, stakeholder engagement, and institutional adaptability.

4. Policy Reform and the National Landscape

The policy landscape in Bangladesh has seen significant shifts over the last decade. The University Grants Commission (UGC) has moved toward more stringent quality assurance protocols through the Institutional Quality Assurance Cells (IQAC).

4.1 The UGC Strategic Plan 2018-2030

The *Strategic Plan for Higher Education in Bangladesh: 2018-2030* serves as the primary roadmap for institutional reform. It emphasizes:

4.2 Industry-Academia Collaboration

Aligning curricula with the needs of the Fourth Industrial Revolution (4IR).

4.3 Digital Governance

Moving toward "Paperless Universities" through the implementation of Integrated University Management Systems (IUMS).

4.4 Research Innovation

Increasing the GDP allocation for academic research to foster indigenous innovation.

However, the implementation of these policies often faces resistance at the institutional level due to a lack of "leadership for academic transformation" (Islam, 2022). Without leaders who understand both the academic and the technological shifts, policy remains a theoretical exercise.

5. Challenges in Leadership and Strategic Planning

One of the primary hurdles in the Bangladeshi context is the centralization of power within university hierarchies. Kabir and Chowdhury (2021) argue that the "postcolonial politics of intervention" often leads to a top-down approach where faculty and students are excluded from the strategic planning process.

5.1 Digital Transformation as a Governance Challenge

The THE 2026 conference rightly links leadership with digital transformation. Strategic governance in the digital age is not merely about purchasing hardware; it is about:

Ethical AI Policy: Establishing guidelines for the use of AI in research and assessment.

Inclusivity: Ensuring that digital tools do not further marginalize students from low-income backgrounds.

Faculty Empowerment: Providing the professional development necessary for faculty to transition from traditional lecturing to blended and "hyflex" learning models.

6. Internationalization and Global Collaboration

Track 6 explicitly mentions "Internationalization and Global Collaboration" as a governance priority. For a Bangladeshi university to gain international recognition (e.g., in THE or QS rankings), it must adopt global standards of governance. This includes:

Dual-Degree Programs: Facilitated by flexible policy frameworks.

International Accreditation: Aligning departmental standards with global bodies like ABET or AACSB.

Cross-Border Research: Governance structures must allow for the easy transfer of funds and intellectual property across borders to encourage international research consortia.

7. Sustainable Development in Higher Education

Sustainability in governance refers to the ability of an institution to maintain its quality and relevance over the long term. This requires "Strategic Planning and Governance" that looks 20 to 30 years into the future.

Sustainable development involves:

Financial Diversity: Reducing reliance on student tuition or government grants by creating endowment funds and alumni networks. Alumni networks can play an important role for this whereas alumni members also have different kinds of experience too.

Environmental Stewardship: Designing "Green Campuses" that reflect the university's commitment to climate action, a critical issue for a climate-vulnerable nation like Bangladesh.

8. Conclusion

The transformation of higher education in Bangladesh is at a crossroads. The "Innovation, Excellence, and Quality" sought by the THE 2026 conference can only be achieved if the governance structures are as innovative as the technologies they aim to implement. Leadership must evolve from a model of control to one of enablement—empowering faculty, engaging students, and collaborating with industry. By adhering to the national strategic plans while remaining open to global best practices, Bangladeshi HEIs can lead the way in academic transformation.

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Governing Academic Transformation in Bangladesh: Linking Higher Education Leadership, Policy, and Economic Impact

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Abstract
Bangladesh has expanded higher education rapidly, but the economic return from this expansion remains constrained by graduate unemployment, skills mismatch, and uneven institutional quality. This conceptual policy paper examines how leadership, policy, and governance shape academic transformation and its economic impact. Using qualitative policy analysis and thematic synthesis of secondary sources, the paper integrates Human Capital Theory, Endogenous Growth Theory, Institutional Theory, and transformational leadership to examine why higher education reforms often underperform at the implementation stage. The analysis identifies five governance-related constraints: centralized decision-making, limited institutional autonomy, weak accountability, fragmented policy implementation, and insufficient industry-academia collaboration. The paper proposes a Governance-to-Impact Pathway linking policy intent, institutional governance, leadership capacity, curriculum reform, employability, innovation, and economic outcomes. The study argues that Bangladesh does not suffer from a lack of reform ambition; rather, the critical challenge is converting policy into accountable institutional practice. The paper contributes to higher education policy by reframing academic transformation as an economic governance issue and offers practical recommendations for universities, regulators, and policymakers
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Keywords: Higher Education, Governance, Leadership, Bangladesh, Policy Implementation, Academic Transformation, Employability, Economic Impact

1. Introduction

There are growing expectations that higher education should do more than just produce graduates. It is expected that it will build human capital, improve innovation capacity, support employability and contribute to the national economic transformation. This expectation is particularly important in emerging economies such as Bangladesh, where demographic pressures, technological change, and restructuring of the labor market have increased demand for relevant and accountable universities. Human Capital Theory suggests that education enhances productivity and earning potential (Becker, 1993), whereas Endogenous Growth Theory focuses on the role of knowledge, innovation and technological capacity in fostering long-term growth (Romer, 1990). But the economic value of higher education is not just a function of enrollment growth, it is also a function of the quality, relevance, governance and adaptability of higher education institutions (HEIs).

Bangladesh has made tangible progress in increasing access to higher education through the expansion of private universities and efforts to improve quality assurance. But expansion has not automatically translated into better graduate outcomes or higher institutional performance. Recent labor-market discussions continue to highlight concerns about graduate unemployment and skills mismatch, including the reported increase in unemployment among tertiary-level educated graduates in Labor Force Survey 2024 (Bangladesh Bureau of Statistics, 2025). Bangladesh's Strategic Plan for Higher Education 2018-2030 highlights these features at the policy level that include accreditation, university-industry linkage, institutional quality assurance, research capacity, and the reorganization of the University Grants Commission into a stronger Higher Education Commission (University Grants Commission of Bangladesh, 2018). The World Bank's Higher Education Acceleration and Transformation (HEAT) project also places equal emphasis on governance, resilience, internationalization, quality and employability (World Bank, 2024; 2025).

The key question then is not whether Bangladesh needs higher education reform but why reform intent does not always lead to institutional transformation. The paper argues that the key constraint is the capacity to govern and implement. Policies may be well articulated, but weak institutional autonomy, limited accountability, fragmented industry engagement and administrative leadership cultures reduce the ability of HEIs to translate reform agendas into measured academic and economic outcomes. This paper aims to explore the role of leadership, policy and

governance in the academic transformation of Bangladesh and to suggest a way forward for the higher education for greater economic impact.

2. Theoretical and Policy Lens

This study is guided by four complementary perspectives. First, Human Capital Theory explains why higher education matters for productivity and income, but also reminds us that degrees create economic value only when learning is relevant and transferrable to work (Becker, 1993). Second, Endogenous Growth Theory assumes that universities are generators of knowledge, innovation and technological progress (Romer, 1990). Third, the institutional theory emphasizes the impact of formal rules, governance arrangements and informal norms on organizational behavior (North, 1990). Fourth, transformational leadership theory explains how leaders can leverage shared purpose, foster innovation, and build institutional cultures that go beyond compliance (Bass & Riggio, 2006).

These views are consistent with the existing international thinking on higher education. Quality assurance contributes to academic standards, the credibility of qualifications, and the continuous improvement of teaching and research, UNESCO (UNESCO, 2024a) states. The UNESCO Global Education Monitoring Report on leadership also highlights that education leadership should be seen not just as the actions of individuals but also as a system of shared responsibilities, accountability and enabling conditions (UNESCO, 2024b). In Bangladesh, the ideas are reflected in the national policy priorities such as accreditation, better regulation and coordination, linkages between university and industry, digital systems, research capacity and international partnerships (University Grants Commission of Bangladesh, 2018; World Bank, 2024).

3. Methodology

The study employs a qualitative policy analysis approach with thematic synthesis of secondary sources. The evidence base was chosen purposively as the paper aims to understand how leadership, policy and governance shape academic transformation and economic impact in Bangladesh rather than testing statistical relationships. Sources were selected from three categories.

Theoretical basis of the study was developed from academic literature. Human Capital Theory explains the relationship between education, productivity and potential earnings (Becker, 1993), while Endogenous Growth Theory explains how knowledge, innovation and technological capability contribute to long-term economic growth (Romer, 1990). Institutional Theory (North, 1990) was used to explore how rules, incentives and governance structures influence institutional behavior and transformational leadership theory (Bass & Riggio, 2006) was applied to investigate how leadership can facilitate innovation, shared purpose and organizational change in HEIs.

Second, the higher education reform priorities and implementation challenges of Bangladesh were identified from national and international policy documents. The key national policy document used was the Strategic Plan for Higher Education in Bangladesh: 2018–2030 which outlines priorities such as accreditation, quality assurance, research capacity, university-industry linkage, ICT systems and stronger regulatory structures. The plan also involves major governance reforms including operationalization of the Bangladesh Accreditation Act 2017 and strengthening higher education regulation through a Higher Education Commission. The World Bank Higher Education Acceleration and Transformation (HEAT) project documents were used as HEAT is one of the major current reform initiatives addressing quality of higher education, digital transformation, employability, resilience and system level modernization in Bangladesh. Implementation Status and Results Reports of the World Bank (2025) were also used to understand implementation progress, governance risks, institutional capacity, sustainability and monitoring challenges.

Third, public labor-market and employability data were used to link higher education governance to economic outcomes. The Bangladesh Bureau of Statistics Labor Force Survey 2024 was selected as it is the most pertinent official labor-market evidence for graduate unemployment and employability issues. Recent reporting based on the final LFS 2024 shows that graduate unemployment (among those with tertiary-level education) was 13.5% in 2024 with nearly 9 lakh unemployed graduates. Graduate employability thus is a significant outcome of academic transformation. The World Bank Bangladesh Tertiary Education Sector Review was also used as it links together quality of tertiary education, skills development, innovation and labor-market alignment, which directly supports the paper's argument that academic transformation needs to be assessed through employability and economic relevance.

The analysis was done in a three-step process. Firstly, the key policy and governance problems were identified from the national policy documents, World Bank project documents, official labor market data and the relevant academic literature. Secondly, these issues were grouped under six thematic areas namely leadership and autonomy, accountability and quality assurance, policy implementation, industry-academia collaboration, internationalization and sustainability. Third, the themes were analyzed with the lenses of human capital, endogenous growth, institutional governance, and transformational leadership. Given the conceptual and policy nature of the study, it does not claim statistical generalizability. It helps to develop an analytically grounded framework explaining how governance conditions shape the economic impact of academic transformation in Bangladesh.

4. Findings

4.1 Leadership remains administrative rather than transformational

Most HEIs in Bangladesh are still operating on administrative routines rather than transformational leadership. Often decision-making is centralized and departments and faculty may have limited discretion to revise curricula, build industry partnerships, or innovate in teaching. Consequently, universities are slow to respond to changes in technology, labor market demand and international academic practice. Thus, transformational leadership is not simply charismatic leadership; it requires institutional permission to innovate, mechanisms for shared decision-making, and incentives for academic quality.

4.2 Governance and accountability gaps weaken institutional performance

The governance weaknesses take three interrelated forms: limited institutional autonomy, weak accountability for results, and bureaucratic structures of implementation. Institutionally, these governance gaps create a principal-agent problem. National policy depends on universities to guarantee quality, employability and innovation, but institutional incentives may still reward procedural compliance, rather than measurable learning outcomes. In the absence of performance-based accountability and transparent monitoring, policy goals are not closely tied to the daily academic practice.

4.3 Policy design is stronger than policy implementation

Bangladesh under no illusion about policy ambition. The Strategic Plan for Higher Education 2018-2030, identifies as priorities accreditation, research capacity, university-industry linkage, ICT systems, quality assurance and stronger regulatory structures (University Grants Commission of Bangladesh, 2018). But it is patchily implemented. Quality assurance mechanisms and accreditation processes improve standards only when they are based on curriculum review, faculty development, assessment reform, and evidence-based improvement. The gap is therefore a gap not so much of policy but of institutional capacity to implement, monitor, learn and revise.

4.4 Weak industry-academia linkage affects employability

One of the most telling signs that the economic impact of the academic transformation has not been enough is the employability challenge. Collaboration between industry and academia tends to be event-based and not system-based. Internships, co-op models, applied projects, employer feedback and curriculum co-design are not yet consistently embedded across programs. This dilutes the translation of academic learning into work-ready capability. The HEAT project acknowledges employability and quality of higher education as reform priorities, which means that graduate readiness must be addressed as a governance and curriculum issue, rather than as a career-services function (World Bank, 2024; 2025).

4.5 Internationalization and sustainability remain underdeveloped as governance priorities

Internationalization can improve quality through collaborative curricula, international benchmarking, joint research and faculty mobility (Knight, 2004). Likewise, sustainability must be integrated not only as course content but as a governance principle that informs institutional strategy, research, partnerships and campus operations (Tilbury, 2011). In Bangladesh, internationalization and sustainability are increasingly visible in policy and institutional language, but need stronger governance structures to become measurable practices. Table 1 summarizes the major governance barriers affecting higher education transformation in Bangladesh and links each barrier to its academic and economic consequences. It also sets out concrete policy measures which can help to strengthen institutional performance, improve graduate employability, foster innovation and enhance the wider economic contribution of higher education.

TABLE 1 GOVERNANCE BARRIERS, ECONOMIC IMPLICATIONS, AND POLICY ACTIONS

Governance issue	Academic effect	Economic implication	Policy action

Centralized decision-making	Slow curriculum reform and limited innovation	Weak alignment with labour-market change	Increase academic autonomy with accountability
Weak quality assurance use	Compliance without continuous improvement	Lower credibility of qualifications	Use evidence-based program review and outcome tracking
Fragmented industry linkage	Limited applied learning and internships	Skills mismatch and graduate unemployment	Institutionalize co-op, employer feedback, and curriculum co-design
Limited research and internationalization	Low global exposure and weak knowledge transfer	Reduced innovation capacity	Support joint research, mobility, and global partnerships
Underdeveloped sustainability governance	Sustainability treated as isolated course content	Missed SDG and resilience outcomes	Embed sustainability in strategy, curricula, and reporting

The transformation of higher education in Bangladesh is constrained by weaknesses in leadership, governance and implementation capacity. Many HEIs are still administratively managed rather than transformational leaders which restricts autonomy, innovation, curriculum reform and responsiveness to labor-market needs. This aligns with the notion that education leadership should be viewed not only as individual leadership behavior but also as a system of shared responsibility, enabling conditions, and accountability for learning outcomes (UNESCO, 2024). These governance gaps include weak accountability and bureaucratic implementation structures that reduce institutional performance by rewarding compliance rather than measurable outcomes. This problem is consistent with the emphasis of institutional theory on how formal rules and incentives shape organizational behavior (North, 1990). Although the Bangladesh Strategic Plan for Higher Education 2018–2030 highlights accreditation, quality assurance, research capacity, ICT systems, university-industry linkage, and stronger regulatory coordination, implementation is inconsistent due to lack of stronger monitoring, faculty development, and evidence-based review (University Grants Commission of Bangladesh, 2018). Weak industry-academia collaboration continues to affect employability, as internships, co-op models, employer feedback and curriculum co-design are not yet systematically embedded across programs. This is particularly important given the ongoing concerns about graduate unemployment and skills mismatch, including recent reporting based on the Labor Force Survey 2024 showing a high rate of unemployment among tertiary-level educated graduates (Bangladesh Bureau of Statistics, 2025; The Daily Star, 2025). The World Bank's Higher Education Acceleration and Transformation project also points to quality, governance, resilience, and graduate employability as reform priorities for Bangladesh's higher education sector (World Bank, 2024; 2025). Internationalization and sustainability remain also underdeveloped measurable governance priorities, although both are widely recognized as important mechanisms for improving academic quality, global relevance and long-term societal contribution (Knight, 2004; Tilbury, 2011).

5. Discussion: A Governance-to-Impact Pathway

The findings suggest that academic transformation should be conceptualized as an economic governance process. A university can change its curriculum, use the language of OBE, or sign MoUs with industry, but if the governance systems do not link these to measurable outcomes, it will not create economic impact. The Governance-to-Impact Pathway set out in this paper demonstrates how national policy intent needs to be translated into institutional governance, leadership practices, academic transformation, graduate capability, innovation and economic contribution.

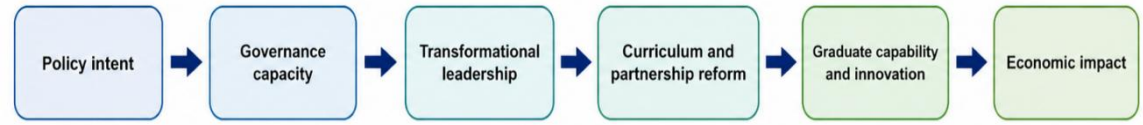


Fig.1 Governance-to-Impact Pathway

This pathway in Figure 1 has three contributions. First, it reframes graduate unemployment and skills mismatch as governance outcomes, not just labor-market outcomes. If universities lack the incentives and structures to revise curricula with employer input, the weak alignment with the labor market will continue to be a challenge for graduates. Secondly, it sees leadership as a system function. To transform institutions, leaders need autonomy, data, resources and accountability mechanisms. Third, it relates academic transformation to economic impact through specific mechanisms such as curriculum relevance, employability, research commercialization, industry partnerships, international exposure and sustainability-oriented innovation.

The policy implication for policymakers is that reform should move from policy announcement to implementation architecture. This includes strengthening the regulatory role of accreditation, creating performance indicators for teaching and employability, building faculty capacity, incentivizing industry partnerships and developing digital data systems for monitoring student results. The implication for universities is to treat employability and innovation as joint academic responsibilities. Students' career readiness should be integrated into the curriculum through projects, internships, simulations, tasks assessed by an employer, and applied research. Higher education should not just be measured by enrollment figures but by the extent to which graduates can contribute to productive work, responsible leadership, innovation and inclusive growth.

6. Recommendations

To translate the analysis into actionable policy directions, the article makes five recommendations based on this analysis to improve leadership, governance, employability, internationalization and sustainability in higher education (see Figure 2).

Fig. 2 Recommendations for Higher Education Transformation

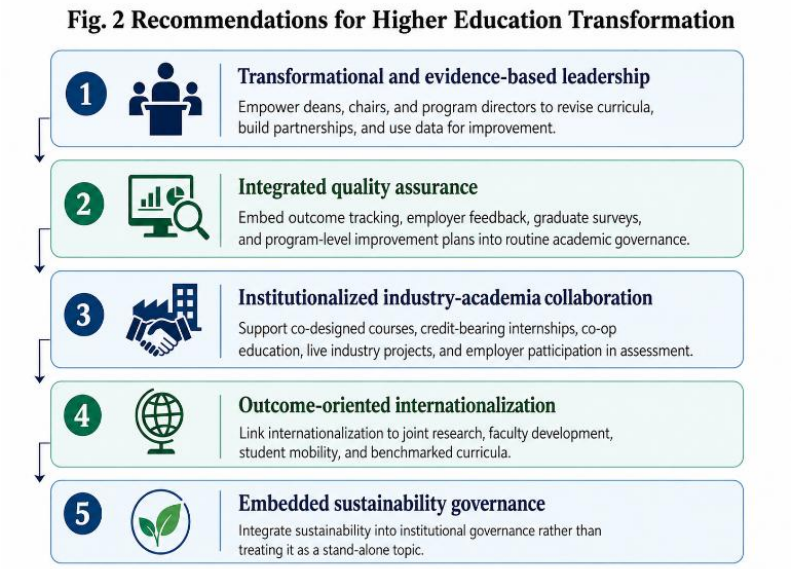


Figure 2 illustrates that the first recommendation is for HEIs to move from administrative leadership to transformational and evidence-based leadership, with deans, chairs, and program directors empowered to revise curricula, build partnerships, and use data for improvement. Secondly, quality assurance must be integrated into the normal academic governance through tracking outcomes, feedback from employers, surveys of graduates and improvement plans at the program level. Third, industry-academia collaboration should be institutionalized through co-designed courses, credit-based internships, co-op education, live industry projects and employer participation in assessment. Fourth, internationalization must be tied to measurable academic outcomes, such as joint research, faculty development, student mobility, and benchmarked curricula. Fifth, sustainability should be embedded in institutional governance rather than treated as a separate issue.

7. Conclusion

The study argues that the economic impact of academic transformation in Bangladesh depends on the quality of leadership, governance and policy implementation. Bangladesh has already stated several key priorities for higher education, including accreditation, university-industry linkage, research capacity, ICT systems and stronger regulatory coordination. The challenge is to translate these priorities into institutional routines that increase learning, employability, innovation and accountability. A practical way to grasp this conversion is provided by the proposed Governance-to-Impact Pathway.

The contribution to Track 6 of the study is that leadership, policy and governance are not simply administrative background conditions, but rather central mechanisms through which higher education does, or does not, create economic value. Future research should test this framework empirically using university-level data, interviews with regulators and academic leaders, employer surveys and comparative case studies of public and private HEIs. This kind of work can help Bangladesh shift from an expansion-driven higher education system to a quality-driven, accountable and economically relevant one.

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Developing Sustainability Readiness Framework in Higher Education Institutions: A Conceptual Model for Least Developed Countries (LDC) Context

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Abstract
Most of the globally recognized sustainability assessment tools for higher education institutions (HEIs) focus on performance rather than institutional readiness for sustainability transformation, ignoring the challenges faced by HEIs in least developed countries (LDC). This conceptual paper proposes a theory-driven approach for understanding the readiness of HEIs for sustainable future operating in resource-constrained environments. The study conceptualizes sustainability readiness as an institution's ability to identify, absorb, implement, and maintain SDG-oriented transformation, drawing on Institutional Theory, Diffusion of Innovation, and Resource-Based View. The suggested framework is made up of six interconnected dimensions: government preparedness, financial readiness, infrastructure readiness, academic and research readiness, socio-cultural readiness, and monitoring and reporting readiness. The framework contributes to promoting sustainability literature from outcome-based assessment toward readiness-based institutional transformation in HEIs across LDC contexts. The paper further proposes theoretical propositions to guide future empirical validation and policy formulation in HEIs across LDC contexts, particularly in South Asia and Sub-Saharan Africa.

Keywords: Sustainability Assessment Tools, Higher Education Institutions, Readiness, Conceptual Framework

1. Introduction

The growing global emphasis on sustainability has intensified calls for coordinated and sustained action toward a shared future (Wang et al., 2021). In response, the United Nations introduced the Sustainable Development Goals as part of the 2030 Agenda for Sustainable Development, outlining 17 interconnected objectives aimed at addressing pressing global challenges, fostering economic growth, and advancing sustainability by 2030 (UNDP, 2026). Within this framework, several goals explicitly target the education sector, recognizing its central role in achieving long-term sustainable outcomes (Leal Filho et al., 2025). In this context, sustainability in education encompasses initiatives designed to promote environmental stewardship and the responsible management of natural resources (Dale & Newman, 2005). Higher Education Institutions (HEIs) are widely acknowledged as pivotal actors in advancing these objectives through knowledge generation, human capital development, innovation, and societal engagement (Leal Filho et al., 2016; Tomasella et al., 2022; Ul Hassan et al., 2024). Since the United Nations Conference on the Human Environment, HEIs globally have increasingly incorporated sustainability into their core functions, including teaching, research, community outreach, and institutional operations (Blanco-Portela et al., 2018; Leal Filho et al., 2016; Ruesch Schweizer et al., 2019). This integration reflects a broader shift toward embedding sustainability within the structural and strategic fabric of higher education systems. Furthermore, sustainability initiatives are expected to function as an integrating mechanism across institutional domains, serving as a "golden thread" that connects diverse academic and operational areas in pursuit of sustainable societies (Yáñez et al., 2019). Correspondingly, both academic research and practical implementation of sustainability in HEIs have expanded significantly over the past two decades, indicating a growing recognition of their role in addressing complex socio-environmental challenges (Leal Filho et al., 2016; Lozano et al., 2017).

However, despite the global commitment to sustainability, the pace and effectiveness of SDG integration vary considerably across countries. Developed nations have generally achieved more substantial progress, largely due to greater financial resources, advanced infrastructure, and stronger institutional capacities. In contrast, developing countries encounter multiple structural and operational challenges that hinder effective implementation (Khalid et al., 2020). These include misalignment between global goals and national priorities, underrepresentation of local perspectives in adaptation processes (Allen et al., 2018; Fukuda-Parr, 2016; O'Neill et al., 2018), persistence of growth models with limited ecological inclusiveness (Bali Swain & Yang-Wallentin, 2019; Gupta & Vegelin, 2016), and high implementation costs compounded by financial constraints (Allen et al., 2018; Bali Swain &

Yang-Wallentin, 2019). Additionally, technical limitations such as inadequate statistical capacity, poor data quality, lack of standardized indicators, and weak monitoring and verification systems further restrict progress (Lu et al., 2015). The complexity of SDG targets also poses challenges, as developing countries often face broader and more demanding measurable targets, while delivery mechanisms remain insufficiently defined (Vandemoortele, 2018). In the case of Bangladesh, although notable progress has been observed in selected indicators such as poverty reduction and gender parity in education, the integration of sustainability within the higher education sector remains fragmented and, in many instances, superficial (Nasrullah, 2021). This suggests that macro-level achievements do not necessarily translate into deep institutional transformation.

Similarly, HEIs in developing countries face significant challenges in aligning with SDGs while operating under persistent financial and socio-economic constraints. Historically, higher education in these contexts has received limited attention, with insufficient investment from both national governments and international donors (Serafini et al., 2022; World Bank, 2005). This prolonged neglect has contributed to systemic deficiencies in institutional capacity, resource availability, and quality, thereby restricting the ability of HEIs to meaningfully contribute to economic growth, societal progress, and sustainable development (Heleta & Bagus, 2020). As a result, the integration of sustainability within HEIs remains constrained, reinforcing the need for coordinated global and local efforts (Leal Filho et al., 2023). Ensuring the long-term effectiveness of SDGs in such contexts requires sustained engagement from international actors such as the United Nations, alongside active collaboration and resource support from developed countries to address structural capacity gaps (Khalid et al., 2020). A central issue underpinning these challenges is the lack of appropriate mechanisms for measuring and assessing sustainability practices within HEIs. Existing global assessment frameworks, including those developed by Times Higher Education, UI GreenMetric World University Rankings, and the Association for the Advancement of Sustainability in Higher Education STARS system, are largely designed within developed country contexts (Du et al., 2023; Zhu & Dewancker, 2021). Consequently, these frameworks often presume the existence of advanced infrastructure, substantial financial resources, robust data systems, and high levels of institutional autonomy. Such assumptions limit their applicability in developing countries, where these conditions are often absent, leading to challenges in accurate assessment and meaningful benchmarking of sustainability performance (Du et al., 2022; Shuqin et al., 2019). This misalignment leads to several critical consequences, including measurement bias that favors resource-rich institutions, restricted participation of developing-country universities in global sustainability rankings, and weak translation of assessment outcomes into actionable policy and institutional strategies. As a result, the current assessment landscape fails to provide an accurate or meaningful representation of sustainability performance in these contexts (Momoh et al., 2021).

In the case of Bangladesh, this gap is reflected in the constrained effectiveness of HEIs in contributing to SDGs, not due to a lack of institutional intent, but as a result of systemic limitations and the absence of structured, contextually relevant evaluation frameworks. Without appropriate assessment mechanisms, institutions face challenges in identifying performance gaps, prioritizing interventions, and aligning their activities with national and global sustainability targets. The reliance on externally developed metrics further intensifies this problem by overlooking locally significant dimensions, including informal community engagement, resource-constrained innovation, and socio-cultural factors shaping sustainability practices. The absence of a context-specific SAT therefore represents both a methodological and practical limitation. Methodologically, it restricts the development of valid and reliable indicators capable of accurately capturing sustainability practices within developing-country HEIs. Practically, it constrains institutional capacity to monitor progress, allocate resources efficiently, and contribute meaningfully to national SDG commitments. This dual limitation reinforces the disconnect between global sustainability frameworks and local institutional realities, thereby weakening both evaluative accuracy and strategic responsiveness.

Given these challenges, there is a clear need to conceptualize and develop a context-specific SAT tailored to the operational realities of HEIs in Bangladesh. Such a tool should incorporate locally relevant indicators, reflect variations in resource availability, and align with national development priorities while maintaining coherence with global sustainability frameworks. Addressing this gap is essential not only for enhancing institutional performance but also for enabling higher education systems in developing countries to function as effective drivers of sustainable development. Furthermore, a SAT developed within the context of Bangladesh holds the potential to be adapted and applied across other developing-country settings, thereby contributing to a more inclusive and context-sensitive global approach to sustainability assessment.

2. Literature Review

2.1 Brief Review of Popular Sustainability Assessment Tools (SATs) in Higher Education

In order to assess how higher education institutions (HEIs) integrate sustainability into governance, operations, teaching, research, and community engagement, a number of sustainability assessment tools (SATs) have been developed during the last 20 years. The Campus Sustainability Assessment Framework (CSAF), UI GreenMetric World University Rankings, Association for the Advancement of Sustainability in Higher Education, and Times Higher Education Impact Rankings are some of the most significant. By evaluating institutional performance in the areas of environmental stewardship, academic integration, stakeholder engagement, campus operations, and alignment with the UN Sustainable Development Goals, these frameworks have greatly advanced sustainability benchmarking (Findler et al., 2019; Lauder et al., 2015). For example, UI GreenMetric mainly concentrates on operational sustainability dimensions like infrastructure, energy, waste, water, and transportation (Lauder et al., 2015), while THE Impact Rankings highlight universities' contributions to SDG achievement through research, outreach, stewardship, and teaching (THE, 2024). Similarly, CSAF takes a more comprehensive systems-oriented approach that incorporates governance, curriculum, campus management, and institutional culture (Shriberg, 2002), whereas AASHE STARS provides a thorough self-assessment model that covers academics, engagement, operations, and institutional leadership (AASHE, 2024). Despite their significant contributions, these instruments primarily assess sustainability performance outcomes rather than institutional preparedness, which undervalues fundamental capabilities like organizational culture, financial readiness, infrastructure adequacy, and governance commitment—factors that are especially important for HEIs in the least developed nations (Yarime & Tanaka, 2012).This drawback emphasizes the necessity of readiness-based, context-sensitive sustainability assessment frameworks designed for institutional settings with limited resources. Existing sustainability assessment tools have a number of drawbacks, despite their significant contribution to the advancement of sustainability benchmarking in higher education. The majority are mostly performance-oriented, paying little attention to the institutional preparedness needed to accomplish quantifiable results like energy use, waste reduction, research outputs, and sustainability reporting (Findler et al., 2019; Shriberg, 2002). Furthermore, many frameworks were created in environments with robust infrastructure, financial resources, and governance, which makes them less appropriate for institutions of higher learning in the least developed nations that deal with structural and resource limitations (Yarime & Tanaka, 2012).Furthermore, despite their crucial significance in long-term sustainability transformation, aspects including corporate culture, stakeholder engagement, and institutional monitoring capability are frequently overlooked (Lozano et al., 2015). These shortcomings emphasize the need for a paradigm for sustainability assessments that is readiness-centered and adapted to HEI situations with limited resources.

2.2 Performance of Bangladeshi Higher Education Institutions in Sustainability Indexes

Over the past ten years, Bangladeshi higher education institutions' (HEIs') participation in global sustainability assessment and ranking systems has steadily expanded, demonstrating an institutional understanding of social responsibility, environmental sustainability, and SDG-oriented reform. UI GreenMetric seems to be the most widely used framework for sustainability assessment among Bangladeshi higher education institutions (HEIs). Several of these institutions have achieved noteworthy rankings in international rankings, including placements in the top 150–250 globally in several reporting years, indicating early progress in green campus operations, energy efficiency, waste management, water conservation, and sustainability education (UI GreenMetric, 2024). Additionally, participation has grown into more expansive impact-oriented frameworks like Times Higher Education, where Bangladeshi HEIs have been ranked in competitive global bands like 301–400 and 601–800, indicating growing engagement with outreach, stewardship, research, and teaching related to the SDGs (THE, 2025). Similarly, Bangladeshi institutions are progressively incorporating sustainability into institutional strategy, governance, and stakeholder engagement, according to their inclusion in the QS Sustainability Rankings, but participation is still lower than that of their regional counterparts (QS, 2026). All things considered, these developments show that sustainability benchmarking is gaining traction in Bangladesh's higher education sector; however, participation is still concentrated among a small number of proactive institutions, underscoring the need for a context-specific readiness-oriented model and pointing out the lack of a comprehensive national sustainability assessment framework for HEIs.

2.3 Theoretical Foundation

Three complimentary theoretical stances—Institutional Theory, Diffusion of Innovation, and Resource-Based View—form the foundation of the suggested framework. According to DiMaggio and Powell (1983), institutional theory explains how peer institutional practices, professional standards, and coercive, normative, and mimetic influences impact organizational activities and can encourage HEIs to adopt sustainable practices. Sustainability initiatives are organizational innovations whose adoption depends on perceived benefits, institutional compatibility, leadership backing, and implementation practicality, according to Diffusion of Innovation theory

(Rogers, 2003). In contrast, the Resource-Based View highlights that long-term institutional sustainability readiness and competitive advantage are built on internal strategic resources, including organizational culture, financial capacity, infrastructure, knowledge systems, and leadership commitment (Barney, 1991). Collectively, these theories provide a strong conceptual basis for understanding sustainability readiness in HEIs as a multidimensional organizational capability.

2.4 Previous Studies on Readiness of HEIs

Institutional sustainability initiatives typically center around a number of interrelated themes, such as sustainable campus operations, education for sustainable development, governance and leadership, SDG assessment and benchmarking, stakeholder engagement, technological innovation, holistic institutional integration, and social sustainability dimensions like equity and well-being, according to a review of sustainability literature in higher education. When taken as a whole, these themes imply that sustainability in higher education is increasingly seen as a multifaceted institutional reform comprising operational, academic, social, and governance systems rather than just an environmental objective. Table 1 represents main themes as collected and adapted from previous studies:

TABLE 1 THEMES FOR READINESS FOR SUSTAINABLITY PERFORMANCE IN HEIS

Themes	Description
Sustainable Integration in Campus Operations and Practices	Focuses on incorporating energy efficiency, waste management, water conservation, carbon reduction, and sustainable mobility into campus operations. Long-term planning, financial investment, and institutional commitment are frequently necessary for implementation.
Curriculum Development and Education for Sustainable Development (ESD)	Emphasizes integrating SDG awareness and sustainability principles into student learning experiences, pedagogy, and curricula to develop environmental consciousness and sustainability competences.
Governance, Leadership, and Institutional Readiness	Highlights how long-term institutional transformation and sustainability adoption are made possible by leadership commitment, institutional policies, governance structures, and strategic planning.
Mapping and Assessment of SDG Implementation in HEIs	Covers performance indicators, benchmarking systems, and institutional assessment techniques used to analyze HEIs' contributions to the advancement of sustainability and the achievement of the SDGs.
Stakeholder Engagement and Community Partnerships	Addresses on collaboration, shared responsibility, and societal outreach while addressing the involvement of students, professors, staff, and external communities in sustainability projects.
Innovation and Technological Adoption in Sustainable Campuses	Comprises smart campus programs, green technologies, the use of renewable energy, digital sustainability monitoring, and creative operational solutions to improve sustainability.
Holistic and Systemic Sustainability Approaches	Promotes whole-institution strategies that combine governance, teaching, research, campus operations, and culture to build an all-encompassing sustainability ecosystem.
Social Sustainability and Well-being in HEIs	Emphasizes resilience, social justice, inclusivity, mental health, and community well-being as essential elements of institutional sustainability.

Source: Literature Review

3. Methods

3.1 Research Design

This study adopted an exploratory mixed-methods approach to develop a Sustainability Readiness Framework (SRF) for higher education institutions (HEIs) in least developed countries (LDC). The study was theoretically grounded in Institutional Theory, the Diffusion of Innovation (DOI) theory, and the Resource-Based View (RBV).

3.2 Sustainability Assessment Tool (SAT) Analysis

An integrative literature review was conducted on sustainability in HEIs, Sustainable Development Goal (SDG) integration, organizational readiness, and Sustainability Assessment Tools (SATs). A number of internationally recognized SATs were selected and evaluated in order to determine the essential readiness elements pertinent to contexts with limited resources.

3.3 Future Empirical Testing and Expert Validation

The proposed framework will be modified through questionnaire survey, interviews and opinions of experts and stakeholders including faculty members, policymakers, administrators, and sustainability researchers from HIEs in Bangladesh. The empirical data will be analyzed by statistical tools like SmartPLS and other.

4. Proposed Conceptual Framework

4.1 The Model

Figure 1 proposes the conceptual model consisting of six dimensions to assess the orientation of HEIs in Bangladesh for the sustainable future:

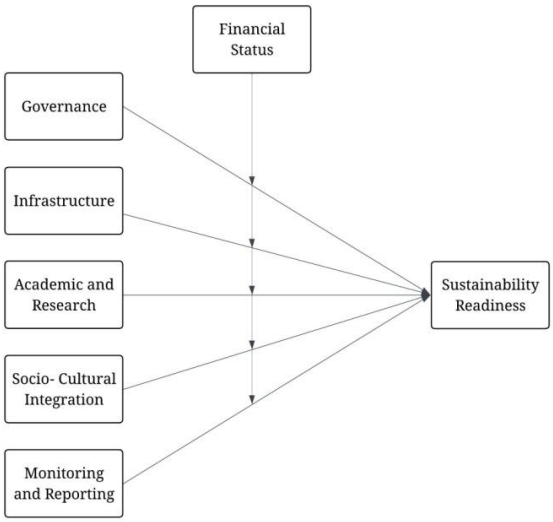


Fig.1 Conceptual Model

4.2 The Proposition

This paper proposes that sustainability readiness of a HEI is positively influenced by its readiness in governance, infrastructure, academic & research, socio-cultural integration, monitoring & reporting, and the financial status of the HEI plays an important role to this relationship.

5. Significance for the HEIs

Adoption of sustainability should be seen by HEIs in Bangladesh and other LDCs as a gradual process of preparation rather than an immediate benchmarking indicator. The proposed model in this study can be used by authority of the HEIs and policymakers in Bangladesh to identify institutional gaps, set investment priorities, and create sustainable paths that take context into account.

6. Conclusion

This conceptual paper improves sustainability studies by shifting sustainability assessment away from performance-based tools toward readiness-based institutional transformation. A theoretically sound basis for future empirical research and policy implication is also provided by the suggested model.

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Evaluating Governance Effectiveness in Higher Educational Institutions Using Stakeholder Surveys

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Abstract
The study was conducted with a pre-set questionnaire focusing on different stakeholders(students, n=105), alumni (n=22), faculty (n=45), non-academic administrative staff (n=54), non-academic laboratory staff(n=20)and employer (n=17) to evaluate the standard of the governance system of CVASU. Under this aspect, a total of a maximum of 10 questions (Q_1, Q_2, Q_3.....Q_{10}) was asked the respondents for evaluating the governance system of the university. The respondents were given their individual opinions freely to each question by ticking on each of the five scores (1-strongly disagree, 2-disgaree, 3-moderarte /neutral /undecided, 4-agree, 5-strongly agree). The results of mean scores about the question (Q_1) of students, alumni and faculty were 4.39, 4.27 and 4.60, respectively. The group mean scores of the questions (Q_1), (Q_2), (Q_3), (Q_4), (Q5), (Q6),(Q7), (Q8), (Q9) and (Q_{10}) were 4.42±0.096, 4.25±0.105,4.03±0.294, 4.0±0.133, 3.81±0.035, 3.98±0.133, 4.19±0.104, 2.98±0.295, 3.37±0.317 and 4.17±0.267, respectively. The overall group mean score of all questions against various aspects of institutional governance is 3.92± 0.14. The data revealed that the responses of the stakeholders against different questions (Q1….Q10) differed significantly (P<0.05). Statistically similar but greater scores were obtained in the questions of Q1, Q2, Q7 and Q10, whereas Q8 being the lowest (2.98±0.295), respectively. The results of the governance system of the institute appear to be very pleasing, as majority respondents are agreed to this point. Though only<3.0 to 5.0% respondents strongly oppose the opinion, and logistic support and necessary measures need to be taken to improve the present administration of the institute.

Keywords: Institutional Administration, Quality Education, Higher Education, Stakeholder.

1. Introduction

Governance is the structure of relationships that bring about organizational coherence, authorize policies, plans and decisions, and account for their probity, responsiveness and cost-effectiveness. Governance and institutional good governance in any higher educational institutes are essential for quality, effectiveness and to enable functioning of any higher education institutions [23, 27]. Institutional teaching, research and overall environment of any university are always affected by a good governance, even though it does not deal with them directly. Good governance is the mirror of any organization, which affects all activities of any institute including all staff, personnel, and stakeholders from top to bottom. Further, good governance is also influenced by many other different specialized administrative works say fund-raising, financial planning or industrial relations and so on.
Effective governance and management of any higher educational institutes hopefully lead to a steady improvement in the facilities, resources, and personnel necessary to carry out smooth academic work/atmosphere. The good governance is a structured body or steering body of any institutes or organization that encompasses governing and managing different external and internal stakeholders (e.g student, faculties, staff, employers) and administration. Governance and management reflect the decision-making rules and processes that link the actors at the various organizational levels.

It is reported that keeping higher educational institutes' (HEI) quality is considered now an alarming or burning issue or challenge in order to meet up the stakeholder, employer's needs, and graduate's quality [13]. Special focus should be given to the academic structural funds disbursing and how they promote the uptake of sustainable development at the institutional level. So, the institutional governance (IG) system should work in a way that ensures better management of the program towards the achievement of mission and objectives of the HEI in a manner that effectively benefits the stakeholders[19, 23]. Institutional governance frameworks are essential for achieving strategic objectives and ensuring accountability to stakeholders[30]. IG includes organizational structures, legislative frameworks, and systemic processes with which new strategies, plan, policies and innovative programs are continually developed, improved, managed and administered. The key indicators or points are considered for the university as well as at the departmental governance include program management,

learning environment, academics facts and figure, academic calendar, brochure/handbook and other documents. The actors involved in ensuring the governance of the university encompasses all administrative spheres from top to program management levels.

It is reported that many previous investigators have been explored the role of good governance in achieving balanced socio-economic condition or development in any higher educational institute [29,12, 3,14, 25]. While sociological understanding of governance efficiency measurement was studied by many other investigators [22, 11, 21]. A substantial number of studies were held to define the best proportion between "qualitative" and "quantitative" paradigms in governance successfulness evaluation. Similarly, the concept of good governance has recently become more relevant or popular in many developing countries [2]. And the study of government model transformation in such countries is reflected in the works of previous researchers [4,8,7, 24].

In view of the above, our current study explored the governance and management of higher education through the lens of the academic profession. The research study involved institutional governance and administration, focusing on a common survey study tool (survey) across various types of stakeholders. Data were retrieved from the academic profession in the knowledge-based society, that addressed the important issues of governance and management of the academic profession. It analyzes the complex inter-relationships and intersections between decision processes and structures at both the system and institutional levels and the experiences and perceptions of the academics, who play a crucial role in fulfilling the mission of higher education. The key concepts that have grounded the analysis of external (system-level) and internal (institution-level) governance, many involving comparative studies, exploring key challenges such as managerialism, gender, shifts in faculty perceptions of influence, and the importance of communication and institutional leadership. It is also undeniable that people have volatile option or opinion and frequently confront numerous challenges or constraints on their living place, sex or gender, ethnicity, knowledge, ideas, views, customs, and individual/ personal experiences. The clues or fact stated in the manuscript is devoted to the consideration of the merits and demerits, problems, limitations or barriers of 10 principles of good governance implementation in the academic environment, in order to estimate the extent to which due human resource of HEI agrees with the principles as mentioned in questionnaire. The key concept of the article is that the academic power relations between the different institutions and stakeholders must be taken into consideration in any governance approach [3]. So, the purpose of the present study is to discover the potential of available data and relevant findings, information, facts& figure or datum for estimating the extent to which local authority agrees with good governance principles or options of HEI, and evaluating the responses or views of different categories of stakeholders as well as implementation policies for maintaining a smooth, safe, sound and peaceful academic or institutional environment.

2. Material and methods

The study was conducted with a pre-formed questionnaire (#A sample copy attached herein below). The questionnaire was developed through a several meeting and workshops with the faculty members of the university followed by the guidance, principles or legislative laws, rules and regulations of IQAC, CVASU, Chattogram. A survey work was conducted with a questionnaire focusing on different sorts of stakeholders (students, n=105), alumni (n=22), faculties (n=45), non-academic administrative staff (n=54), non-academic laboratory staff (n=20) and employer (n=17) to evaluate the standard of governance system of our university. Experimental data were procured from the various classes of stakeholders that were selected randomly. The service providers/employers (n=17) stakeholders were the owners of poultry farm, dairy farm, feed miller companies, food processing plant owner, NGO personnel, government organization, drug manufacturing companies, private entrepreneurship, personnel involved in agricultural business and others.

Sample size and sampling procedure

A total of 243 responses or samples from different stakeholders or service providers were incorporated in this study based on survey work. The regional-based employers, particularly in Chattogram, were selected using a stratified random selection process. Data were collected from the respondent's responses against the scores set from 1 to 5. The number of points namely organizational type (government or non-government, registered or non-registered), persistency of the farms, site or location, distance, good road facilities, availability of graduates (DVM) employed therein, size of the farm/organization, staff number employed etc., were taken into count for selecting employers. Apart from employers, the other stakeholders such as students (n=105), alumni (n=22), faculties (n=45), non-academic administrative staff (n=54), non-academic laboratory staff etc., were considered the CVASU human resource/manpower. Under this standard, a total of 9 to 10 questions differing in features or number a bit, was asked the respondents or stakeholders to evaluate the governance system of the university or PoE. While conducting survey, the stakeholders were discussed the questions as stated in the questionnaire details.

Besides, they were also given enough time as they need to complete the survey form. Before collecting survey data, the respondents are discussed the matter of questionnaire details, and also replied for any query if they raise now and then while conducting survey. They had given their individual opinion freely, and were responded spontaneously and enthusiastically on each question of the governance by putting tick on each of the five scores set from 1 to 5(1-strongly disagree, 2-disgaree, 3-moderarte/neutral/undecided, 4-agree, 5-strongly agree). Ethical approval was not undertaken for this trial, as the study focuses mainly on the inert materials, so it is not so important to undertake ethical approval for this study.

Statistical analyses: All data were subjected to analyze statistically by Minitab statistical software (Minitab version, 16, 2010). One way ANOVA was followed to analyze the collected data by putting data in excel sheet. Descriptive analysis such as mean, frequency, percentage, standard errors and percentage were also done. Duncan multiple range test was used to detect the significance of the means between treatment. The lowest significant level was considered at $P \leq 0.05$.

3. Results

The results of mean scores and responses (%) of different stakeholders say students, alumni, faculty, non-academic staffs (lab and administrative) and employers on the different aspects of governance of university were shown below in Table 1.

Vision, mission and objectives of the entity are clearly stated (Q1)

Based on the survey responses about the (Q_1) vision, mission and objectives of the university, the mean scores of students, alumni and faculties being as 4.39,4.27 and 4.60 (Table 1).The group or combined mean score (4.42±0.096) of this survey indicates that the respondents are well agreed and are very clear about the vision, mission and objectives of the university**.** The responses of the stakeholders against different aspects or questions (Q1….Q10) differed significantly ($P<0.05$). Statistically similar but greater scores obtained in the questions of Q1, Q2, Q7 and Q10 whereas Q8 being the lowest in score (2.98±0.295), respectively.

Vision, mission and objectives of the entity serves the purposes of the society at large (Q2)

Based on the survey responses about the aspect (Q2), the mean scores of students, alumni, administrative staff, lab staff and employers being as 4.22,4.27, 4.24,4.6 and 3.94, respectively (Table 1).The group or combined mean score (4.25±0.105) of this survey indicates that the respondents are well agreed and very clear about the vision, mission and objectives of the university serve well the society and others.

The entity has adequate infrastructures to satisfy its mission and objectives (Q3)

Based on the survey responses about the (Q3), the mean scores of students and staffs were found as 3.62, 3.87 and 4.6 (Table 1). The group mean score (4.03±0.294) of this survey indicates that the respondents are fairly agreed or neutral about this question (Q3) that, the PoE has adequate infrastructures which could satisfy its mission and objectives of the university easily.

The PoE has well-communicated strategic plan (Q4).

Based on the survey responses about the question (Q4), the mean scores were found as 3.69, 3.84, 4.22, 3.83 and 4.4 for the students, alumni, academics, non-academic admin and lab staff, respectively (Table 1). The group mean score (4.0±0.133) of this survey indicates that the respondents are fairly agreed that the PoE has well-communicated strategic plan and program, which is fair enough to run the university governance very well.

Strategic plan of PoE is effectively implemented to achieve its vision, mission and objectives(Q5)

Based on the survey responses about the question (Q5), the mean scores of students and alumni being as 3.84 and 3.87, respectively (Table 1). The group mean score (3.81±0.035) of this survey indicates that the respondents are fair agreed that the strategic plan of PoE is effectively implemented to achieve its vision, mission and objectives.

The HEI has an administrative setup with policy to receive complains and solve the issues on sexual harassment (Q6)

Based on the survey responses about the question (Q6), the mean scores were found as 4.0, 4.18, 3.60 and 4.15 for the students, academics, non-academic admin and lab staff, respectively (Table 1). The group mean score (3.98±0.133) of this survey indicates that the respondents are fairly agreed that the PoE has an administrative setup with policy to receive complains and solve the issues on sexual harassment to run the university governance very well.

TABLE 1 MEAN SCORES ON THE DIFFERENT ASPECTS OF GOVERNANCE RECEIVED FROM THE RESPONSES OF DIFFERENT STAKEHOLDERS

Aspects of Evaluation	Student (n=105)	Alumni (n=22)	Academics (n=45)	Non-academic Staffs		Employer (n=17)	Group Mean (±SEM)	Overall Group Mean (±SEM) and P-value
				Admin. (n=54)	Lab (n=20)			
Q1. Vision, mission and objectives of the entity are clearly stated.	4.39	4.27	4.60	-	-	-	4.42[a]±0.096	
Q2. Vision, mission and objectives of the PoE serve the purposes of the society at large.	4.22	4.27	-	4.24	4.6	3.94	4.25[a]±0.105	
Q3. The entity has adequate infrastructures to satisfy its mission and objectives.	3.62	-	-	3.87	4.6	-	4.03[b]±0.294	
Q4. The PoE has well-communicated strategic plan.	3.69	3.84	4.22	3.83	4.4	-	4.0[b]±0.133	
Q5. Strategic plan of PoE is effectively implemented to achieve its vision, mission and objectives.	3.84	3.77	-	-	-	-	3.81[b]±0.035	
Q6. The HEI has an administrative setup with policy to receive complains and solve the issues on sexual harassment.	4.00	-	4.18	3.60	4.15	-	3.98[b]±0.133	
Q7. Academic calendars containing schedule of all academic activities under the academic program are maintained strictly by the entity.	4.13	4.1	4.1	4.02	4.6	-	4.19[a]±0.104	3.92 ± 0.14 P=0.021
Q8.The class size is appropriate for effective learning environment.	2.68	-	3.27	-		-	2.98[c]±0.295	
Q9.The faculty has IT based student database/portfolio.	2.60	3.50	2.71	3.80	4.25		3.37[c]±0.317	
Q10. Results published duly in compliance with the ordinance	-	3.68	-	4.22	4.6	-	4.17[a]±0.267	

[N=number of employers; SEM-standard error means, Means (±SEM) bearing different superscripts within a column differ significantly at*$P<0.05$]

Academic calendars containing schedule of all academic activities under the academic program are maintained strictly by the entity (Q7)

Based on the survey responses about the question (Q7), the mean scores were found as 4.13, 4.1, 4.10, 4.02, 4.6 for the students, alumni, academics, non-academic admin and lab staff, respectively (Table 1). The group mean score (4.19±0.104) of this survey indicates that the respondents are agreed that the PoE has aacademic calendars containing schedule of all academic activities under the academic program are maintained strictly by the entity, which is very good enough and effective to run the university governance very well.

The class size is appropriate for effective learning environment (Q8)

Based on the survey responses about the question (Q8, the mean scores were found as 2.68 and 3.27 for the students, and academics staff, respectively (Table 1). The group mean score (2.98±0.295) of this survey indicates that the respondents are poorly agreed that the class size is appropriate for effective learning environment to run the university governance very well.

The faculty has IT based student database/portfolio (Q9)

Based on the survey responses about the question (Q9), the mean scores were found as 2.60, 3.50, 2.71,3.80 and 4.25 for the students, alumni, academics, non-academic administrative staff and laboratory staff, respectively (Table 1). The group mean score (3.37±0.317) of this survey indicates that the respondents are fairly agreed that thefaculty has IT based student database/portfolio for all academic activities under the faculty program are maintained strictly by the entity, which is necessary and effective to run the university governance very well.

Results published duly in compliance with the ordinance (Q10)

The survey data included alumni and non-academic staff only. Based on the survey responses about the question (Q10), the mean scores were found as 3.68, 4.22 and 4.6 for the alumni, non-academic administrative staff and lab staff, respectively (Table 1). The group mean score (4.17±0.267) of this survey indicates that the respondents are agreed enough that the results published duly in compliance with the ordinance, which is necessary to run the university governance very well.

4. Discussion

Good governance is a sine qua non for every higher educational institute or organization in order to set up a close connection among the dimensions of governance: (1) voice and accountability; (2) political instability and violence; (3) government effectiveness; (4) regulatory quality; (5) rule of law, and (6) control of corruption [14]. This article focuses governance literature on nonprofit organizations and highlights the importance of governance effectiveness from the perspective of multiple stakeholders. It argues that good governance depends on aligning diverse stakeholder expectations and building accountability mechanisms [6].

Mission, vision, objectives or goal, academic infrastructures and strategic plan

The results showed significantly higher average score (4.10) observed in these aspects of questions (Q1, Q2, Q3, Q4 and Q5). It implies that our university governance system on these aspects of the questions appear to be very pleasing or acceptable as majority respondents are agreed to the questions as per the likert scale (4). In this regard, we can say that our current mission, vision, objectives, goals of the university are clearly stated and well–defined to serve the stakeholders largely. It is reported that effective university governance depends on balancing academic autonomy with managerial accountability to meet institutional goal [23]. Apart from these, still we have some weakness or shortfalls which need to address the good governance strategies in non-profit higher-education settings and proposes principles of governance structure to improve accountability, transparency, and mission alignment [16]. Effective governance and administrative digitization enhance institutional accountability and service delivery [30].

Rules on academic activities and administrative body to receive plaints/complain and solve sexual harassment issues of the university

It is evident from the results obtained in the questions (Q6, Q7) that our university governance system on these aspects appears to have a very good policy and well-organized administrative set up to receive complains and solve the issues on sexual harassment very well. The responses between the questions differed significantly showing average score 4.0. It indicates that the stakeholders are well agreed to this concept or aspects according to likert scale stated in this study. University must establish clear rules governing academic activities and create formal administrative bodies to receive and resolve complaints, including sexual harassment cases. Transparent academic regulations promote fairness, accountability, and student protection in teaching, assessment, and supervision processes[20] . The concept emphasizes that universities must consider the interests of diverse group of people, including students, faculty, administrators, and external partners to maintain the academic rules, issues of sexual scandals and other activities strictly [10]. Institutions should adopt written codes of conduct that define acceptable behavior, outline disciplinary procedures, and ensure due process. Comparative studies of European higher education systems show that governance reforms promoting transparency and shared responsibility improve institutional performance and stakeholder trust [8].

Class room, IT facilities and result publication strategies of the university

The results found in the questions (Q8, Q9, Q10) are significantly influenced by stakeholder's responses. It indicates that result publication of the entity scored the highest (4.17±0.267), IT based student database score (3.37±0.317) fair enough or moderate, and class size score (2.98±0.295) is not agreeable according to likert scale. It is evident from the result that class room size facilities got the lowest score amongst other facilities found in this study. The reason could be larger group of students (100) are accommodated in a small size class room, which is difficult to run academic activities say-taking class, exam and other works smoothly. If we could split the number of students into two small groups allocating /dividing in two separate rooms, that could be a good solution to overcome this problem easily. Another weakness is, students do not have internet database or website, even though internet supply or coverage is available to each student continuously across the campus. We think it is easy to improve this facility as we have IT section, which should take initiatives to strengthen these facilities of the university for making respective student website or database. Further, results publishing system is still okay according to stakeholder's opinion. Nevertheless, another steps or initiatives say automated system of result publication could be launched to make the process more convenient for each or every student of the university. This study shows how internal and external governance structures affect transparency and accountability through risk information disclosure in non-profit organizations, linking good governance with stakeholder communication [1].

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to overcome this problem easily. Another weakness is, students do not have internet database or website, even though internet supply or coverage is available to each student continuously across the campus. We think it is easy to improve this facility as we have IT section, which should take initiatives to strengthen these facilities of the university for making respective student website or database. Further, results publishing system is still okay according to stakeholder's opinion. Nevertheless, another steps or initiatives say automated system of result publication could be launched to make the process more convenient for each or every student of the university. University should implement automated result management systems, establish clear academic calendars, and monitor administrative performance. Timely and transparent result publication also supports academic planning and student trust. Reliable and high-speed internet access is equally critical for graduate students, who depend on digital libraries, research databases, and online collaboration platforms. According to United Nations Educational, Scientific and Cultural Organization [28], equitable digital infrastructure strengthens research capacity and academic continuity. Institutions can improve by expanding campus-wide Wi-Fi coverage, upgrading bandwidth, and providing remote access to academic resources.

The current findings indicate that governance effectiveness is strongly associated with clear communication, stakeholder involvement in decision-making, and trust in institutional leadership. Faculty members often emphasize academic autonomy and participatory governance, while students prioritize transparency and service delivery. Administrative staffs focus more on policy clarity and operational efficiency. The concept highlights that disparities in perception might affect institutional cohesion and performance. It concludes that inclusive governance frameworks, improved communication strategies, and formal feedback mechanisms are essential for strengthening stakeholder confidence and enhancing overall institutional quality and sustainability in higher education settings. Together, the study suggests that effective governance frameworks must integrate stakeholder participation, transparency, and leadership collaboration to strengthen institutional effectiveness. Inclusive and participatory decision-making systems are very much important for research focusing on stakeholder perceptions of university governance. Similarly, reports from the [19] emphasize that participatory governance structures enhance communication and accountability in universities. Distributed leadership models further support collaborative governance by encouraging shared roles and engagement across institutional levels [5].

5. Conclusions

From an overview of the results obtained in this study revealed that, the responses of the stakeholders to the different aspects addressed in questions Q1–Q10 showed significant variation, indicating that stakeholders perceived and evaluated the assessed dimensions differently. This significant difference suggests that the questions captured distinct constructs or levels of importance, rather than eliciting uniform responses across all aspects. Despite the overall significant variation, questions Q1, Q2, Q7, and Q10 recorded statistically similar but comparatively higher mean scores. This pattern implies a consensus among stakeholders regarding these aspects, reflecting stronger agreement, satisfaction, or perceived relevance. The similarity in scores among these questions might indicate that they address closely related themes or core issues that are well recognized and positively perceived by the respondents. Higher scores also suggest that these aspects align more closely with stakeholder expectations or priorities. It can be inferred from the overall results of all questions against various aspects of CVASU governance system appears to be very pleasing or acceptable, as majority of respondents agrees to this point. Though class size sounds not much convenient, but it can be improved by adopting a new policy. However, only <3.0 to 5.0% respondents strongly oppose against the various aspects, which is of little significance, and necessary measures and stern steps need to be taken to improve the present administration for taking our governance system better in future. Further study could be adopted to verify or elucidate our current findings and necessary improvement of the university governance to an extent.

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Field Investigation on Perception of Pupils on Economic and Non-Economic Factors Affecting Admission & Non-Completion of Studies at BUBT – In Line with the Four Domains of BAC

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Abstract
This mixed-methods study investigates the economic and non-economic factors influencing student admission and non-completion at Bangladesh University of Business and Technology (BUBT). A sequential explanatory design was used, surveying 2,389 students, followed by 40 in-depth case studies analyzed with NVivo. Principal Axis Factoring (KMO=0.873) on 16 satisfaction variables identified four latent factors explaining 64.2% of the variance in migration intent. Logistic regression revealed that a better CGPA (OR=0.71), convenient location (OR=0.71), higher family income (>40,000 BDT, OR=0.74-0.77), and satisfaction with classroom ambience (OR=0.80) and co-curricular activities (OR=0.76) significantly reduced dropout likelihood. Conversely, financial difficulty, English language barriers, and rural-urban cultural shock were the most potent predictors of migration intent, with a synergistic effect showing a 58-65% intent rate for students facing all three challenges. Most of the pupil responders viewed economic issues as more significant than non-economic factors. The study found high demand for PhD programs led by senior faculty mentors, improved infrastructure (canteen, lodging, transport), and enhanced career support. The proctorial system was a unique area of high satisfaction (92.5% positive sentiment). The paper depicts with targeted, activity-based recommendations for institutional improvement. BAC's four domains drive holistic development. Authors' recommendations to strengthen AI-integrated curricula, enhance counseling services, link co-curricular activities to employability, and promote lifelong learning through financial resilience program. Integrate PhD promotion policy and flexible retirement (USA/Australia model) to strengthen faculty performance across all four domains are recommended by the authors.

***Keywords**:* Student Dropout, Financial Constraint, English Language Barrier, Rural-Urban Cultural Shock, Mixed-Methods, BUBT, Bangladesh, Factor Analysis

1. Introduction

The paradigm shift from traditional education to Outcome Based Education (OBE) has changed the curriculum design, teaching and assessment [1-3]. Alignment of assessments with Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs) is an important aspect of OBE [4-7]. The fast proliferation of private universities in Bangladesh has made assessing student demand for admission and non-completion a priority. Despite this development, many students have difficulties in choosing a university and completing their studies due to economic (family income, tuition costs) and non-economic (academic assistance, social integration) barriers [8, 9]. This study fills a large research vacuum by exploring these characteristics simultaneously in Bangladesh University of Business and Technology (BUBT), a leading private university.

Research Question: To what extent do economic variables and institutional integration (mapped across the four BAC learning domains) influence student admission decisions, migration intent and non-completion at Bangladesh University of Business and Technology (BUBT)?

The Bangladesh Accreditation Council (BAC, 2020) has developed Bangladesh National Qualifications Framework (BNQF) for Higher Education based on the Outcome-Based Education (OBE) ideas. The framework recognizes four core elements of learning: knowledge, skills, values and application, to ensure that graduates obtain measurable capabilities (Biggs & Tang, 2011; Spady, 1994; Harden, 2002).

Much has been written about student attrition and non-completion in higher education. Tinto (1975, 1993) discovered that both academic and social integration are major indicators of persistence in his seminal work on models of student integration and departure. An early empirical model of dropout behavior was provided by Spady (1971) who emphasized the combination of individual and institutional effects.
Investment in higher education from the standpoint of human capital results in enormous economic benefits (Becker, 1993). However, Palmisano et al. (2022) reveal the persistence of discrepancy of opportunity in tertiary

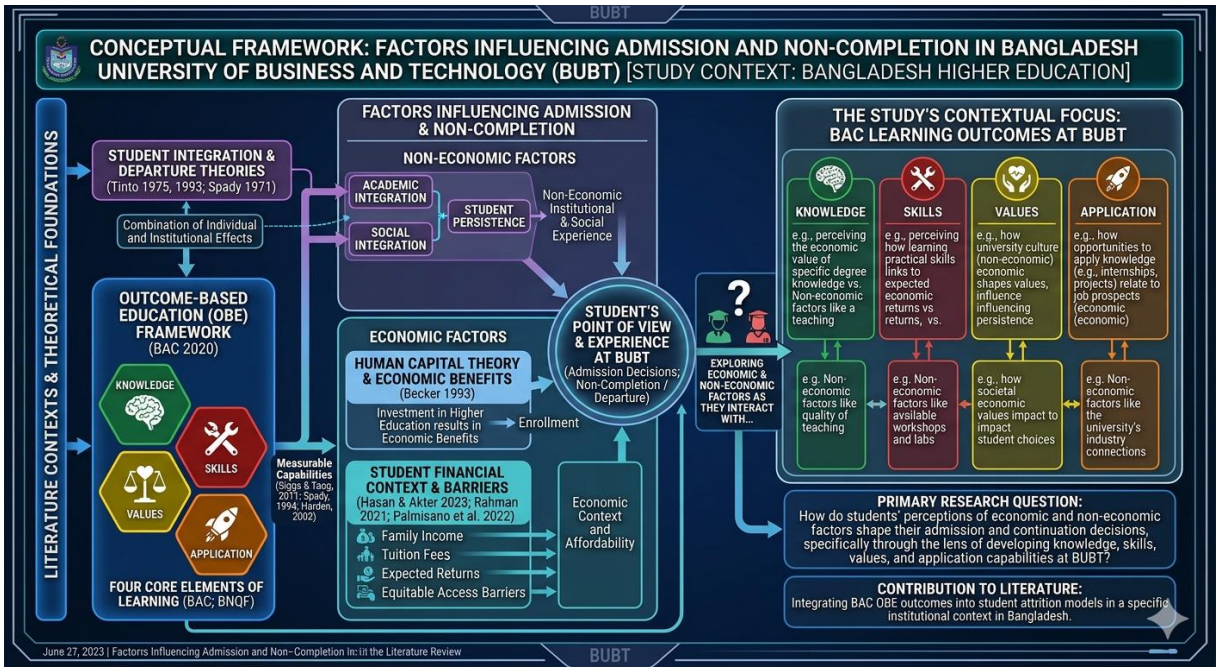
education across countries. Hasan and Akter (2023) found that economic factors such as family income, tuition fees and expected returns were relevant in enrollment and continuation in Bangladesh. Also, Rahman (2021) emphasizes the significance of higher education in the national economic development, but mentions the barriers that prevent equitable access.

This study adds to the existing literature by studying students' point of view on economic and non-economic factors influencing admission and non-completion in BUBT in the context of the four areas of BAC's learning outcomes.

There is a rich literature on student attrition and results in higher education, but important gaps still exist. There is a lot of literature on Outcome-Based Education (Spady, 1994; Harden, 2002; Biggs & Tang, 2011) and the Bangladesh National Qualifications Framework (BAC, 2020) and on theoretical models of student departure (Spady, 1971; Tinto, 1975, 1993). But most of the studies are either theoretical or on public colleges and Western cultures.

Existing studies in Bangladesh mainly explore the economic determinants of enrollment (Hasan & Akter, 2023) or macroeconomic contribution of higher education (Rahman, 2021) but little attention has been paid to non-economic factors such as institutional support, academic integration and social belonging. Importantly, no empirical study has been precisely studied students' perceptions of economic and non-economic factors affecting admission and non-completion at private universities such as BUBT, particularly in the context of the four learning outcome domains of the BNQF (BAC, 2020).

This study addresses this gap by examining students' lived experiences at BUBT through a field-based study, and hence, provides nuanced insights into the interactions of these elements with BAC's outcome-based paradigm.



(Source: Authors)

2. Methodology

2.1 Research approach

The research follows a sequential explanatory mixed-methods approach that includes a quantitative survey and qualitative case studies.

2.2 Background of the Bangladesh National Qualifications Framework (BNQF)

The study is based on the mandate of the Bangladesh Accreditation Council (BAC) for higher education that mandates the academic programs to be aligned with the Bangladesh National Qualifications Framework (BNQF). The BNQF sets out four different domains of learning outcomes which all graduates should be able to demonstrate.

These dimensions provided the theoretical perspective through which to assess BUBT's institutional activities and student perceptions:

- Fundamental Domain: Technical application of skills and discipline-specific knowledge. This was operationalized through variables such as CGPA, classroom ambiance and faculty performance.
- Social Domain: Teamwork and community participation abilities include interpersonal skills and communication skills. This was measured via co-curricular satisfaction, instructor behavior, and the proctorial system.
- Thinking Domain: Analytical skills include decision-making, critical thinking, problem-solving and entrepreneurship. The student desire for novel programs, AI integrated curricula, and career development services was the measure of this.
- Personal Domain: Traits such as ethics, flexibility, leadership, lifelong learning and self-management. This was done by looking at the student migration intent, the financial stability of the student and the requirement for psychiatric counselling.

The study findings are evaluated within these four BNQF domains to generate practical suggestions for curricular and policy improvement.

2.3 Sample

A stratified convenience sample approach was used to survey a total of 2,389 students (2,260 undergraduates, 129 postgraduates) in four faculties (Engineering, Business and Economics, Social science and Arts, Law). The sample size was more than the minimum required (n=1,334) computed using Cochran's calculation. Forty in-depth case studies were then undertaken with current and previous students.

2.4 Instrumentation

A structured questionnaire comprising 42 items was used to measure demographic, economic factors (income, parental occupation), non-economic factors (learning atmosphere, faculty performance, co-curricular activities) and institutional facility satisfaction (e.g., canteen, medical, psychological, proctorial systems).

2.5 Data Analysis

Quantitative data were analyzed using R (v4.4.2). Descriptive statistics, chi-square tests, binary logistic regression, and Principal Axis Factoring (PAF) with promax rotation were conducted. The qualitative data from the case studies were thematically analysed and coded using NVivo 14.

3. Results of Estimation

3.1 Demographic Profile of the Sample

The sample was 58.0% male and 42.0% female and 70.0% were 18-22 years of age. Family income distribution was wide, with 14.3% earning ≤20,000 BDT and 20.0% earning >50,000 BDT monthly. Overall, 34.9 per cent of students said they intended to migrate or drop out.

3.2 Factor Analysis of Institutional Drivers

Principal axis factoring (PAF) was performed on 16 satisfaction variables, and the data were found to be suitable (KMO = 0.873, Bartlett's test $p < 0.001$). Four factors with eigenvalues >1.0 were kept, accounting for 64.2% of the total variance.

TABLE 1 FACTOR LOADINGS (PROMAX ROTATION)

Variable	Factor 1: Academic & Mentor Climate	Factor 2: Infrastructure & Welfare Deficit	Factor 3: Psycho-Social & Safety Environment	Factor 4: Fairness & Career Support
Faculty Performance	0.78	0.12	0.08	0.14
Teacher Behavior & Attention	0.74	0.09	0.21	0.11
Co-curricular Satisfaction	0.68	0.04	0.18	0.09

Variable	Factor 1: Academic & Mentor Climate	Factor 2: Infrastructure & Welfare Deficit	Factor 3: Psycho-Social & Safety Environment	Factor 4: Fairness & Career Support
Canteen Facility	0.11	0.79	0.09	0.05
Psychological/Counselling Facility	0.16	0.11	0.82	0.07
Proctorial System	0.08	0.07	0.71	0.14
Exam Fairness & Evaluation	0.21	0.06	0.13	0.75
Career Development & Guidance	0.18	0.09	0.16	0.72

(Source: Authors)

3.3 Logistic Regression Analysis

A binary logistic regression model predicting migration intent was statistically significant ($\chi^2(15)=114.27$, $p<0.001$, Nagelkerke $R^2=0.124$).

TABLE 2 LOGISTIC REGRESSION RESULTS

Variable	Coefficient (β)	Std. Error	p-value	Odds Ratio (OR)	95% CI for OR
(Intercept)	0.8507	0.2449	0.001	2.341	[1.452, 3.778]
Economic Factors					
Income (40k-50k BDT)	-0.2987	0.1334	0.025	0.742	[0.571, 0.964]
Income (>50k BDT)	-0.2678	0.1199	0.026	0.765	[0.605, 0.967]
Scholarship (75% waiver)	-0.452	0.095	<0.001	0.636	[0.528, 0.766]
Academic Factor					
CGPA	-0.3417	0.1058	0.001	0.7105	[0.578, 0.874]
Non-Economic Factors					
Classroom Ambience	-0.2169	0.0458	<0.001	0.8049	[0.736, 0.880]
Co-Curricular Satisfaction	-0.2714	0.0502	<0.001	0.7623	[0.691, 0.841]
Location Convenient	-0.3421	0.1287	0.008	0.710	[0.552, 0.914]
Library Factors					
E-Library Access	-0.3301	0.0821	<0.001	0.7188	[0.612, 0.845]

(Source: Authors)

3.4 Integrated Case Study Findings (NVivo)

The 40 case studies revealed key themes:

- Most asked for feature: Mentoring of senior faculties at the outset of PhD program (80% cases)
- Most satisfaction: Proctorial system (pleasant emotion 92.5 per cent).
- Facilities: Canteen (70% negative), housing (60% negative) and transport (65% negative).• English and Math deficit (87.5% of the instances) as a National Problem.

3.5 Reasons for Dropping Out (Top Three Reasons)
1. Financial Constraint (Rank #1): Students from families earning <=20k BDT had 34.2% migration intention, compared to 20.0% for >50k BDT. Intent down 9.6 percentage points with 75% tuition waiver.

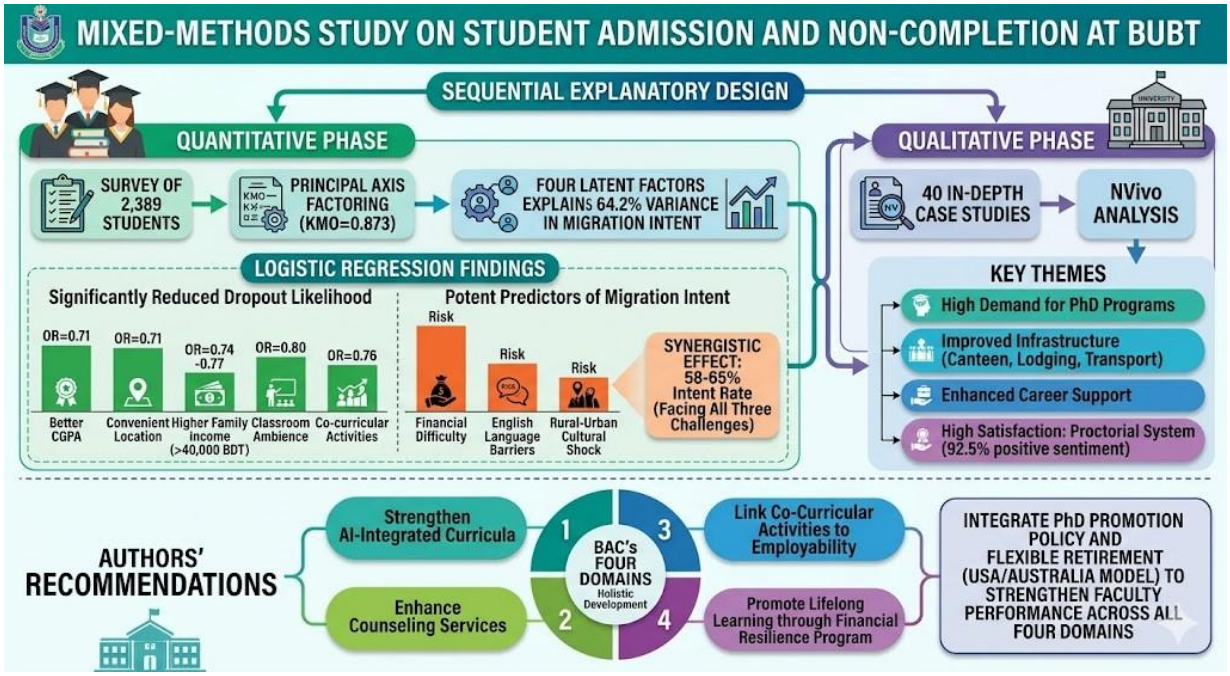
2. English Language Barrier (Rank #2) 87.5% of the case studies cited English language barrier as a hindrance to academic progress and confidence.

3. Rural-Urban Cultural Shock (Rank #3) Students from rural areas reported more estrangement and higher migration desire (38.9% vs. 28.4% for students from urban areas)

The synergistic migration intent rate of students with all three criteria was 38-45%, which was substantially higher than the sample average of 34.9%.

4. The intent rate is 12% to 15%. Living in private rooms regardless of sex pushes some students to insecurity and even drug usage.

The study finds that student growth happens in four domains related to BAC. Association of fundamental domain (CGPA, faculty performance) with strategic planning implementation (OR = 6.17 for BAC compliance). Proctorial system, teacher behavior) (Social dimension) Stakeholder participation (V=0.48) Investment in research Thinking Domain (AI curriculum, career services) (V=0.38) Personal domain (counseling, financial resilience) enhances sustainability (V=0.36)



(Source: Authors)

4. Conclusion

This study reveals that the student non-completion at BUBT is caused by a complex interplay of economic restrictions, academic elements (CGPA) and non-economic institutional experiences (ambience, co-curricular, amenities). The results support important components from Tinto's [5] and Spady's [6] integration models and point to the occurrence of circumstance-driven inequality, according to Palmisano et al. [7]. The low explanatory

power of the model (R2=0.124) indicates the importance of further research on factors such as parental education and normative congruence.

The study provides a strategic plan for BUBT in line with the domains of the BNQF:
(1) aggressively recruit senior PhD faculty to bolster the Fundamental Domain (knowledge application);
(2) invest in need-based financial aid and bridge courses to support the Personal Domain (lifelong learning);
(3) improve canteen, lodging, and transport to improve the Social Domain (community engagement); and
(4) establish a formal career development center to target the Thinking Domain (entrepreneurship & problem solving).
By addressing these issues, BUBT can lower dropout rates, improve student well-being, and fulfill its objective of providing equitable, excellent education.

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A Conceptual Paper on Implementing Notional Learning Hours Framework (NLHF) in Bangladeshi HEIs: A Transformative Culture in Higher Education

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Abstract
Notional Learning Hours (NLHs) have been shown to be an effective predictor of success in terms of Outcome-Based Education (OBE) since they give a measure of a threshold of effort needed to complete the desired learning outcomes (LOs) and not hours calculated in the classroom. The purpose of the paper is to explore the notion of NLHs in the Higher Education Institutions (HEIs) in Bangladesh. It suggests that the present concept of NLHs is viewed as merely a requirement by HEIs that the credits be distributed. As a refinement of workload, independent study, and assessment time, the paper highlights the significant role that NLHs play as a mediator between contact hours and intended learning outcomes (ILOs). As a rule, the notion of endless hours is not elastic, since it is inflexible and does not fit various modes of learning and speeds of learning. In the paper, the improved concept of Dynamic Notional Learning Hours (DNLHs) is suggested to assist learners by using a standardized NLH Time Allocation Record Template (NTART) as illustrated in the Appendix comprising sections A and B in a sheet format, which helps students to be transparent about their learning since they will know about the expected workload and the time spent on different learning activities as well to gain the learner autonomy and self-regulation. To summarize, this paper describes how an optimal match between pedagogical design and highly-skilled tasks will improve an intended student learning outcomes and harmonize student workloads.

***Keywords**: Dynamic Notional Learning Hours (DNLHs), OBE, Student Workload, Academic Credits, Learner Autonomy, Curriculum Design*

1. Introduction
Education is going global into learner-centredness with the emphasis being on student-centred learning via participation of student in his/her learning. The Outcome-Based Education (OBE) as a replacement of teacher-led teaching (didactic) is an effort to create a learning context that focuses on active learning by the student and lifelong learning. This is a welcoming shift in Bangladesh met by the means of didactic teaching-based lessons and the necessity of skill sets required of graduates to work in a dynamic working environment in a global market. Notional learning hours (NLH) makes an excellent predictor of success in Outcome-Based Education (OBE) since they are a learner-centered instrument that compares the time needed to attain the desired learning outcomes (ILOS) rather than time spent in the classroom. This paper proposes that the Higher Education Institutions (HEIs) of Bangladesh require a shift in attitude towards learner-centricity, which is one of the predictors of success of Outcome-Based Education (OBE) on higher education.

2. Problem Statement
Though the number of hours of learning is used to calculate the workload of the students, inconsistency in the application of the system in the universities create gaps between the learning outcomes expected and the workload of the course of the students. Failure to utilize this very well leads to ineffective credit awarding, overworking of students and exposure of students to stress and fatigue.

3. Conceptual Framework for Notional Learning Hours (NLH):
The NLH can be divided into two: *Contact Hours* and *Self-Directed Learning Hours* (**see Figure 1 below**). The two elements **[8]** are fundamental in attracting students towards achieving the learning outcomes of a course. The self-directed learning involves the activities that students do on their own, not under scrutiny and have no relation to school time. It includes study, assessment, and other activities that lead to the well-rounded learning experience and their ability to interact with the learning content fully at their own pace.

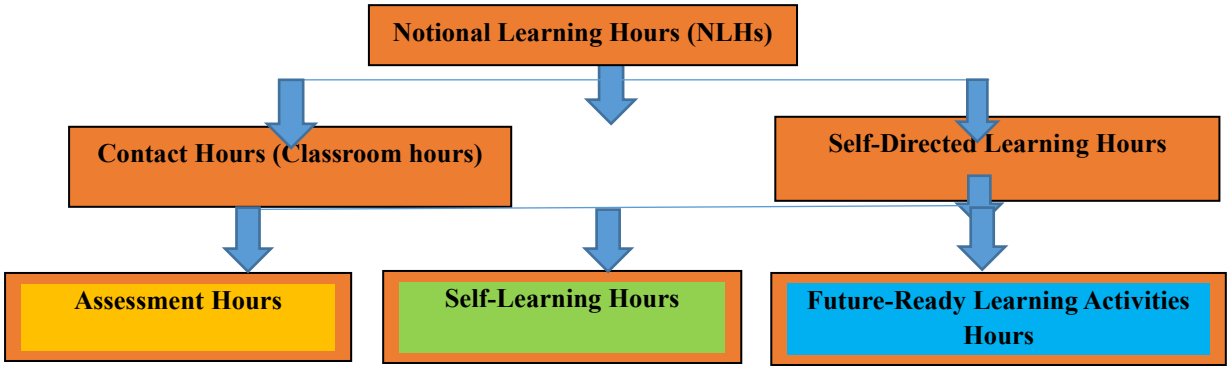


Fig.1 Components of National Learning Hours

This framework will give the overview of NLHs, their intent, parts, and the elaborate examples of related activities. It will also point out the intention of NLH based on student workload with definite definitions and practical examples using an *NLH Time Allocation Record Template (NTART)* **[Appendix]** to promote transparency in workload expectations. This NLH model, including its elaborate division of contact time, self-study time, assessment time and future-ready learning actions, conforms to the criteria of BAC accreditation.

3.1 Notional Learning Hours (NLHs) Activities:

The Notional Learning Hours refer to the total amount of time hours that a learner is expected to take in achieving learning outcomes of a module. They comprise a wide range of activities that enable the knowledge acquisition, skills acquisition and application. **Table 1** shows a list of different **learning activities** (**LA**) and their **descriptions** (**D**):

1. LA: Pre-Lecture Preparation	
D: Reading of assigned items and taking of notes and reviewing previous lectures to create a base preparation before attending class.	
2. LA: Proactive Classroom involvement	
2a. Lectures	**D:** Offering lectures by teachers on introduction and explanation of basic subjects.
2b. Seminars and Tutorials	**D:** Group discussion and small group activities to strengthen the understanding and foster critical thinking.
3. LA: Hands-on and Real-World Learning.	
3a. On-site and Lab Work	**D:** This is the practice of having a practical activity to put the theoretical learning into a controlled or real-life situation.
3b. Workshops	**D:** Special training involving practical skills and techniques that can be used in the field of study.
4. LA: Online Learning Engagement	
D: Taking online courses, using digital materials and participating in virtual classrooms, using online tools to supplement classroom learning.	
5. LA: Question-Based Learning and Research	
5a. Independent Research	**D:** Doing an individual research to delve into topics.
5b. Group Research	**D:** Taking part in research projects that disseminate group work and thinking.
6. LA: Preparation and Completion of Assessment	
6a. Preparation for Assessments	**D:** Reading through the books, solving problems and learning how to take any type of test.
6b. Formative Assessments	**D:** Attendance of quizzes, drafts and practice tests that provide feedback on improving.
6c. Summative Assessments	**D:** By completing major assessments, such as exams, activities, dissertations and presentations, that identify overall achievement of learning outcomes.
7. LA: Project Work and Assignments	
7a. Individual Assignments	**D:** Writing essays, reports, dissertations and sets of problems to demonstrate knowledge and apply it.
7b. Group Projects	**D:** Working with peers on tasks that involve group work and using the skills acquired.
8. LA: Problem-Solving and Applied Project Work	
D: Using critical thinking and/or applied project work using case studies and practical experiences and problem-solving abilities.	
9. LA: Meetings with Tutors	

D: Having a face-to-face meeting with tutor, online or email to seek guidance, clarifications and feedback on academic progress.	
10. LA: Practical work integrated learning and placements	
10a. Practicums and Internships	**D:** Using practical knowledge in a theoretical environment, such as during professional placements, to obtain practical knowledge.
10b. Placements at the academic institutions	**D:** Practical learning experiences that can help in bridging the gap between learning and teaching.

3.2 Contact Hours:

Contact time refers to the learning type whereby students have direct contact with the course instructors either face-to-face or via the internet or in a blended mode. The objective of these lessons is the transfer of knowledge, demonstration of techniques or going through complex problems with the students. All the varieties of contact hours are summarized in **Table 2** showing the intent of the hour and the nature of interaction that is formed.

TABLE 2 WORKLOAD FOR CONTACT HOURS

Workload for Contact Hours	Descriptions
In-Person and Virtual Instruction	Virtual environments (e.g., online forums, video conferencing) and physical classroom environments of face-to-face interaction with the instructors.
Lectures	Group work, where a tutor provides background information and.influential concepts to a broad audience.
Small Group Sessions	Tutorials, seminars, workshops where interactive discussions and learning can be done.
Practical Sessions And Demonstrations	These are practical exercises such as laboratory work and studio work and field trips by which tutors demonstrate and guide practice in order to obtain practical abilities.
Tutorials	Lessons, either individual lessons or group lessons, where students receive feedback on work completed, and they understand how to improve their progress. Flexibility is made possible via this direct service, either by office hours or by email/virtual engagement with tutors.

3.3 Self-Directed Learning Hours

The hours that learners use in taking the initiative to identify their learning needs, set goals, identify the resources and evaluate their progress, rather than relying on formal education are the self-directed learning (SDL) hours. It is a process whereby the teacher and the learner interchange roles. In accordance with the framework of notional learning hours, self-directed Learning Hours are divided into *self-learning hours*, *assessment hours*, and *future-ready learning activities hours*.

3.3.1 Self-Learning Hours

Self-learning hours entail self-directed learning activities where students undertake self-directed learning to enlarge their learning in the content covered during the contact hours. These activities are also geared towards self-directed studies, which are the characteristic of higher education fostering among students responsibility towards their academic progress. Self-study may include doing homework before scheduled sessions, follow-up, additional reading and practice, and hands-on activities to reinforce learning. Self-study is lifelong process and assists students in developing a solid platform of comprehending course content. **Table 3** provides an overview of self-study, with emphasis on the importance of self-study in higher education. It can be completed through self-study, performing an individual work and a group work, peer discussions etc.; students can reaffirm course material by sharing a learning experience, all without the regular contact hours.

TABLE 3 WORKLOAD FOR SELF-LEARNING HOURS

Self-Learning Workload	Descriptions
Problem-Solving and Practice	Training on exercises, case studies or practice problems to apply concepts learned in the classroom, either in a group or one-on-one.
Research and Reading	Browsing supplementary materials and doing independent/group study to have more in-depth understanding of course topics
Review of Lecture Notes	Re-reading and summarizing lecture notes to review and solidify essential content, individually or in small groups.
Software Tool Practice	Practice with the pertinent software or tools to enhance technical skills and trust to their application.
Session Preparation and Follow-Up	Preparing ahead of the following classes or revising the prior classes with the peers or individually to cement knowledge and retention.
Wider Reading and Exploration	Further readings, online and informal study groups to broaden knowledge on related topics.
Group Work and Peer Discussions	Classroom discussion or group study to share opinions, describe concepts and develop knowledge

Practical Hands-On	Real world activities and experiments to reinforce theoretical learning where students may apply ideas in a concrete and interactive manner.

3.3.2 Assessment Hours

The assessment hours are specially allocated to activities related to preparation, and involvement in formal assessment. The aim of these activities is to assist students to integrate knowledge and show their comprehension of course material by taking exams, completing assignments, projects and other assessive activities. The assessment hours activities are concerned with things that directly assist a student in getting ready to formal assessment as shown in Table 4. They are fundamental in determining academic progress and in making sure that students are sufficiently ready to showcase their learning in graded work. Assessment preparation hours are specifically the amount of time you spend in preparation of a graded task, e.g., assignments, presentations or exams. This will include doing research, writing, revising, rehearsing, and reading of a particular material in order to pass tests.

TABLE 4 WORKLOAD FOR ASSESSMENT ACTIVITIES

Assessment Workload	Descriptions
Exam Preparation	Intensive study and review of essential concepts and topics and practicing problems in exams.
Project Work and Assignment Completion	Time spent in writing, revising, and completing projects, essays, and other significant tasks to be assessed.
Practice Tests and Mock Exams	Practicing or taking practice tests and pinpoint some areas that require additional review.
Group Study for Assessments	Special study sessions organized together to study materials to be remembered in other exams or tests.
Presentation Preparation	Preparing rehearsal and polishing of part presentation of the evaluation criteria.
Feedback Review and Improvements	Going over the comments of the instructors on the previous assessments and doing what needs to be done or changed.

3.3.3. Future-Ready Learning Activities Hours

The other Learning Activities are the experiential learning activities that do not take place in the formal contact and self-study. These are primarily Supervised Placements and Practice Hours which are prescribed by HEC and which highlights the concept of structured professional placements in modules to assist in furthering knowledge with the assistance of real-world application. Such placements are also very practical, and close the gap between theoretical and practical at work. Academic attending is also included in these activities, like, conferences, seminars and workshops that expose the students to broader work-based knowledge and new developments in their profession. Although these activities are not included in the formal learning, they add to the well-rounded learning experience, providing collaborative learning, peer support, and engagement with the professional community, as described in Table 5

.

TABLE 5 WORKLOAD FOR FUTURE-READY LEARNING ACTIVITIES HOURS

Future-Ready Learning Workload	Descriptions
Placements at the academic institutions	Immersive teaching practice, which gives students a chance to practice studying at the universities.
Professional Placements	Experience in a work environment.
Academic Conferences and Seminars	Participating in external events to experience a wider perspective in the study area

4. Academic credits and Notional Learning Hours

With opportunities and barriers in a higher education setting, NLH provides a single measure to indicate how much time a student is expected to spend due to the attainment of the learning outcomes of a course or a module. Following Bangladesh National Qualifications Frameworks (BNQF), the HEI has to adopt the following guideline for a 14-weeks course (see Table 6):

TABLE 6 LEARNING-TEACHING ACTIVITIES AND SUGGESTED NOTIONAL HOURS PER CREDIT

Sl.	Teaching-learning Activities	Credit	Credit Hours (with number of weeks)	Notional Hours	TLA Status	Semester Term
1	Lecture/Tutorial/ Seminar	1	1 hour (14 weeks)	±40 hours	Analytical	Semester/ Trimester
2	Lab, Studio, or Clinical Work	1	1.5 hours (14 weeks)	±60 hours	Experimental	
3	Industrial/ Workplace Learning	1	2 hours (14 weeks)	±80 hours	Experiential	

Moreover, students will have an opportunity to be more regular in their programs and seek a clear structure to manage the time and prepare. A suggested minimum proportion of contact hours to self-directed learning hours is 1:2, which means that during the course of time that a student is allowed to spend in the instructor-led contact time, he or she has to spend at least two hours of the time in self-directed learning. The 1:2 ratio relates to the part of advancing the idea of autonomous learning, which is noteworthy to the process of higher education since one of the learners in question will engage with the learning materials during the out-of-formal learning sessions to enrich and evolve his/her learning. In order to make the concept of allocation of notional learning hours easier to comprehend, an example is presented below of how this is done in a normal 3 credit lecture-based course:

EXAMPLE:

- **Credit** = 3
- **Notional Learning Hours** =3x±40=±120 hours
- **Contact Hours:** ±42 hours
- **Self-Directed Learning Hours:** ±78 hours
- **Self-Learning Hours:** ±64 hours
- **Assessment Hours:** ±4 hours
- **Future-Ready Learning Activities Hours:** ±10 hours
- **Self-Directed Learning Hours Calculation:** Self-Learning Hours + Assessment Hours + Future-Ready Learning Activities Hours =**±(**64 +4 +10)= ±78 hours
- **Ratio of Contact Hours to Self-Directed Learning Hours:** 42: 78 (to meet ±120 hours, round figure ±78 hours can be applied in order to comply with the minimum recommended ratio of 1: 2)

5. NLH Time Allocation Record Template (NTART)

A key component to the implementation of the NLH framework is to use a standardized *NLH Time Allocation Record Template (NTART)* as illustrated in the Appendix comprising sections A and B in a sheet format**.** This template helps students to be transparent about their learning, as they will know the expected workload and how they should spend their time on different learning activities. The template also helps faculty to establish clear expectations for workload and increase consistency across academic programs.

6. Pedagogical and Structural Benefits

The following benefits of the notional hours are significant to both the adoption of institutions and students:
a) Clarity/Openness: The students are more aware of the work they have to finish their course.

b) Regulation of the Workload in the Number of Assignments: Institutions can determine that the amount of independent study hours is regulated that the number of assignments will not fatigue the students.

c) Prior Learning Assessment: It is possible to establish how notional hours can identify the assessability of prior learning experiences such that the student is able to obtain credits.

d) Mobility: The number of notional hours makes an action of mobility especially when it comes to transfer and accumulations systems like *BNQF Credit Accumulation and Transfer System (BCATS)*.

7. Obstacles and Implementation

There are some problems with the use of notional hours:

a) **Student Variability:** It is not a good assumption of the classes with different background that there will be an average student.

b) Quality Hours: The classroom time can hardly be split in hours of quality (e.g., surfing the internet vs research).

c) Online Classes: Due to the inequality between the time of synchronous and asynchronous learning, online classes are over-taught.

8. Conclusion

*D*ynamic *N*otional *L*earning *H*ours *F*ramework (DNLHF) is a useful method in workload planning both to students and to the academic credit allocation. The disaggregation of contact hours, self-directed Learning, assessment hours and future-ready learning activities is a good balance of giving instructions and independence. The proposed 1:2 ratio to contact hours and independent study in a dynamic way enables students to not only be in control of their respective progress but also to be responsible of the workload of their teachers in terms of outcome based curriculum.

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APPENDIX

NLH TIME ALLOCATION RECORD TEMPLATE (NTART)

(For a 3 credit *Lecture based* course)

[Section A]: Notional Learning Hours Distribution Sheet (with the tiles of academic workloads)

Notional Learning Hours (±120 hr.)=Class-Contact hours (±42hr.)+Directed Self-Study (±78hr.)
(±120 credits for only *Lecture based courses*)

TITLES OF ASCADEMIC WORKLOADS (In accordance with the demand of course work)	CLASS-CONTACT HOURS (±42 Hours)	SELF-DIRECTED LEARNING HOURS (±4+±64+±10=±78 Hrs.) [Sample for a course]		
		Assessment Hours (±4 hrs.)	Self-Learning Hours (±64 hrs.)	Future-Ready Learning Hours (±10 hrs.)
Examinations (Mid and Final)	(+/-) 42 hours	±4 hrs.	±	±
1. Tutorials/ Feedback review and improvements		±	±	±
2. Simulation learning		±	±	±
3. Academic seminar, workshop, conference, etc.		±	±	±2 hrs.
4. Project work/ Research and reading		±	±	±
5. Work attachment/Internship		±	±	±2 hrs.
6. Group assignment and assignment completion		±	±	±
7. Presentation/Poster presentation		±	±8 hrs.	±
8. Revision		±	±8 hrs.	±
9. Group work/Group study for assessment		±	±	±
10. Field work/Practical hands-on/Placement at the academic institutions		±	±	±
11. Industrial tour		±	±	±
12. Study tour		±	±	±
13. Case study		±	±	±
14. e-Learning		±	±8 hrs.	±
15. Demonstration		±	±8 hrs.	±
16. Individual assignment		±	±8 hrs.	±
17. Clinical work/Problem solving and practice		±	±	±
18. Group discussion		±	±	±2 hrs.
19. Research Project		±	±8 hrs.	±
20. Self-Directed Reading/Wider reading and exploration		±	±8 hrs.	±
21. Review of Lecture Notes		±	±8 hrs.	±
22. Session Preparation and Follow-Up/Presentation prep.		±	±	±
23. Quizzes/Mock exam		±	±	±
24. Workplace experiences/Professional placements		±	±	±2 hrs.
25. Peer discussion		±	±	±2 hrs.
26. Software Tool Practice		±	±	±
27. Practice tests/Mock exams		±	±	±

** [N.B.: Contact Hours=Pink ; Assessment Hours=Orange ; Self-Learning Hours=Green ; Future-Ready Learning Hours=Light Blue]

(Contd.)

[Section B]: Time Allocation Evaluation Sheet for Notional Learning Hours

Please select *Academic Workloads* from section A *(page 1)* and measure notional learning hours for each lecture-based course upon the requirements of achieving learning outcomes:

1. **Title of the Course (lecture-based):**
2. **Name of the Course Instructor:**
3. **Total lecture-based notional hours: ±120 hours (guided by BNQF)**
4. **Credit: 3**

CLOs	Titles of the Academic Workloads chosen by you	Class-Contact hours followed (In accordance with BNQF)	Directed Self-study hours(±) with activity plans followed (±78 hours fixed)
CLO 1	1. Individual Assignment	(Total classroom hours you have conducted in one lecture-based course)	• Planning=±15 min. • Outlining=±15 min. • ---------- • ----------
CLO 2	2.------		
CLO 3	3.------		
CLO 4	4.------		
	5. Summative Examinations (for Mid and Final)		±4 hr.
Total		±42hr.	±78 hr.
Total Notional Hours (for lecture-based course)		± (42+78)=±120 hours	

[SIGNATURE AREA]		
Signed by (Course Instructor)	Verified by (Faculty Dean)	Authorized by (Director, IQAC)

Explainable AI-Driven Learning Analytics for Student Success Prediction and Quality Assurance in Educational Settings

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Abstract
The growing adoption of artificial intelligence in education has created new opportunities for data-informed quality assurance, early academic risk detection, and evidence-based student support. This paper proposes LEARNSIGHT-QA, a Learning Analytics and Explainable Reasoning Network for Student Insight and Quality Assurance, to predict student academic performance and support institutional decision-making. The study uses the UCI Student Performance Dataset, where demographic, family, school-related, behavioral, attendance, and academic variables are used to classify student outcomes. The final grade, G3, is used as the output target, while G1 and G2 represent first and second period grades. The proposed framework applies Logistic Regression, Random Forest, XGBoost, Gradient Boosting, and LightGBM, and integrates SHAP-based explainability to identify influential predictors. Experimental results show that LEARNSIGHT-QA achieved 91.6% accuracy in binary at-risk detection and 88.29% accuracy with 85.84% macro F1-score in three-class performance prediction. The framework supports early warning, academic advising, assessment monitoring, and continuous quality improvement through transparent and actionable academic insights.

Keywords*:* Explainable AI, Learning Analytics, Student Performance Prediction, Quality Assurance, At-Risk Student Detection, SHAP, Machine Learning, Educational Data Mining

1. Background Study

The rapid digital transformation of education has increased the importance of data-informed teaching, learning, assessment, and quality assurance [1]. Educational institutions now collect different types of student-related data through admission records, academic assessments, attendance systems, learning management systems, and institutional monitoring processes [2]. These data can support evidence-based decision-making by helping teachers and administrators identify students who may require academic guidance, targeted intervention, or additional learning support. However, many institutions still depend mainly on final examination results or delayed academic reports, which limits the possibility of early intervention [3].

Student performance prediction has become an important area within learning analytics and educational data mining. Machine learning techniques can identify patterns in student demographic, family, behavioral, attendance, and academic variables to predict whether a student is likely to perform well or become academically at risk [4-5]. Such predictive insights are useful not only for individual student support but also for institutional quality assurance, because they can help departments monitor learning progression, review assessment practices, and improve academic support systems [6].

Despite the usefulness of machine learning, prediction alone is not sufficient for educational decision-making [7]. In academic settings, teachers, advisors, and quality assurance units need to understand the reasons behind a prediction [8]. For example, if a student is predicted as at risk, it is important to know whether the prediction is influenced by weak previous grades, high absence, low study time, family background, travel time, or other contextual factors. Therefore, explainable artificial intelligence is necessary to make predictive models transparent, interpretable, and actionable.

This paper proposes the LEARNSIGHT-QA framework, which stands for Learning Analytics and Explainable Reasoning Network for Student Insight and Quality Assurance. The framework integrates machine learning-based student performance prediction with SHAP-based explanation and quality assurance-oriented decision support. The study uses the UCI Student Performance Dataset, which contains student demographic, family, school-related, behavioral, attendance, and grade-related variables. In the dataset, G1 represents the first-period grade, G2 represents the second-period grade, and G3 represents the final grade or output target. The final grade is used to construct student performance categories for prediction and academic risk detection.

The main objective of this study is to develop an explainable AI-driven framework that can identify at-risk students and provide interpretable evidence for academic quality improvement. The proposed framework supports early warning, student advising, assessment monitoring, and continuous improvement in education. The major contribution of this paper is the integration of predictive learning analytics, explainable AI, and quality assurance decision support into a single framework. Experimental results show that LEARNSIGHT-QA achieved 91.6% accuracy in binary at-risk student detection, demonstrating its potential for data-informed academic intervention and educational quality enhancement.

2. Proposed LEARNSIGHT-QA Framework

This study proposes the LEARNSIGHT-QA framework, which stands for Learning Analytics and Explainable Reasoning Network for Student Insight and Quality Assurance. The framework is designed to predict student performance, identify academically at-risk students, and provide interpretable evidence for educational quality assurance. Unlike prediction-only approaches, LEARNSIGHT-QA integrates machine learning, SHAP-based explainability, and quality assurance-oriented decision support into a unified framework.

The proposed framework consists of seven stages: educational data input, data preprocessing, performance label construction, dual prediction design, machine learning classification, explainable AI interpretation, and quality assurance decision support. Student-related demographic, family, school-related, behavioral, attendance, and academic variables are first processed for model training. The final grade G3 is then converted into performance labels. For three-class prediction, students are categorized as At-risk, Pass, and Excellent, while for binary risk detection, they are categorized as At-risk and Not-at-risk.

A dual prediction strategy is used. The first setting excludes G1 and G2 to represent early prediction, while the second setting includes G1 and G2 as academic-progress indicators. Logistic Regression, Random Forest, XGBoost, Gradient Boosting, and LightGBM are trained and compared. The selected model is then interpreted using SHAP to identify the most influential predictors of student performance. Finally, prediction and explanation outputs are mapped into quality assurance actions, including early warning, academic advising, assessment monitoring, targeted intervention, and continuous improvement. The overall architecture of the proposed framework is presented in Fig. 1.

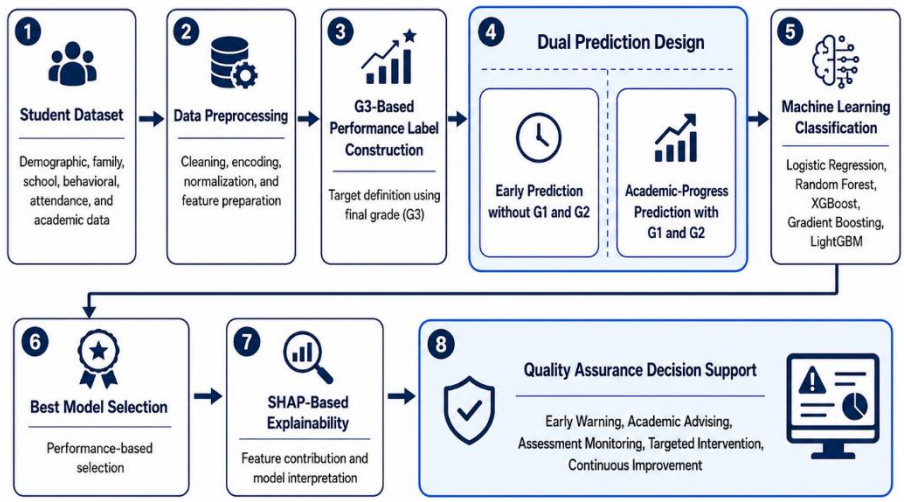


Fig.1 Architecture of the Proposed LEARNSIGHT-QA Framework.

3. Methodology

This study develops the LEARNSIGHT-QA framework for explainable student performance prediction and quality assurance decision support. The methodology includes dataset preparation, performance label construction, dual prediction design, model training, evaluation, and SHAP-based interpretation.

3.1 Dataset and Target Variable

The study used the Portuguese course subset of the UCI Student Performance Dataset because it contains a larger number of student records than the Mathematics course subset. The dataset includes demographic, family, school-related, behavioral, attendance, and academic variables. The grade variables are G1, G2, and G3, where G1 is the

first-period grade, G2 is the second-period grade, and G3 is the final grade. In this study, G3 was used as the prediction target.
The final grade was transformed into two prediction tasks. For three-class performance prediction, students were categorized as At-risk, Pass, and Excellent. For binary quality assurance-oriented risk detection, students were categorized as At-risk and Not-at-risk.

TABLE 1 PERFORMANCE LABEL CONSTRUCTION BASED ON FINAL GRADE G3.

G3 score range	Three class labels	Binary label	Purpose
0 to 9	At-risk	At-risk	Academic risk detection
10 to 14	Pass	Not-at-risk	Standard performance monitoring
15 to 20	Excellent	Not-at-risk	High performance identification

The label construction was defined as follows: for three-class classification, students with G3 scores from 0 to 9 were labelled as At-risk, students with G3 scores from 10 to 14 were labelled as Pass, and students with G3 scores from 15 to 20 were labelled as Excellent. For binary classification, students with G3 scores from 0 to 9 were labelled as At-risk, while students with G3 scores from 10 to 20 were labelled as Not-at-risk.

3.2 Data Preprocessing
Let the student dataset be represented as:

$$D = \{(x_i, y_i)\}_{i=1}^{n} \quad (1)$$

where x_i represents the feature vector of the *i-th* student and y_i represents the corresponding performance label. Categorical features were encoded into numerical form, numerical features were retained, and the generated target label was used for classification. Stratified train-test splitting was applied to preserve class distribution.
The dataset was divided into training and testing subsets using an 80:20 stratified train-test split. Stratification was applied to preserve the original class distribution in both subsets, particularly because the At-risk class was smaller than the Not-at-risk class. This preprocessing ensured that the models were trained and evaluated on representative class distributions.

3.3 Dual Prediction Design
Two experimental settings were used to evaluate the LEARNSIGHT-QA framework. Setting 1 represents early prediction, where G1 and G2 were excluded from the input features. This setting evaluates whether student performance can be predicted before prior grade information is available. Setting 2 represents academic-progress prediction, where G1 and G2 were included as academic-progress indicators. This setting evaluates final performance prediction after first and second period grades become available.

TABLE 2 DUAL PREDICTION SETTINGS USED IN LEARNSIGHT-QA.

Setting	Feature definition	Excluded variables	Interpretation
Early prediction	X_early = X excluding {G1, G2, G3}	G1, G2, G3	Prediction before prior grade information is used
Academic progress prediction	X_progress = X excluding {G3}	G3	Prediction using first and second period grades

The feature sets were defined as:

$$X_early = X - \{G1, G2, G3\} \quad (2)$$

$$X_progress = X - \{G3\} \quad (3)$$

where G3 was excluded from all input features because it was used as the target variable.

3.4 Classification Models
Five classifiers were evaluated: Logistic Regression, Random Forest, XGBoost, Gradient Boosting, and LightGBM. Logistic Regression was used as the baseline model, while Random Forest, XGBoost, Gradient Boosting, and LightGBM were used to compare ensemble-based learning approaches. The best model was selected based primarily on macro F1-score for the three-class performance prediction task and accuracy for the binary at-risk detection task.

3.5 Evaluation Metrics
Model performance was evaluated using accuracy, precision, recall, and F1-score. The equations are given below:

$$Accuracy = (TP + TN) / (TP + TN + FP + FN) \quad (4)$$

$$Precision = TP / (TP + FP) \quad (5)$$

$$Recall = TP / (TP + FN) \quad (6)$$

$$F1 = 2 \times (Precision \times Recall) / (Precision + Recall) \quad (7)$$

where TP, TN, FP, and FN represent true positives, true negatives, false positives, and false negatives, respectively. For the three-class task, macro-averaged metrics were used because the class distribution was imbalanced. Macro precision, macro recall, and macro F1-score were calculated by averaging the class-wise scores equally across all classes. For the binary at-risk detection task, accuracy and F1-score were used to evaluate the practical usefulness of the framework for quality assurance.

3.6 Explainability and Quality Assurance Mapping

SHAP analysis was applied to the selected model to identify the most influential predictors of student performance [10]. The SHAP value of a feature represents its contribution to a model prediction and can be expressed as:

$$f(x) = \varphi_0 + \Sigma_{j=1}^{m} \varphi_j \quad (8)$$

where $f(x)$ is the model output, φ_0 is the base value, and φ_j is the contribution of the j-th feature. The SHAP-based outputs were mapped into quality assurance actions such as early warning, academic advising, assessment monitoring, targeted intervention, and continuous improvement.

Algorithm 1. LEARNSIGHT-QA Framework.		
Input	:	Student dataset D, feature set X, final grade G3
Output	:	Predicted student performance class, best model, SHAP based explanation, QA decision support
Step 1	:	Load the student performance dataset.
Step 2	:	Define G3 as the output target.
Step 3	:	Convert G3 into three-class and binary performance labels.
Step 4	:	Encode categorical variables and prepare numerical variables.
Step 5	:	Construct X_early = X - {G1, G2, G3}.
Step 6	:	Construct X_progress = X - {G3}.
Step 7	:	Train Logistic Regression, Random Forest, XGBoost, Gradient Boosting, and LightGBM.
Step 8	:	Evaluate models using accuracy, precision, recall, and F1-score.
Step 9	:	Select the best model based on predictive performance.
Step 10	:	Apply SHAP to explain feature contributions.
Step 11	:	Map prediction and explanation outputs to quality assurance actions.

4. Results and Discussion

The proposed LEARNSIGHT-QA framework was evaluated using two prediction tasks: binary at-risk student detection and three-class student performance prediction. The binary task was considered the primary quality assurance-oriented task because identifying academically vulnerable students is more actionable for institutional intervention. The three-class task was used to provide a more detailed performance classification into At-risk, Pass, and Excellent categories.

4.1 Model Performance Comparison

The proposed LEARNSIGHT-QA framework was evaluated using binary at-risk detection and three-class student performance prediction. As shown in Fig. 2, the binary task compared accuracy and F1-score, while the three-class task compared accuracy and macro F1-score across different models. For binary at-risk detection, LEARNSIGHT-QA achieved the best result with 91.6% accuracy and 84.7% F1-score, outperforming Logistic Regression, Random Forest, XGBoost, and Gradient Boosting. For three-class prediction, it achieved 88.29% accuracy and the highest macro F1-score of 85.84%. Although XGBoost showed slightly higher accuracy, LEARNSIGHT-QA provided better class-balanced performance, making it more suitable for imbalanced educational data and quality assurance-oriented student monitoring.

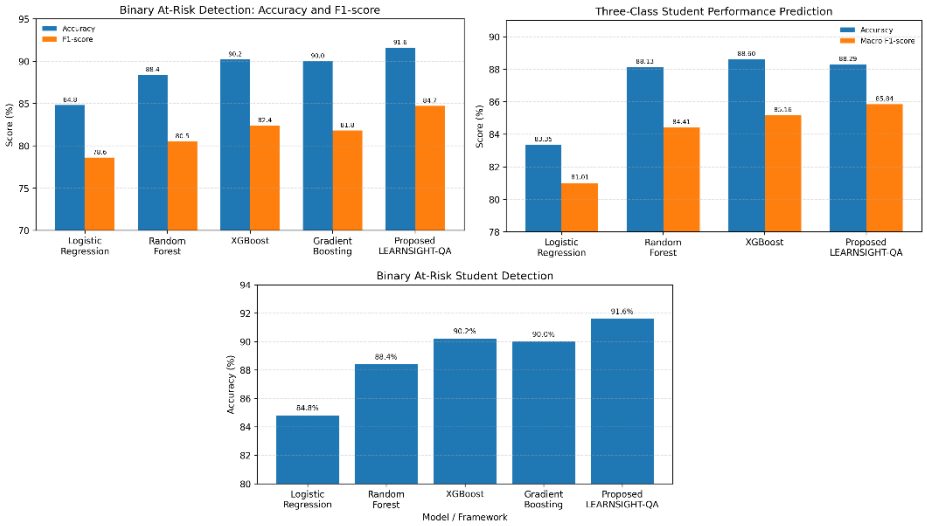


Fig.2 Comparative Performance of LEARNSIGHT-QA and Baseline Models for Binary and Three-Class Prediction Tasks.

4.2 Confusion Matrix Analysis

Fig. 3 presents the row-wise percentage-based confusion matrices for both binary at-risk detection and three-class student performance prediction. In the binary task, the proposed LEARNSIGHT-QA framework correctly identified 80.0% of At-risk students and 93.7% of Not-at-risk students. The misclassification rate was 20.0% for At-risk students and 6.3% for Not-at-risk students. For the three-class task, the model correctly classified 74.0% of At-risk students, 90.0% of Pass students, and 94.0% of Excellent students. The highest classification consistency was observed for the Excellent group, followed by the Pass group. The At-risk class showed comparatively lower correct classification, which is expected because this group had fewer samples than the Pass class.

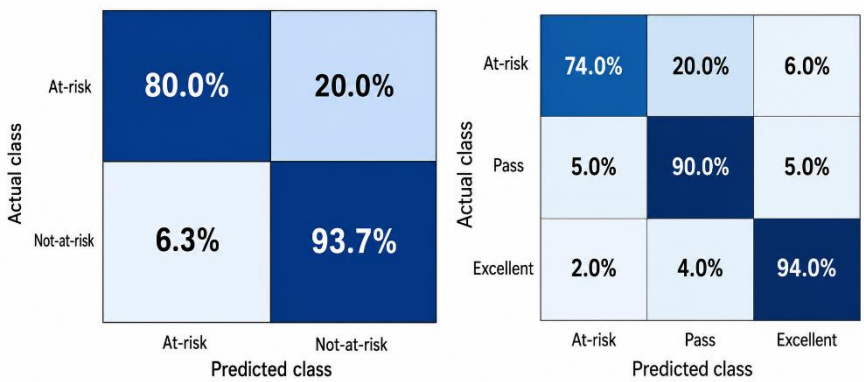


Fig.3 Confusion Matrix of the Proposed LEARNSIGHT-QA Framework for Binary and Three-Class Prediction Tasks.

4.3 G3-Based Performance Label Distribution

The distribution of G3-based performance labels is shown in Fig. 4. Among the 649 students, the Pass category contained the largest proportion, with 418 students (64.4%). The Excellent category included 131 students (20.2%), while the At-risk category included 100 students (15.4%). This distribution indicates moderate class imbalance, where the Pass group is dominant and the At-risk group is comparatively smaller.

This class distribution justifies the use of macro-averaged metrics for the three-class prediction task, because macro F1-score evaluates all classes equally rather than being dominated by the majority Pass class. It also supports the quality assurance focus of the study, as the smaller At-risk group is the most important group for early warning and targeted intervention.

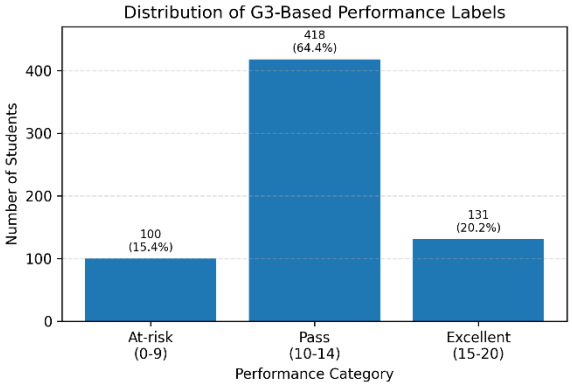


Fig.4 Distribution of G3-Based Performance Labels.

4.4 SHAP-Based Feature Interpretation

Fig. 5 presents the SHAP-based feature ranking of the proposed LEARNSIGHT-QA framework. The results show that G2 was the most influential predictor, followed by G1, indicating that first-period and second-period grades had the strongest contribution to the final performance prediction. Other relevant factors included health, goout, Walc, traveltime, Fedu, Medu, absences, and failures.

The dominance of G2 and G1 is educationally logical because prior academic performance is strongly associated with final grade prediction. At the same time, the presence of behavioral, family, and attendance-related variables suggests that student performance is influenced by broader contextual factors beyond grades alone. These findings improve the interpretability of the proposed model and support quality assurance actions such as early warning, academic advising, attendance monitoring, and targeted intervention for academically vulnerable students.

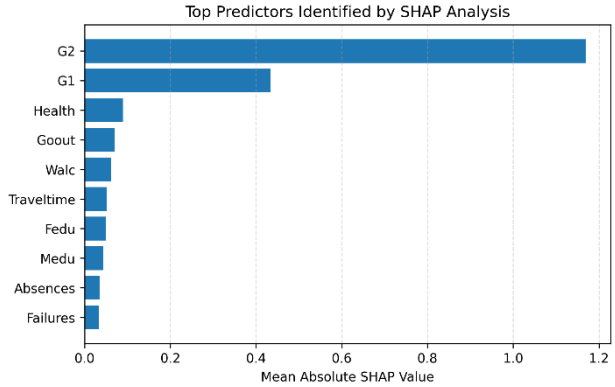


Fig.5 Top Predictors Identified by SHAP Analysis.

5. Conclusion

This paper proposed LEARNSIGHT-QA, an explainable AI-driven framework for student performance prediction and quality assurance decision support. Using the Portuguese subset of the UCI Student Performance Dataset, the final grade G3 was transformed into three-class and binary performance labels. The proposed framework achieved 91.6% accuracy in binary at-risk detection and 88.29% accuracy with 85.84% macro F1-score in three-class performance prediction. SHAP analysis showed that G2 and G1 were the most influential predictors, while health, absences, travel time, parental education, and past failures also contributed to prediction. Overall, the findings indicate that LEARNSIGHT-QA can support early warning, academic advising, targeted intervention, and continuous quality improvement in education. Future work may validate the framework using institutional learning management system data.

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Application of Agile Scrum in Education as a Transformative Approach Towards Collaborative and Active Learning Adaptation

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Abstract
Competence based skills are becoming essentially relevant for graduates in the rapidly evolving working environment. To align the education landscape with the twenty-first century demands, transformative strategies are needed in practice. Traditional approaches of teaching and learning have lost the appeal of involving and engaging students due to the monotonous nature of rote memorization, exam-based assessments while failing to nurture innovation, collaboration and communicative capacities. Promoting incremental improvement, application of Agile Scrum approach in education can promote adaptive capacities in learners towards collaborative and active learning. This study demonstrates the efficacy of collaborative learning approach through application of Agile Scrum framework in engineering course work empowering students with active learning capability. Tracking the submission and measuring the progress enabled observation of heterogeneity and creativity among group performances, achievements and demonstrations. Student engagement seemed mostly satisfactory with respect to the level of completion. Students visibly learnt through collaboration while fostering opportunities to utilize the benefits of active learning scopes such as open discussion, debating, challenging, evaluating etc. With challenges of launching a non-conventional concept to struggle with familiarity, time commitment and mind set issues, Agile in education can set significant milestones in preparing students towards tackling unforeseen future challenges.

***Keywords**:* Agile; Education; Transformation; Collaboration; Active Learning; Adaptation

1. Introduction

Non-technical, skill-based competences among students are increasingly becoming indispensable in making higher education relevant as we are approaching an ever-increasing complexity in meeting the requirements of survival in the 21st century world. As much as we aim to make our graduates sound in their cognitive capacities, content-based learning has been experiencing a paradigm shifting towards outcome-based learning while educators acknowledge that achievement of student-centric learning environments require transformative approaches. There are alleged gaps to address in aligning the curriculum and pedagogical approaches with the job market and the society that leads to an unavoidable mismatch between graduate competences and employers' or stakeholders' requirements (Ehsan, 2021). Memorization, rote learning, examination-based approaches and lack of adequate formative and summative tools are failing to capture the creativity, critical thinking, decision-making, metacognition capacities of the students while failing to address the diverse needs, abilities and aspirations of the students (Chowdhury, 2020).

Are educators alert on what hinders the gap reduction for achieving real competences and how is it possible to co-create the active learning culture to make the education eco-system sustain? In order to bring relevance, the educators need to be the architects in nurturing the students along with themselves with the adaptability to immerse, align and contribute to the ever-evolving educational landscape in the current dynamic context. Integration of innovative pedagogical approach along with inclusive leadership have shown to maximize student engagement and learning outcomes creating more inclusive and effective learning environment contributing to enhancing student performances (Bhuttah et al 2024). Curriculum designers and Educators have also been emphasized to prioritize adaptability, learner autonomy and technology integration to create a sustainable and resilient education system (Sharma, 2025).

Agile approach in education, characterized by its flexibility in adoption, collaboration and focus on personalized learning, has the potential to accommodate the teaching learning environment with the transformation required for students and instructors to facilitate each other through cooperation, creativity, communication and collaboration (Kropp et al, 2016). Collaborative learning provides many benefits, including improved critical thinking skills, communication skills, and teamwork among students. In addition, this approach has proven to be

effective in building an inclusive learning environment and supporting active learning (Uslan et al, 2024). Agile approach enables students to adopt active learning roles and prepares them to adapt themselves with the evolving demands of workplace also increasing productivity (Reehorst et al, 2019). Agile Teaching Learning Methods (ATLM) emphasizes agility, communication and learning process (Chun, 2004) while adoption of agile framework has shown to foster an environment of collaboration, self-direction and incremental progress for the educators and the learners with deeper understanding of critical thinking skills (Fitsilis et al, 2023).

Agile framework encompasses solving problems and completing tasks in increments through self-organized and cross-functional teams (agilemanifesto.org) while Scrum is the most widely used tool for agile application as a project management methodology originated in early 1990's (Schwaber and Sutherland, 2020). Group collaboration is a process of working together with others to achieve a common goal, encompassing communication, coordination, cooperation, and conflict resolution (Johnson & Johnson, 1999). Agile methodologies can reshape the assessment process by focusing on continuous evaluation rather than relying solely on high-stakes exams through formative assessments, portfolios, and project-based evaluations providing more comprehensive views of students' skills and knowledge (Condon et al. 2016).

Realizing the efficacies of Agile framework as an innovative and transformative approach, this study demonstrates the experience and outcomes of application of Agile in education using Scrum as a tool. A focus of this application essentially encompassed upholding the importance of collaborative study and active learning instead of one directional instructor centered learning approach.

2. Methods and Applications

2.1 Applied Tools and Techniques

The framework for application of Scrum is demonstrated in Fig 1.

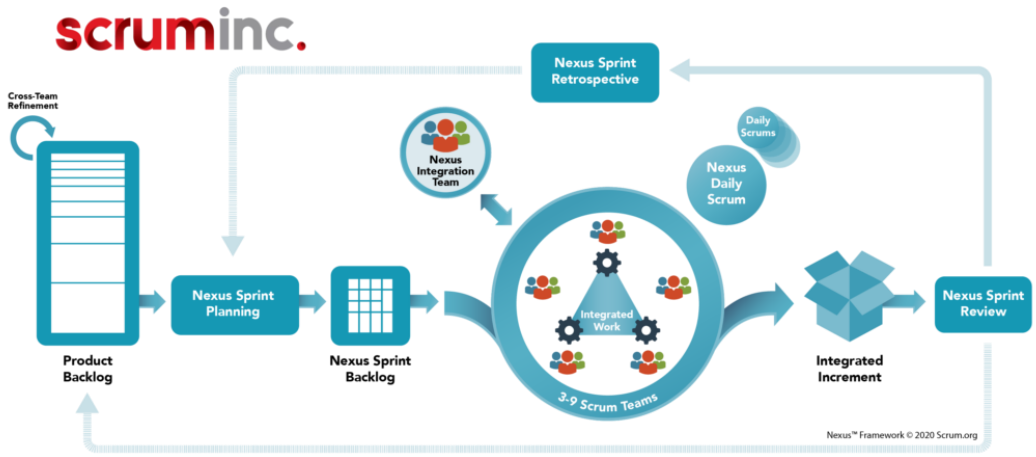


Fig.1 Scrum framework, Agile in Education USA (https://bd.agileineduc)

In order to implement the Agile approach to education, the roles have been adopted as follows:

a. The Course Instructor was considered as the product owner;
b. The instructor adopted the Scrum Master role since the team captain is being exposed through the coursework for the first time while first application being the transition to this approach. This required the facilitation by the instructor so that the students could get proper orientation to this method;
c. The team of students adopted the role of The Development Team.

Undergraduate engineering courses were chosen to apply scrum for consecutive semesters in order to demonstrate the application. Students were required to have group discussion to provide status of their collaborative studies at the end of a stipulated duration on the study content that was delivered to them during the duration (known as

sprint). Sprint lengths were chosen from 1 week – 2 weeks. Deliverables in each of the sprints included statements and time wise declaration or pace of status of completion in the form of velocity charts (delivery versus commitment of tasks/topics) and burn up charts (time series status of tasks according to assigned weights). Assessments were done based on completion that the students came to achieve after each sprint and also based on group participation in submissions.

2.2 Measuring Progress

The Agile framework and its application provide the students with the power and know-how to self-direct, promote and improve their skill base as the processes of Scrum and eduScrum allows for continuous review, retrospect and feedback (Wijnands and Stolze, 2019). This approach further addresses the facilitation of outcome-based assessment (Tudevdagva et al 2020). The tracking of progress constituted the observation of students with their ice breaking through struggles in coming up with story points (task identification based on lecture contents), demonstration of the status in a recommended format, until preparing the charts. This exercise made them capture their own pace of learning and the points of difficulties. This essentially made them better informed regarding their status of learning and familiarity with the course content. All the deliverables from the students enabled the analysis of pace of completion of tasks for each student group for each course. This further provided the opportunity to track sprint wise and group wise completion rate leading to course wise and semester wise completion rate. Two courses were considered for two consecutive semesters for the analysis while number of groups varied for each course in each semester. For example, group number varied for course 1 from 20 – 23 (core course) between two semesters while the same for course 2 varied from 6 – 9 (elective course).

3. Results and Outcomes

3.1 Approaches and Creative Thinking

Active learning enhances the learning experiences of students through engaging them in thinking, discussing, investigating and creativity which is inspired in Agile framework. As shown in Fig. 2 (left), Through a proper blend of individual learning assessments such as exams, assignments and opportunities for collaborative learning such as group discussions, problem solving, open remarks etc. students are able to specialize in content while at the same time they have the opportunity to communicate with others and apply their understanding to communicate the learning. A true entertaining feeling for the students is to identify the bottlenecks and learn how to learn or unlearn. Agile and Scrum provide enhancement of the learning experience through the concepts demonstrated in Fig. 2 (right) with each of the characteristic features showing on the left are leading to the improvisation of the skills and immense opportunities for the learners.

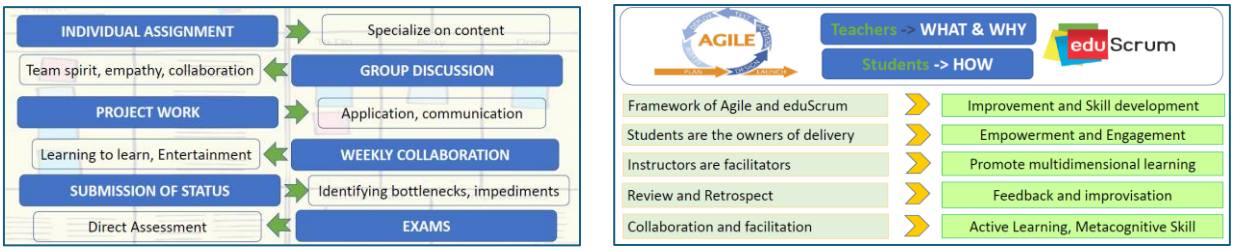


Fig.2 Efficacies of collaborative learning with activity wise benefits (left) and characteristic opportunities (right)

3.2 Variability Across Groups and Courses

The students on each course were required to provide weekly status of their studies and activities in charts or flaps as shown in Fig. 3. These submissions represent logbooks where they put their status and thoughts on the content.

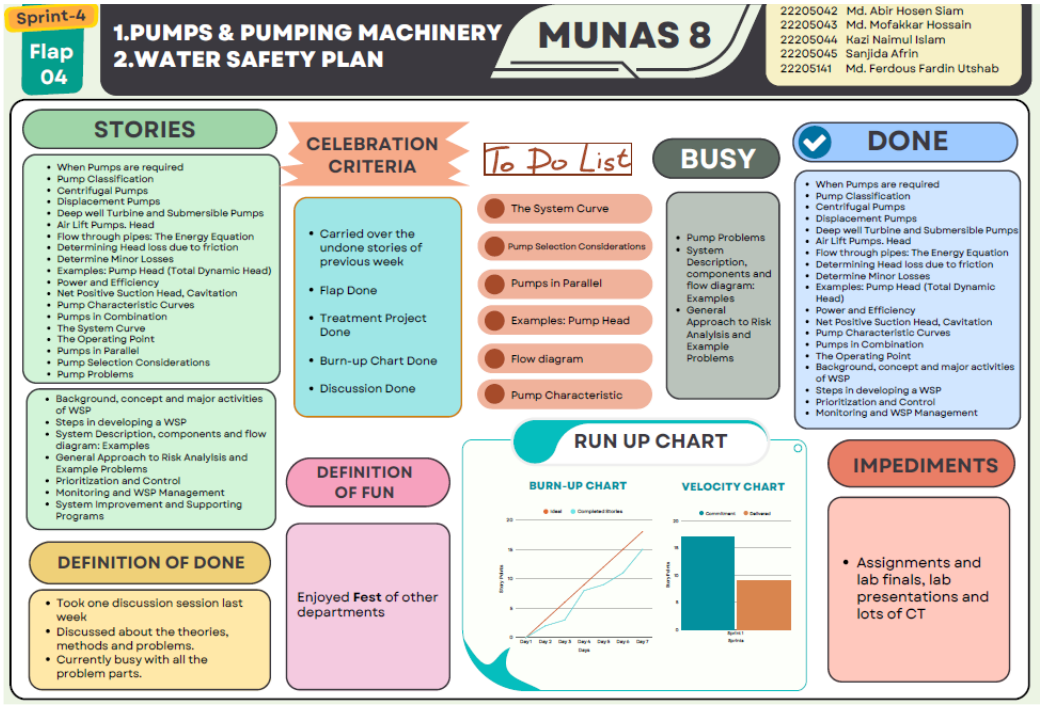


Fig.3 Example Weekly submission charts (flap) of Course 1 (up) and Course 2 (down)

Over time, along with the sprint progression, the very nature and look of these charts keep evolving. From a very amateur platform, with the help of the instructor's comments and feedback, students get the opportunity to review, reform their practices and better represent their understanding. Variation of presentation across groups and variation across courses are pretty evident (only 1 from each course from multiple submissions were chosen to show for this study) when students identify problems and report the completion if it is a problem-based course while they discuss the content if it is a theoretical course. Since each student is not expected to demonstrate similar understanding, this group discussion provides all with an exposure or opportunity to brainstorm before they meet next with the instructor. The variation in submission across groups and courses reflects the commitment of the students to the course and also the importance of the content from the students' perspectives. Students are keeping the inventory of their learning in less or more detailed forms which show group wise and course wise interest among students.

Fig 4 provides a compilation of course wise completion rate among student groups. These were calculated and averaged from their weekly/bi-weekly sprint wise submission of velocity charts (delivered vs committed tasks). To generalize between both courses and semesters, completion rates vary mostly within >60 – 100% reflecting a broad range of delivery among student groups. This is a true capture of the heterogeneity within courses and semesters since students with multiple capacities, commitment and intentions participate with different paces and struggles. The degree of heterogeneity can very well inform the instructor regarding the pace he/she needs to maintain or optimize to benefit most of the learners. The weekly variation of completion rates is also reflected in the error bars which were calculated from the standard deviation from weekly submission completion rates. Important factor to note here is all the groups mostly hit more than 50% completion rates providing clear indication of collaborative efforts. The group flaps and the details from retrospective discussions in the class are reflections of active learning that students keep aspiring to pursue and learn from.

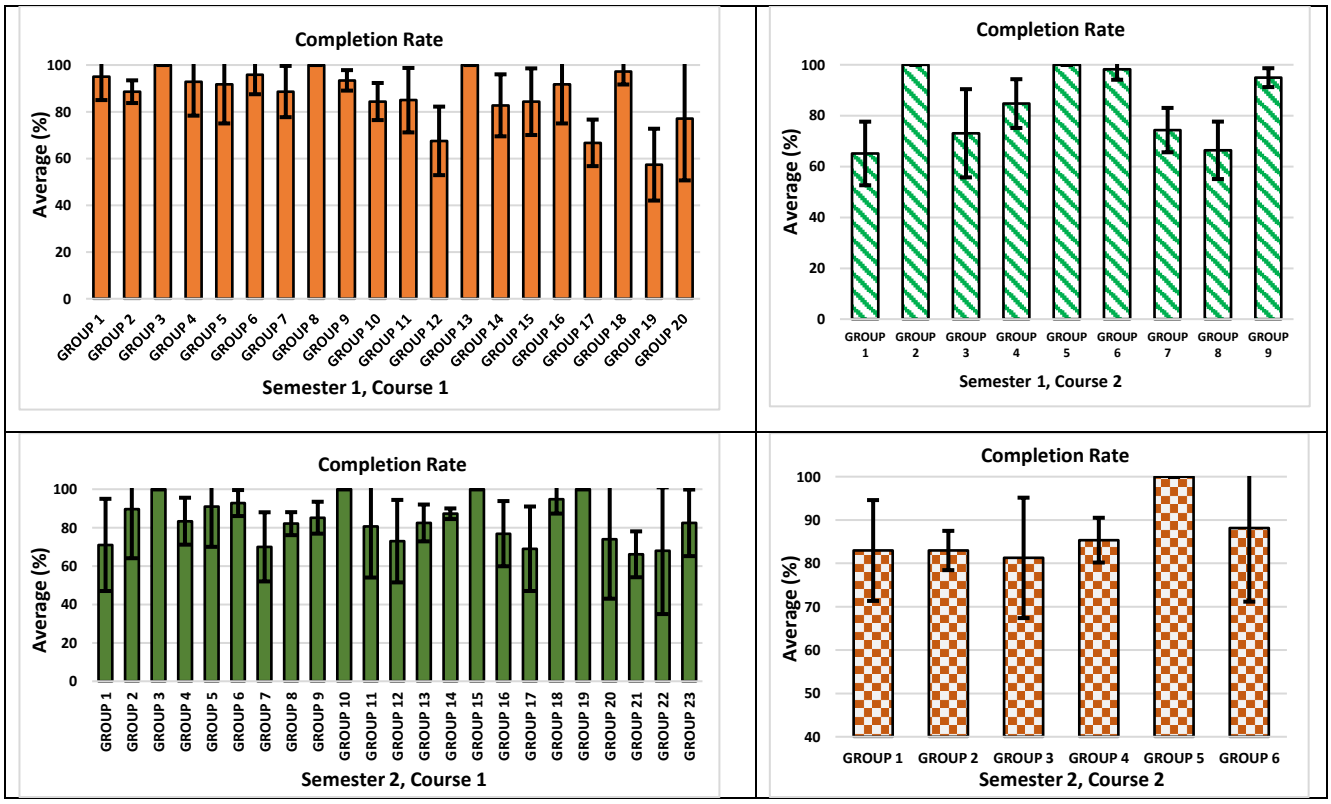


Fig.4 Course wise and semester wise average rates of completion of tasks by students (error bars represent standard deviations)

3.3 Apparent Consistencies

To bring it altogether, Fig. 5 summarizes the completion rates in specific semesters and then for both semesters together. This brings out the apparent consistency in outcome (>80% completion rates) that students are mostly engaged, which they are reportedly demonstrating detailing the topics in trouble and topics that are covered. However, this essentially cannot be expected to be reflected in or correlated with performances since students with various capacities and commitment are collaborating contributing in different paces; Nevertheless, even one step forward would mean reaching perfection for ambitious students and reaching a better grade for the weaker ones. Groupwise tracking is also possible if we want to zoom in through compilations provided in Fig 4. Students go through an adaptation towards collaborative learning and some even realize the benefits of active learning through the leadership in submission and completion.

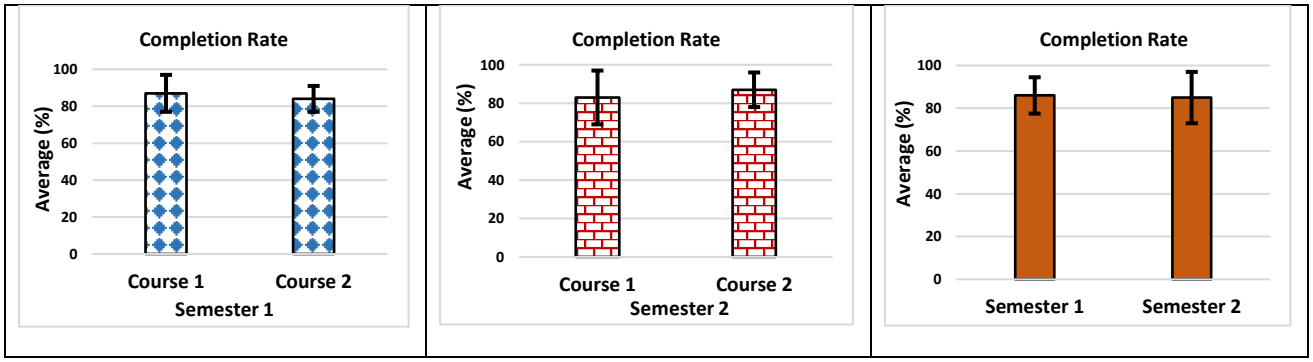


Fig.5 Summary completion rates for courses and for semesters demonstrating consistency

3.4 Challenges and Threats

With experience from years of application of Agile/Scrum approach in engineering education, several challenges can be identified which potentially diminish and hinder the outcomes. Industry and academia both face emerging threats of any sort of application through rapidly changing technology, enrolment and marketplace demand. Thus, instructors need to pace themselves with and design their content for the students to equip them with the most effective know-how. With that commitment, educators also face fatigue dealing with management issues with respect to time, attention, mindset, focus, intense curriculum, preparation etc. leading to impact on relevance, effectiveness in delivery, assessment of performance, involvement, feedback etc. Ensuring the engagement, collaboration and active participation of students would also require the proper environment, incentive and motivation from the ends of the instructors which sometimes become hindered by administrative issues or priorities. Transformation and innovation require dealing with changes and risks whereas efforts invested in these initiatives might sometimes backfire on the quality of delivery, personal growth and overcommitment. Again, mass level alignment with a non-conventional concept requires time and within a limited time in a semester wise course work only provides limited exposure to the students. If the culture is not adopted wholeheartedly by the community, the familiarity will not develop and there will always be apprehension towards realizing the true benefits of its application, let alone keeping room for continuous and incremental improvement which are core concepts of Agile framework.

4. Conclusion

This study investigated the potential of application of Agile/scrum as a transformative approach in education to expose the students with the opportunity to study in collaborative environment with targets or goals to achieve within a given duration in a continuous basis with feedback and improvement. The experiences proved to be beneficial to engage the students in active learning and adapt themselves with the capacity to utilize the collaborative opportunity in demonstrating incremental improvements. Completion rates in each sprint showed variation across groups and courses while ultimately averaging towards a satisfactory engagement level. Acknowledging the challenges and risks from familiarity, adaptation, prioritization, motivation, time commitment and transition requirements' perspectives, Agile framework could be effectively implemented in education for equipping graduates with the proper mindset and skills preparing them to immerse themselves in the rapidly changing competitive world.

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Resource-Based Skills, Confidence, and AI Learning in Graduates' Employment Outcomes

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Abstract

Graduate employability is even more important now due to the rapid technological change and the increased use of artificial intelligence (AI) in the workplace. The paper examines the effects of resource-based skills on employment, confidence (self-efficacy), and AI learning and how these effects shape graduates' employment outcomes. The study utilized a qualitative research methodology, and in-depth interviews were conducted to understand how the graduates perceive their career readiness, skill development, and workplace preparedness. The findings revealed four major themes: resource-based skills, confidence, AI learning, and employment outcomes. The respondents noted that competencies such as technical, communication, teamwork, and digital skills had a positive impact on their employability and flexibility in the workplace. The researchers also found that the self-efficacy gained through internships, practical learning, and exposure to the profession positively influenced graduates' confidence in securing a job. Furthermore, AI learning and applications such as ChatGPT were perceived as beneficial for improving productivity, lifelong learning, and job preparedness in the digital workplace. The findings suggest that a combination of soft skills, technical skills, experiential learning, and AI literacy within a higher education framework can improve graduates' employability and career success in the long term. This study will add to the body of knowledge on graduate employability by emphasizing the overall impact of resource-based capabilities, confidence, and AI learning on graduate employment opportunities in the modern labor market.

Keywords: Graduate Employability, Resource-Based Skills, Self-Efficacy, AI Learning, Employment Outcomes, Higher Education.

1. Introduction

Graduate employability has emerged as a significant issue among higher education institutions due to rapid technological change, shifting labor market needs and the growing role of artificial intelligence (AI) in the workplace. To keep pace with the competitive nature of AI-driven environments, employers increasingly demand graduates who not only know technical concepts but also possess soft skills, digital literacy, adaptability, and problem-solving skills (Cheng et al., 2025; Sozon et al., 2026).

Moreover, the use of AI in learning and workplaces has changed the learning process, communication, and work performed by graduates, and AI skills have become a mandatory part of professional preparation (Portocarrero Ramos & Cruz Caro, 2025). Even with academic qualifications, many graduates have difficulty finding jobs due to a lack of skills and workplace preparation. Previous research has shown that self-efficacy, practical experience, and continuous learning have a strong impact on graduates' employability and success (Zhan et al., 2024; Ingusci et al., 2026). Resource-Based View (RBV) theory posits that valuable skills and knowledge can be strategically leveraged as resources to enhance individual competitiveness and employment opportunities. Furthermore, recent research has shown that developing soft skills, including communication, teamwork, and adaptability, is crucial for sustainable employability in contemporary organizations (Bedoya-Guerrero et al., 2024). Thus, this paper examines the roles of resource-based skills, confidence (self-efficacy), and AI learning in graduates' employment success.

2. Literature Review

This study is underpinned by the Resource-Based View (RBV) theory, which posits that valuable knowledge, skills, competencies, and capabilities are strategic resources that improve individual and organizational performance. In graduate employability, technical skills, soft skills, self-efficacy, and AI competencies are the main resources that enhance their labor market competitiveness (Jan, 2024). According to the RBV, graduates with distinctive and flexible skills are more likely to attain sustainable employment and career development. Self-efficacy theory further posits that individuals' confidence affects motivation, decision-making, and workplace performance (Salisu et al., 2026). As AI learning and digital literacy are increasingly important in contemporary workplaces, RBV can be used to understand the roles of resource-based skills, confidence, and AI learning in graduates' employment outcomes (Verma et al., 2025).

The literature highlights that a combination of technical skills, soft skills, and psychological factors determines graduate employability. Research consistently shows that communication skills, teamwork, critical thinking, and digital literacy enhance employment readiness and workplace performance among graduates (Neneh & Dzomonda, 2026; Bedoya-Guerrero et al., 2024). In the context of AI-driven labor markets, graduates are increasingly likely to acquire AI-related skills and adaptability to technological change (Cheng et al., 2025). Research also suggests that institutions of higher learning should be considered critical in equipping students with the skills to work through experiential learning and work-training programs (Nguyen, 2026). Self-efficacy is also emerging as a critical predictor of employability and career achievement. Zhan et al. (2024) report that the more confident a graduate is in their skills, the higher their chances of succeeding in job searching, adjustment to the work environment, and career-related decision-making. On the same note, Jia and Tu (2024) found that AI-enhanced learning positively affects students' motivation, self-efficacy, and engagement in their studies. Ongoing AI education and exposure to digital technologies have also been associated with greater productivity, innovation, and employability among graduates (Portocarrero Ramos & Cruz Caro, 2025). Thus, available literature shows that a combination of resource-based skills, self-confidence, and AI learning could considerably empower the employment prospects and long-term career progression of graduates.

3. Methodology

This study adopts a qualitative research design to examine the influence of resource-based competencies, confidence, and AI learning on graduates' employment prospects. This method is appropriate because it enables us to fully understand the participants' lived experiences, perceptions, and processes of meaning-making, which are difficult to elicit through purely quantitative methods (Silverman & Patterson, 2021; Coe et al., 2025). It is a new field in which AI learning and employability can be studied; therefore, a qualitative inquiry is the most effective way to provide in-depth, contextual information on how graduates perceive and use their skills in the actual job environment.

The research uses a qualitative approach with a multi-method design, including in-depth semi-structured interviews and focus group discussions (FGDs). Individual experiences of skill development, confidence, use of AI tools, and employability challenges during the education-to-employment transition are captured through semi-structured interviews (Jeppu et al., 2023; Al-Rantisi et al., 2026). FGDs are used to supplement the interviews as they facilitate interactive dialogue, shared experiences, collective perceptions, and contrasting perceptions of employability and AI learning (Nabolsi et al., 2021; Geampana & Perrotta, 2025). The combination of the two techniques will enhance data richness and facilitate triangulation, thereby increasing the credibility of the results. Participants are selected through purposive sampling to ensure relevant and information-rich insights. The sample includes recent graduates across various academic fields and early-career professionals, enabling a diversity of experiences in skill learning, confidence-building, and exposure to AI. Based on the principle of data saturation, the research will involve about 20-30 interviewees and 3-4 FGDs, with 6-8 interviewees per group (Chang & Lai, 2021; Ramadan et al., 2024). Data are collected through semi-structured interview guides designed based on the conceptual framework. The questions are centered on three main themes: resource-based skills, such as technical, soft, and digital competencies; confidence and self-efficacy in job search; and workplace adaptation and AI learning to improve employability. FGDs follow the same pattern, but the focus is on participants' interactions to identify similarities and distinctions. All interviews and FGDs are audio-recorded and verbatim transcribed for analysis, with consent (Opesemowo & Adekomaya, 2024).

The thematic analysis is performed on data that includes familiarization, initial coding, categorization, pattern identification, and theme development. This procedure helps clarify the relationships among abilities, self-confidence, artificial intelligence learning, and employment outcomes (Dellafiore et al., 2026). A reflexive approach is adopted to ensure that interpretations are grounded in participants' narratives, with the researcher's

role taken into account. The study employs rigor through member checking, peer debriefing, and triangulation of interview and FGD data (Lin et al., 2026).

Ethics is upheld during research. The subjects are made aware of the purpose of the research, and informed consent is given. Pseudonyms and secure data storage guarantee confidentiality and anonymity. Participation is optional, and participants may drop out at any time without repercussion (Silverman & Patterson, 2021).

4. Findings

The qualitative results indicated four key themes affecting graduates' employment outcomes: resource-based skills, confidence (self-efficacy), AI learning, and employment outcomes. The interviewees repeatedly emphasized that a combination of technical skills, soft skills, and digital literacy better prepared them for the labor market and increased their chances of getting hired.

Theme 1. Resource-Based Skills

Graduates highlighted that educational experiences and training programs helped them develop technical and interpersonal skills. Technical competencies such as digital literacy, software use, and problem-solving skills are considered required for employability. At the same time, soft skills, such as communication, teamwork, and collaboration, were mentioned numerous times as useful in work environments. Respondents also mentioned the increased role of AI and online resources, specifically, the use of ChatGPT, to enhance productivity and aid in job preparation. The above findings indicate that resource-based skills can be used as a source of career readiness.

Theme 2. Confidence (Self-Efficacy)

The second theme was on the significance of self-confidence in the transition from education to employment. Participants reported that after gaining exposure through internships and training, they felt more confident in their job search, job interview preparation, and adjustment to the workplace. Graduates also reported enhanced decision-making skills regarding career and professional objectives. The findings show that self-efficacy is a key factor in helping graduates cope with employment challenges and seek appropriate career opportunities.

Theme 3. AI Learning

The theme of AI learning among graduates has become highly relevant in modern times. The respondents were mindful of the growing presence of AI in contemporary workplaces and the need to continually refresh their knowledge. The majority of graduates have indicated that they have been using AI-based tools to enhance efficiency, streamline tasks, and improve learning experiences. Lifelong learning and flexibility were perceived as necessary for competitiveness in a changing digital workplace. Overall, AI learning was found to improve skills and professional confidence.

Theme 4. Employment Outcomes

The final theme was the positive impact of skills, confidence, and AI learning on employment outcomes. Graduates said they felt better equipped to work, better able to secure employment, and better positioned for career growth. The respondents linked their employability to the combination of technical, soft, and AI skills they gained through their education and training. The results indicate that a set of resource-based capabilities and self-efficacy enhances graduates' career preparation and facilitates lifelong professional growth.

5. Discussion

The findings of the current study demonstrate that resource-based skills, such as technical competencies, soft skills, and digital literacy, are important contributors to graduates' employability and work readiness. The participants highlighted that communication, teamwork, and practical digital skills helped them successfully enter the job market. These results are consistent with the existing literature, indicating that employability is closely linked to transferable skills and self-development (Ingusci et al., 2026; Bhattacharya & Chawla, 2026). In addition, the findings confirm the Resource-Based View (RBV), which posits that valuable, flexible skills are strategic resources that increase career competitiveness and contribution to an organization. Graduates who honed technical and interpersonal skills said they were better prepared to face interviews and internships, and to adapt to the workplace. This implies that institutions of higher learning are critical in equipping students with balanced competencies aligned with labor market demands.

The other significant result was the increased contribution of AI learning and self-efficacy to employment outcomes. Respondents admitted that knowledge of AI applications like ChatGPT enhanced productivity, learning speed, and self-confidence in their professional work. Life-long learning and flexibility were also viewed as key

to the future career advancement of AI-based workplaces. Such results are in line with current studies indicating that AI-related learning positively contributes to occupational self-efficacy, employability, and career resilience among graduates (Jia & Tu, 2024; Zhang et al., 2025). In addition, the research found that confidence gained during internships, interview preparation, and practical exposure positively influenced career decision-making and job acquisition among graduates. Therefore, the development of AI literacy, hands-on learning, and confidence-building practices in the higher education curriculum can enhance graduates' preparedness to join the fast-paced digital workforce.

6. Conclusion

This paper concludes that resource-based skills, self-efficacy, and AI learning are interconnected and significantly impact graduates' employment outcomes. The findings show that technical skills, soft skills, and digital competencies enhance graduates' workforce preparedness, whereas confidence gained through practical experience strengthens their ability to navigate and adapt to the labor market. Furthermore, the awareness and use of AI tools facilitate lifelong learning, productivity and career development amid an increasingly digital work environment. Altogether, the researcher emphasizes the need to incorporate skill training, experiential learning, and AI literacy into higher education programs to enhance graduates' employability and long-term career success.

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Trending research topics on Outcome Based Education in Bangladesh: a bibliometric analysis based on Scopus data (1990-2026)

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Abstract
This study looks at publishing patterns, active contributors, important publications, and popular research topics in the field of outcome based education in Bangladesh. This study examined 470 Scopus papers between 1990 and 2026 to identify patterns, top articles, and trending topics. In this paper, the bibliometric analysis approach is carried out using R software. The study shows the yearly count of scientific articles published over a 36-year span (1990–2026). This study illustrates an analysis based on Bradford's Law, a bibliometric method employed to pinpoint the most significant or "core" journals within a particular research domain. PLOS ONE is the leading journal in this collection, accounting for 41 articles (about 32% of all essential articles). Bangladesh leads in overall articles (169, 36%), but has a moderate international collaboration rate (42.6% MCP). The study depicts that PROST A, 2013, LANCET has the most total citations (470) but a lower TC per Year (33.57).

Keywords: Outcome Based Education, Bibliometric Analysis, Scopus, R Software

1. Introduction
Outcome-Based Education (OBE) has become a commonly embraced framework in global educational systems, especially within vocational training programs (Levatino et al., 2024). OBE focuses on aligning curriculum, teaching methods, and assessments with well-defined learning outcomes (Zhao et al., 2023). Instead of mainly emphasizing instructional inputs like teaching hours or teacher qualifications, OBE prioritizes more on the abilities, understanding, and qualifications that students are anticipated to accomplish (Yongliang, 2023).

2. Objectives and Methodology
This study looks at publishing patterns, active contributors, important publications, and popular research topics in the field of outcome based education in Bangladesh. This study examined 470 Scopus papers between 1990 and 2026 to identify patterns, top articles, and trending topics. In this paper, the bibliometric analysis approach is carried out using R software.

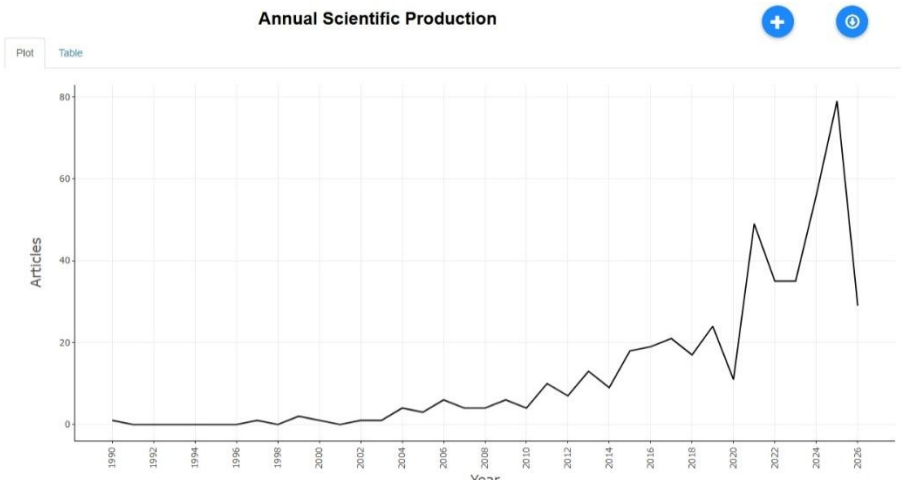
3. Results


Fig.1 Trend

The provided image is a line graph named "Annual Scientific Production," showing the yearly count of scientific articles published over a 36-year span (1990–2026). Here is a comprehensive analysis of the data patterns:

Overview of General Trends
1990 – 2003 (Dormant Phase): For more than ten years, research productivity in this particular area was almost absent, varying from 0 to 2 publications annually.
2004 – 2014 (Early Growth Phase): A slow yet erratic increase starts to take shape. The output remains under 15 articles each year, yet the "baseline" of research begins to increase.
2015 – 2020 (Acceleration Phase): Research interest increases notably, peaking at around 24 articles in 2019 before a sudden, brief decline in 2020 (possibly connected to global changes in research priorities during the pandemic).

Recent Increase (2021 – 2025)
The graph's most notable aspect is the exponential increase that began in 2021:
2021: A significant rise to almost 50 articles.
2024 – 2025 (Peak): The field attains its highest level in 2025 with around 78–80 articles published. This indicates a dynamic or swiftly advancing area of research.

The chart indicates a significant decrease in 2026, falling to roughly 30 articles.

TABLE 1 TOP JOURNALS

Journals	Rank	Freq
PLOS ONE	1	41
BMJ OPEN	2	21
BMC PUBLIC HEALTH	3	13
JOURNAL OF HEALTH, POPULATION AND NUTRITION	4	12
BMC PREGNANCY AND CHILDBIRTH	5	10
HEALTH SCIENCE REPORTS	6	7
TRIALS	7	7
BMJ OPEN	8	6
BMC HEALTH SERVICES RESEARCH	9	5
BMC PEDIATRICS	10	5

This table illustrates an analysis based on Bradford's Law, a bibliometric method employed to pinpoint the most significant or "core" journals within a particular research domain. The table identifies the journals located in Zone 1, recognized as the Nucleus or core zone. Bradford's Law states that a research area is usually segmented into three zones, with each zone containing approximately one-third of all articles. Zone 1 includes a limited number of very productive journals that release the largest share of the literature. PLOS ONE is the leading journal in this collection, accounting for 41 articles (about 32% of all essential articles). This indicates that the research field has a significant footprint in extensive, multidisciplinary open-access publishing.

TABLE 2 CONTRIBUTING COUNTRIES

Country	**Articles**	**Articles %**
BANGLADESH	169	36
USA	61	13
AUSTRALIA	35	7.4
UNITED KINGDOM	34	7.2
CANADA	15	3.2
JAPAN	12	2.6
INDIA	11	2.3
MALAYSIA	8	1.7

SWEDEN	6	1.3
ITALY	5	1.1

This table displays bibliometric statistics on scientific publications, most likely from a certain research subject or journal set, and highlights the involvement of related authors by country. Bangladesh leads in overall articles (169, 36%), but has a moderate international collaboration rate (42.6% MCP). The United States and Australia have very high collaboration rates (75.4% and 77.1% MCP, respectively), which means that the majority of their research is conducted with overseas collaborators. Japan and Sweden have the greatest rates of collaboration among the listed countries (83.3% each). Italy is an outlier: all five articles are SCP (0% MCP), indicating no international co-authorship in this collection.



Fig.2 Word Cloud

This WordCloud offers a visual representation of the most commonly occurring keywords or "Medical Subject Headings" (MeSH terms) present in the dataset. The dimensions of each word correspond to how often it appears, thereby emphasizing the primary themes of the study. According to this visualization, the research corpus focuses on Public Health and Epidemiology in Bangladesh.

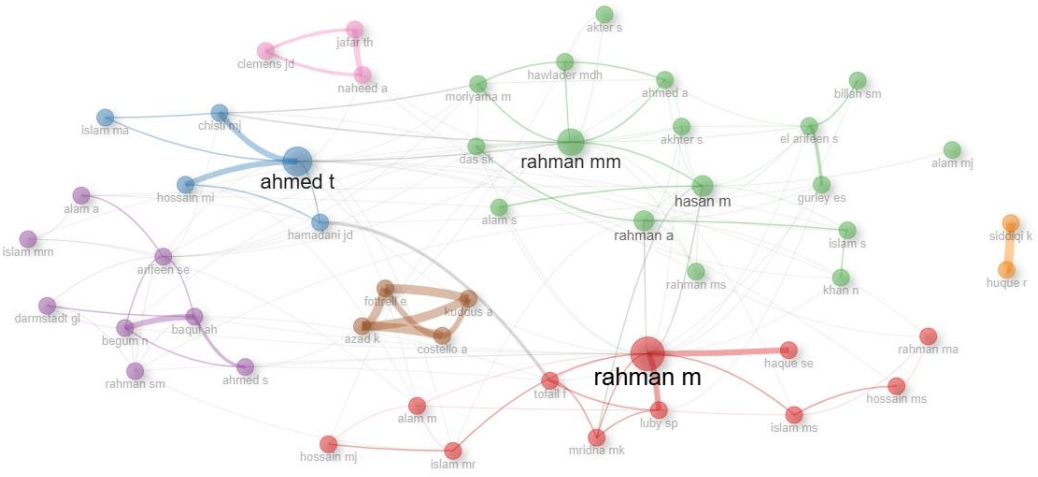


Fig.3 Author Collaboration

This image illustrates a Collaboration Network (commonly referred to as a Co-authorship Network), which charts the social and professional relationships among researchers within a particular discipline. The "Core" (Red, Green, Blue): These clusters are deeply interrelated. There is notable "cross-pollination" among Rahman M, Rahman MM, and Ahmed T, suggesting a cohesive scientific community. The Brown Cluster (Kuddus A, Costello A, Azad K): This is a closely connected group with strong ties, indicating a specialized sub-unit or a particular significant project (e.g., an extensive clinical trial) where these authors collaborated almost exclusively. Isolated Clusters (Pink and Orange): The Pink cluster (Clemens JD, Jafar TH, Naheed A) remains connected to the central

network but is somewhat on the outskirts. The Orange group (Siddiqi K, Huque R) is entirely separated from the primary entity, signifying a self-sufficient research unit.

TABLE 3 TOP CITED PAPERS

Paper	Total Citations	TC per Year	Normalized TC
PROST A, 2013, LANCET	470	33.57	4.95
VOLGMAN AS, 2018, CIRCULATION	426	47.33	9.34
HAIDER R, 2000, LANCET	321	11.89	1.00
KHAN K, 2012, NEUROTOXICOLOGY	221	14.73	4.32
PSAKI SR, 2014, POPUL HEALTH METR	216	16.62	3.63
JAFAR TH, 2020, NEW ENGL J MED	214	30.57	6.29
HAMID MO, 2013, CURR ISSUES LANG PLANN	166	11.86	1.75
BHOPAL R, 2002, J PUBLIC HEALTH MED	148	5.92	1.00
GAZIANO TA, 2015, LANCET GLOBAL HEALTH	139	11.58	4.93
ABOUD FE, 2011, PEDIATRICS	133	8.31	2.77

The table depicts that PROST A, 2013, LANCET has the most total citations (470) but a lower TC per Year (33.57) than the second paper, due to its earlier publication date (2013 vs. 2018). VOLGMAN AS, 2018, CIRCULATION boasts the highest TC per Year (47.33) and the highest Normalized TC (9.34), indicating it is particularly impactful compared to its discipline and year. Studies such as HAIDER R, 2000, LANCET and BHOPAL R, 2002, J PUBLIC HEALTH MED have a Normalized TC of 1.0, indicating the baseline (average anticipated citation impact for their field/year). JAFAR TH, 2020, NEW ENGL J MED shows robust TC per Year (30.57) and elevated Normalized TC (6.29), suggesting swift influence even though it is relatively new. HAMID MO, 2013 has a moderate overall citation count (166), yet its Normalized TC stands at 1.75, just a bit above the average.

4. Conclusion

Outcome come based education one of the emerging topics in education sector. Based on data set, the study depicts publication trends, top contributing countries, most cited papers, top publishing journals, collaborating authors and emerging key words based on word clouding.

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Outcome-Based Capstone Project Evaluation Aligned with Program Outcomes and Rubrics

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Abstract
Assessment methods that may accurately gauge students' acquisition of technical, professional, and ethical abilities are necessary for the successful use of Outcome-Based Education (OBE) in engineering programs. The capstone project offers the perfect setting for assessing these results since it is the final academic endeavor. However, there is frequently a lack of openness, uniformity, and clear connection to program learning objectives in traditional grading procedures. This paper presents an outcome-based performance evaluation approach using rubric-based assessment of capstone projects implemented in the Department of Electrical and Electronic Engineering at Eastern University. The proposed framework methodically matches Bloom's Taxonomy levels, professional qualities, complex engineering issue characteristics, and Course Outcomes (COs) with Program Outcomes (POs). Report writing, oral defense, ethical compliance, sustainability issues, and teamwork are all evaluated using structured rubrics. The assessment results facilitate ongoing quality improvement and provide for quantitative outcome achievement analysis. The suggested rubric-driven approach promotes higher-order learning, problem-solving skills, and professional responsibility among graduate engineers while guaranteeing fairness, measurement validity, and accreditation preparation.

Keywords: Outcome-Based Education, Capstone Project, Rubric-Based Assessment, Course Outcomes, Program Outcomes, Engineering Accreditation

1. Introduction

The paradigm shift from traditional education models toward Outcome-Based Education (OBE) has fundamentally redefined curriculum design, teaching strategies, and assessment practices in engineering education. While conventional assessment systems emphasize content coverage and examination performance, OBE focuses on measurable learning outcomes that graduates must demonstrate upon completion of a program. These outcomes typically include technical competence, problem-solving skills, communication ability, ethical awareness, teamwork, and lifelong learning capacity.

The final-year capstone project represents a critical component of undergraduate engineering programs, providing students with an opportunity to integrate theoretical knowledge with real-world problem-solving. Capstone projects are expected to address complex engineering problems, apply modern engineering tools, manage constraints, and evaluate societal, environmental, and ethical impacts. Consequently, capstone assessment must be structured, transparent, and explicitly aligned with predefined learning outcomes. The paper presents a rubric-driven outcome-based framework for capstone projects that enables systematic, quantitative performance assessment for accreditation-oriented quality improvement; however, it is limited to evaluation and outcome measurement and does not address the structured development or implementation process of capstone projects [1]. The study proposes a framework combining accreditation checks and student surveys to evaluate an integrated civil engineering design project [2]. The paper proposes a generic OBE-aligned framework with CO-PO mapping and rubric-based evaluation for systematic assessment of undergraduate engineering final-year projects; however, the framework does not explicitly incorporate or assess complex engineering problems and complex engineering activities as defined in contemporary accreditation standards [3]. The study empirically demonstrates that capstone project participation significantly enhances students' communication, teamwork, and interpersonal skills [4]. The paper presents a structured design and evaluation methodology for multidisciplinary robotics capstone projects, validated through a year-long robot case study [5]. The rubric is limited in Washington Accord compliance as it does not explicitly assess complex engineering problems and fails to cover the full spectrum of graduate attributes beyond investigation and communication [6]. Despite being ABET-aligned, the methodology in [7] lacks clear Washington Accord mapping, does not thoroughly evaluate intricate engineering difficulties and trade-offs, and offers scant proof of thorough attribute coverage and strong CQI. The model does not explicitly align with the Washington Accord's 12 Graduate Attributes; instead, it is solely based on ABET (1–7) outcomes linked to PLOs [8].

However, capstone evaluation is often challenged by subjective judgment, inconsistent grading standards, and weak traceability between assessment criteria and program outcomes with Washington Accord compliance. To address these challenges, the Department of Electrical and Electronic Engineering (EEE) at Eastern University has adopted a rubric-based, outcome-aligned assessment framework for capstone projects. This paper presents the structure, implementation, and benefits of this rubric-based outcome evaluation approach.

2. Capstone Project Structure under OBE Framework

Under the OBE framework, the capstone project is designed as a three-semester course conducted individually or in groups of up to three students under faculty supervision. The project is explicitly formulated to solve a complex engineering problem using knowledge and skills acquired throughout the undergraduate program.

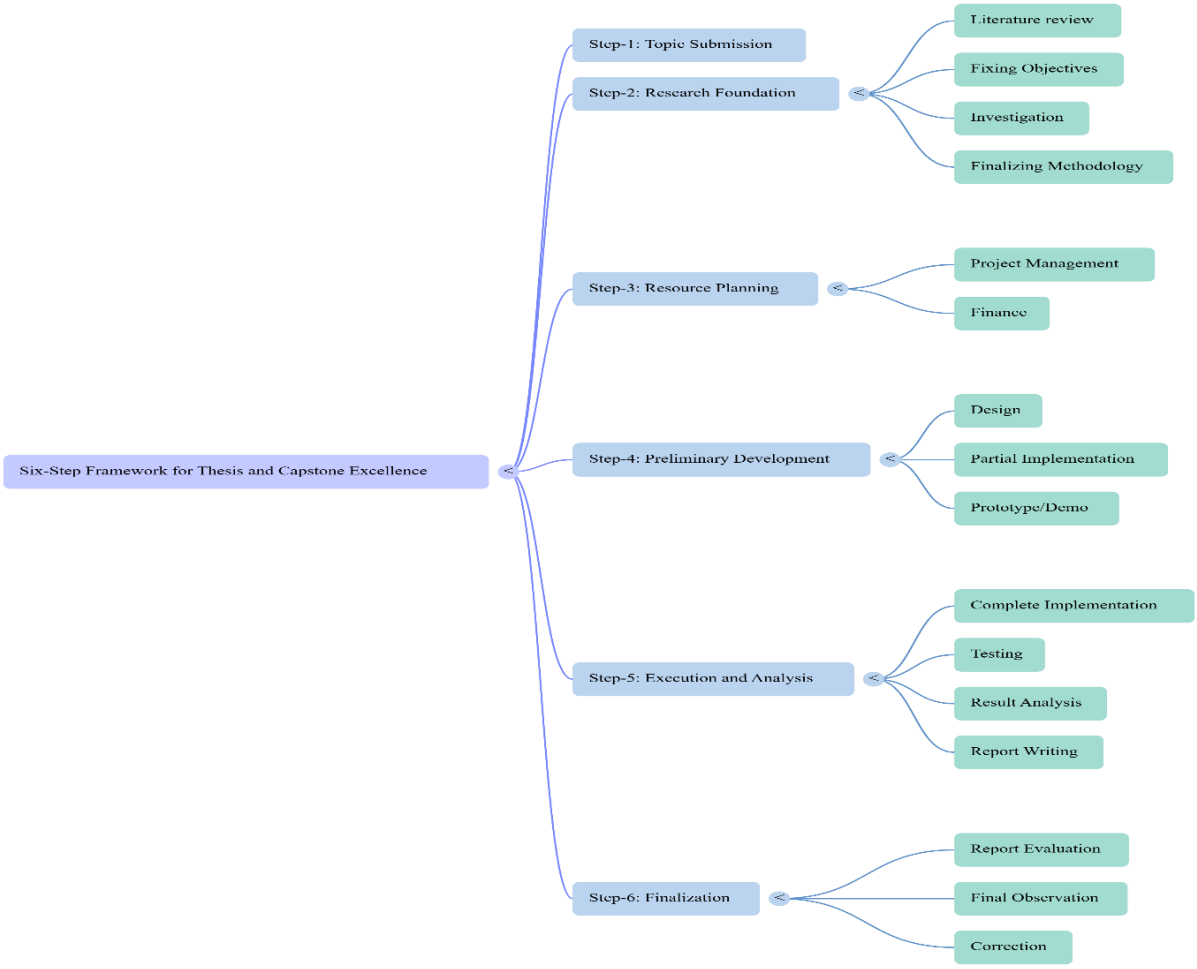


Fig.1 Proposed OBE Framework

The project development process follows a structured sequence of stages, beginning with topic selection and approval, followed by a comprehensive literature review and the finalization of the methodology. This is succeeded by project planning and financial estimation, after which the design phase and partial implementation are carried out. The process then advances to complete implementation, testing, and detailed result analysis, and concludes with final evaluation and necessary corrections. Throughout all these stages, continuous monitoring is maintained to ensure steady outcome progression and consistency in performance.

3. Rubric-Based Assessment Methodology

3.1 Alignment with Outcomes and Bloom's Taxonomy

The table presents a structured mapping of Course Outcomes (COs) with corresponding Program Outcomes (POs), Bloom's Levels (BL), and relevant attributes of complex engineering problems and activities. It also outlines the associated delivery methods and assessment tools adopted to ensure measurable attainment of learning outcomes. The integration of cognitive, psychomotor, and affective domains reflects a comprehensive outcome-based

education (OBE) approach. Furthermore, the framework ensures continuous monitoring and alignment of teaching-learning activities with assessment strategies to support systematic performance evaluation and quality improvement.

TABLE 1 CO-PO MAPPING, DELIVERY METHODS, AND ASSESSMENT FRAMEWORK

COs	Statements	PO	BL	WP	EA	Delivery Methods and Activities	Assessment Tools
CO1	Review and analyze the problem to identify possible solutions	2	C2				
CO2	Identify a contemporary challenging problem whose solution can be designed, developed and verified	12	P1				
CO3	Conceptualize design solution of an engineering design to a defined end state	3	C3	1,2,3			
CO4	Perform technical investigation and analysis of the proposed design	4	A2				
CO5	Plan a project and perform different interdisciplinary tasks of project management	11	P2			Demonstration/Tutorial/Self Study	Report Writing/Oral Presentation/Log book
CO6	Apply ethical principles, standards and professional engineering code of ethics	8	A3				
CO7	Incorporate the use of modern engineering tools in the design, and verification Processes	5	P2	1,2,3			
CO8	Work effectively in a team	9	P1				
CO9	Write professional technical report related to the project and orally present project results	10	P1		1,2,3		
CO10	Evaluate the sustainability impact on the design solution	7	A3				
CO11	Assess the impact of the project and the product on societal, health, safety, legal and cultural issues	6	A3				

3.2 Assessment Components and Weight Distribution

In TABLE 2 distributes evaluation across multiple components, including report writing, presentation, ethical compliance, and continuous assessment, ensuring both technical depth and professional skill development. The weighting scheme emphasizes outcome-based evaluation by aligning specific report sections (e.g., literature review, methodology, and results) with measurable competencies. Additionally, the inclusion of ethical issues and peer evaluation ensures holistic assessment, covering technical, societal, and professional dimensions.

TABLE 2 CAPSTONE PROJECT ASSESSMENT COMPONENTS AND THEIR WEIGHT DISTRIBUTION

Assessment Method	CO	PO	BL	WP	EA	Components	Distribution (%)
Report Writing	1	2	C2			Chapter: Literature Review	10
	2	12	P1			Chapter: Methodology (Explanation and selection of methodology)	10
	3	3	C3	1,2,3		Chapter: Methodology (Design of proposed solution)	10
	7	5	P2	1,2,3		Chapter: Methodology (Simulation file for thesis and/or demonstration for project)	10
	5	11	A3			Chapter: Methodology (work activities plan and financing plan)	10
	4	4	A2			Chapter: Result & Discussion (Result Analysis)	10
	10	7	P2			Chapter: Result & Discussion (Explanation on impact on societal, safety and other issues	5
	11	6	P1			Chapter: Result & Discussion (Explanation on cost effective and environmental issues)	5
Presentation	9	10	P1		1,2	Final Defense	10

Ethical Issues	6	8	A3	Report checking, Similarity Index, Data validation	10
Continuous Assessment	8	9	A3	Log book data and peer evaluation form	10
Total					100

The assessment structure allocates 70% weight to report writing, 10% to oral presentation and defense, 10% to ethical and professional issues, and 10% to continuous assessment and teamwork, ensuring a comprehensive evaluation framework with a total of 100%.

3.3 Rubric Design and Performance Levels

Rubrics evaluate students across multiple dimensions including literature review quality, design methodology, technical investigation, result interpretation, sustainability analysis, and societal impact assessment. Each descriptor in TABLE 3 clearly defines expected performance levels, minimizing evaluator subjectivity and improving grading consistency.

TABLE 3 MARKING RUBRIC OF THESIS/PROJECT REPORT

G. No: Category	ID: COs, PO and Section	Title: Outstanding (Up to 100%)	Very Good (Up to 80%)	Good (Up to 70%)	Poor (Up to 50%)
(10) Literature Review & Analysis	CO1, PO2 Chapter: Literature review and Critical analysis	Presents a well-organized review of previous works covering most recent publication with critical analysis and valid conclusion of existing work.	Presents somewhat well-organized review of previous works covering most recent publication with critical analysis and valid conclusion of existing work.	The literature review does not cover sufficient existing literature and/or recent work with insufficient critical analysis and conclusion.	Unable to clarify the understanding of the problem.
(10) Investigation on Methodology	CO2, PO12 Chapter: Methodology (investigation & Explanation on Methodology)	Outstanding investigation on available methods has been conducted and appropriate method has been chosen for the solution of stated problem.	Very good investigation on available methods has been conducted and appropriate method has been chosen for the solution of stated problem.	Good investigation on available methods has been conducted and appropriate method has been chosen for the solution of stated problem.	Poor investigation on available methods has been conducted and appropriate method has been chosen for the solution of stated problem.
(10) Development of Solution	CO3, PO3 Chapter: Methodology (Design)	Outstanding solution of stated complex engineering problem has been designed.	Very good solution of stated complex engineering problem has been designed.	Good solution of stated complex engineering problem has been designed.	Poor solution of stated complex engineering problem has been designed.
(10) Investigation on obtained results	CO4, PO4, Chapter: Result & Discussion	Outstanding analysis and interpretation on obtained results or data has been provided.	Very good analysis and interpretation on obtained results or data has been provided.	Good analysis and interpretation on obtained results or data has been provided.	Poor analysis and interpretation on obtained results or data has been provided.
(10) Project Management	CO5, PO9 Chapter: Methodology (Project management and Finance)	Outstanding project management and financial budget have been demonstrated.	Very good project management and financial budget have been demonstrated.	Good project management and financial budget have been demonstrated.	Poor project management and financial budget have been demonstrated.
(10) Modern tool use	CO7, PO5 Chapter: Methodology (Explanation on physical, prototyping and software tools)	Identify the hardware tools (physical and prototyping) and software tools that may be used in the development of the design with a critical discussion on how these tools will benefit the design.	Identify the hardware tools (physical and prototyping) and software tools that may be used in the development of the design with some basic discussion provided to support the tool selection.	Identify the hardware tools (physical and prototyping) and software tools that may be used in the development of the design with some supporting documentation	Only rudimentary tools were identified for possible used in the design with no supporting documentation.
(5) Discussion on environmental effect	CO10, PO7 Chapter: Result & Discussion	Demonstrates an advanced understanding of the concept of sustainability and shows an ability to apply this understanding to	Demonstrates a proficient understanding of the concept of sustainability and shows a clear understanding of the sustainability	Demonstrates a developing understanding of the concept of sustainability and shows some awareness of the sustainability	Demonstrates a basic understanding of the concept of sustainability and recognizes some of the sustainability considerations

G. No:	ID:	Title:			
		evaluate the sustainability of engineering solutions	considerations related to the engineering problem	considerations related to the engineering problem	related to the engineering problem
(5) Discussion on safety, societal and other issues	CO11, PO6 Chapter: Result & Discussion	Demonstrates an advanced knowledge and understanding of the societal, health, safety, legal and cultural issues related to the context in engineering solutions	Demonstrates a proficient knowledge and understanding of the societal, health, safety, legal and cultural issues related to the context in engineering solutions	Demonstrates a developing knowledge and understanding of the societal, health, safety, legal and cultural issues related to the context. May lacks depth or breadth of understanding	Demonstrates minimal knowledge and understanding of the societal, health, safety, legal and cultural issues related to the context in engineering solutions
					Total Mark (70)

4. Conclusion

This paper presented an outcome-based performance evaluation approach using rubric-based assessment of capstone projects within an undergraduate EEE program. By systematically aligning assessment criteria with course outcomes, program outcomes, Bloom's Taxonomy levels, and complex engineering attributes, the framework ensures valid, transparent, and comprehensive performance evaluation. The methodology strengthens BAETE accreditation compliance, enhances learning outcome measurement, and supports continuous quality improvement. The proposed approach can be readily adapted by other engineering programs pursuing structured and outcome-driven capstone assessment practices.

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Outcome-Based Assessment of an Undergraduate Analog Electronics-II Course with CQI Integration

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Abstract
An outcome-based assessment (OBA) framework for an undergraduate Analog Electronics-II (EEE-233) course is presented in this study. The study incorporates procedures for Continuous Quality Improvement (CQI), alignment with Program Outcomes (POs), and Course Outcome (CO) attainment analysis. Formative and summative assessment instruments were used to examine three COs. The findings show a range of attainment levels: at the Spring 2024 trimester, CO3 achieved high attainment (73.68%), CO1 moderately attained (52.63%), and CO2 not attained (15.79%). Gaps in necessary knowledge, assessment alignment, and problem-solving abilities were found using root cause analysis. These results led to the proposal of tailored CQI techniques. The study shows how evidence-based improvement in engineering education can be facilitated by structured OBE implementation.

***Keywords**:* Outcome-Based Education (OBE), Course Outcome (CO), CQI, Analog Electronics, Assessment, Accreditation

1. Introduction

Since Bangladesh became a full signatory to the Washington Accord through the Board of Accreditation for Engineering and Technical Education (BAETE), the implementation of Outcome Based Assessment (OBA) has been a major focus of academic institutions in Bangladesh, particularly among engineering departments. Outcome-Based Education (OBE) emphasizes the achievement of measurable learning outcomes and alignment with accreditation requirements such as Washington Accord principles. In engineering education, OBE ensures that students acquire analytical, design, and problem-solving competencies. Curriculum consists of Basic Sciences, Engineering Sciences, Humanities and Social Sciences, Program Core, Program Electives, Open Electives, Capstone Project and Professional Training. Several studies have reported the assessment of Course Outcomes (COs) across diverse disciplines such as Data Structures, Engineering Chemistry, Microcontrollers, automated assessment systems, Control Systems, and Engineering Ethics [1-6]; however, these works often lack a structured and systematic approach toward Continuous Quality Improvement (CQI). The Analog Electronics-II (EEE-233) course is a core second-year course focusing on operational amplifiers, oscillators, feedback circuits, and active filters. The course aims to develop both analytical and design-based competencies through structured learning outcomes. This study presents a case-based implementation of OBA in this course, incorporating assessment mapping, attainment measurement, and CQI-based improvement. Complete instructions for determining the accomplishment utilizing a suitable choice of direct and indirect methods to measure COs and POs are provided in the publication [7]. A framework for direct and indirect evaluation techniques to gauge Course Outcome (CO)–Program Outcome (PO) attainment in an Engineering Physics course is provided in article [8]. In order to get student input, the study uses course exit surveys for indirect assessment. Although CO attainment levels are given, the research does not place enough emphasis on root cause analysis to find gaps where results fall short of benchmark targets. Implementing a successful Continuous Quality Improvement (CQI) method requires this kind of study. Additionally, the accepted methodology has inherent limitations even though it offers valuable insights through surveys and assessment-based evaluations. The validity and reliability of the assessment results may be impacted by bias, especially if self-reported data is used.

2. Course Design under OBE Framework

2.1 Course Overview

Electronics is a major force behind contemporary technology, giving other scientific fields tremendous energy and serving as a game-changing instrument in the present day. This course aims to give students a solid foundation in the design and analysis of electronic circuits while introducing them to a significant area of electronics. Understanding operational amplifier characteristics and using them to analyze and construct basic circuits as well as creating amplifier circuits that adhere to specifications are the main goals of the course. Additionally, it highlights the application of analog filters for efficient signal conditioning, the research of frequency response in power amplifiers and circuits, and the analysis of linear oscillator circuits to ascertain gain and bandwidth.

2.2 Course Outcomes (COs)

The course outcomes (COs) are systematically aligned with program outcomes (POs) and categorized according to Bloom's cognitive levels, ranging from understanding to creation shown in TABLE 1. CO1 focuses on conceptual understanding of analog electronic circuits, while CO2 emphasizes analytical and design skills. CO3 addresses higher-order design capabilities through active filter synthesis. Each CO is supported by structured teaching–learning strategies, including lectures and problem-solving sessions, and is evaluated using both continuous and summative assessment tools to ensure comprehensive outcome measurement. To fully measure student performance, the course uses both formative and summative evaluation techniques. While the final exam is the main summative evaluation, ongoing assessment is carried out through midterm and class assessments to track students' continued comprehension. Students' practical abilities, analytical aptitude, and proficiency in applying theoretical knowledge to actual circuit design problems are also evaluated through assignments and design-oriented tasks.

TABLE 1 COURSE OUTCOMES (COs)

CO No.	CO statement	Corresponding PO No.	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
1	Explain the properties and operation of basic op-amp circuits, Oscillators, Feedback and Power Amplifiers	1	Cognitive/Understand	Lecture, solving problems, Q/A	Class Test, Mid and Final Exam
2	Analyze and design op-amp circuits	1	Cognitive/ Analyze	Lecture, solving problems, Q/A	Class Test, Mid and Final Exam
3	Design active analog filters using op-amp IC to meet required specifications	3	Cognitive/ Create	Lecture, solving problems, Q/A	Assignment/Project, Final Exam

3. Outcome Assessment Methodology

3.1 CO Attainment Calculation

The Course Outcome (CO) attainment is calculated using a structured direct assessment approach by mapping individual assessment components-such as quizzes/assignments, midterm, and final examinations to specific COs. For each CO, student performance is aggregated from all relevant questions linked to that outcome, and the obtained marks are compared against a predefined threshold, typically set at 50% of the allocated marks. The attainment level is then determined based on the percentage of students achieving this threshold. In addition, a weighted aggregation is applied, where continuous assessment components (quizzes and assignments) contribute 20%, and summative assessments (midterm and final examinations) contribute 80% to the overall CO attainment. This approach ensures a balanced evaluation of both continuous learning and final performance. Furthermore, attainment levels are categorized into Low, Medium, and High based on predefined rubrics, and the final CO attainment is expressed as the percentage of students meeting or exceeding the threshold level, enabling quantitative analysis for continuous quality improvement

TABLE 2 STUDENT WISE CO ATTAINMENT

			CO Wise Percentage of Attainment		
		Program Outcomes (POs)	1	1	3
		Course Outcomes (COs)	CO1	CO2	CO3
		Marks Allocated	33%	17%	50%
Sl.	**SID**	**Name**	**Percentage of Attainment**		
1	183400059	Ahmed Saiful Islam	27%	0%	0%
2	191800044	Md. Osman Sheikh	100%	0%	80%
3	193400006	Md. Shazid Sharier	0%	0%	0%
4	201400029	Amana Khatun Lima	100%	100%	100%
5	201400032	Papry Sarkar	20%	0%	100%

6	201400065	Md. Estiaque Ahmed Evan	0%	0%	0%
7	201410013	Md. Jaber Khan	0%	0%	0%
8	202400007	Rudra Dipta Pandit	100%	33%	100%
9	223800001	S. M. Shaidul Islam Shohagh	20%	0%	100%
10	223800003	Shariful Islam	47%	0%	73%
11	223800004	Samiya Akter Jarin	100%	100%	100%
12	223800005	Md. Elius Hossen	100%	0%	80%
13	223800006	Md. Khairul Alam	100%	33%	100%
14	223800007	K. S. M Imran Shorif	100%	67%	20%
15	223800009	Md. Hafizur Rahman	100%	33%	100%
16	223800014	Meer Abdullah Al Arif	100%	33%	100%
17	223800015	Md. Kawsar Ali	73%	0%	100%
18	223800016	Md. Saiful Islam	20%	0%	100%
19	223810044	Nirupam Chakma	20%	0%	100%

The CO-wise attainment analysis reveals strong student performance in CO3, moderate attainment in CO1, and significantly low performance in CO2, indicating a major learning gap in analytical and design skills that requires focused improvement.

3.2 CO Attainment Results

The figure 1 presents a comparative analysis of Course Outcome (CO) attainment based on a predefined threshold (50%), showing the percentage of students who fall below the threshold (red bars) and those who are equal to or above the threshold (green bars) for each CO.

From the figure 1, it can be observed that:

- CO1 demonstrates a relatively balanced performance, where approximately 52-53% of students achieved or exceeded the threshold, while about 47% remained below it, indicating marginal attainment.
- CO2 shows the weakest performance among all outcomes, with a significantly high proportion (around 80-85%) of students below the threshold and only a small fraction achieving the required level, indicating that this outcome is not attained and requires significant improvement.
- CO3 exhibits the strongest performance, where nearly 70-75% of students meet or exceed the threshold, and only a small percentage fall below it, indicating that this outcome is successfully attained with a high level of proficiency.

Overall, the figure clearly highlights the disparity in attainment levels across different COs, emphasizing the need for targeted corrective actions, particularly for CO2, while maintaining the effective teaching strategies used for CO3.

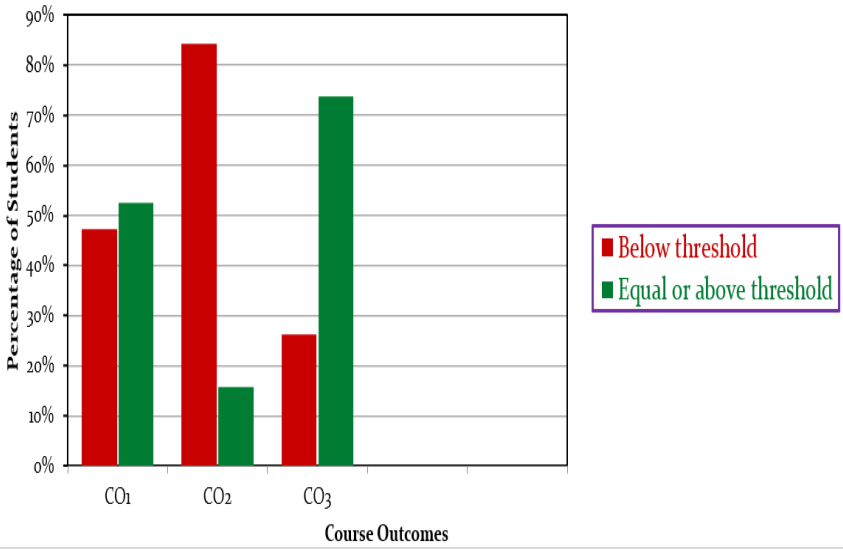


Fig.1 CO attainment for Electronics-II course

4. Root Cause Analysis

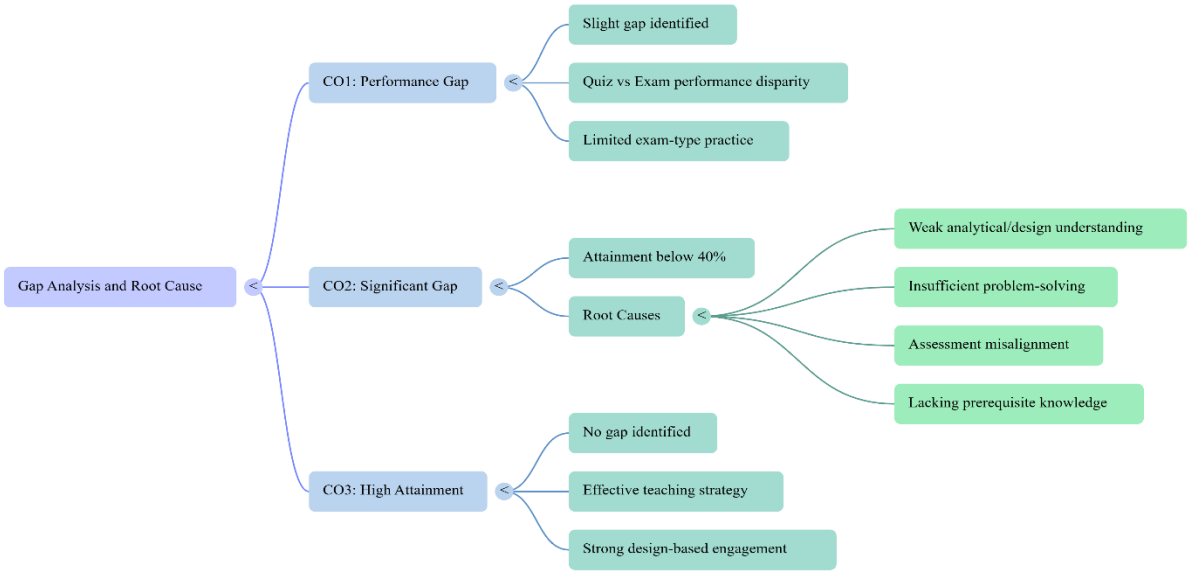


Fig. 2 Map for structured gap analysis highlighting varying levels of CO attainment

The figure 2 illustrates a structured gap analysis highlighting varying levels of CO attainment and their underlying causes. CO1 shows only a slight performance gap, primarily due to disparities between quiz and exam performance and limited exposure to exam-oriented practice. In contrast, CO2 exhibits a significant gap, where attainment falls below 40%, mainly due to weak analytical understanding, insufficient problem-solving skills, and misalignment of assessment strategies. On the other hand, CO3 demonstrates high attainment with no major gaps, reflecting effective teaching approaches and strong student engagement in design-based learning activities.

5. CQI-Based Improvement Actions

A set of targeted corrective actions has been proposed based on the identified gaps in CO attainment to improve the overall teaching-learning process shown in TABLE 3. For CO1, improvement measures focus on enhancing students' exam preparedness through increased exposure to exam-oriented problems, revision sessions, and structured question banks. For CO2, which exhibited significant underperformance, comprehensive interventions are planned, including remedial classes, regular tutorial sessions, step-by-step problem-solving guidance, improved alignment of assessment questions with CO objectives, and reinforcement of prerequisite knowledge. In contrast, for CO3, which demonstrated high attainment, the current effective instructional strategies will be maintained, with the addition of advanced design problems to further enhance higher-order learning skills. All corrective actions are categorized under the teaching–learning process and are to be implemented by the course instructor within defined timelines, ensuring a systematic approach to Continuous Quality Improvement (CQI).

TABLE 3 IDENTIFIED GAPS IN CO ATTAINMENT

CO No.	Corrective Actions	Action type	Responsible Person	Timeline
CO1	- Include more exam-oriented practice problems - Conduct revision classes before exams - Provide sample question banks	Teaching-learning process	Course Teacher	Next offering (SP25)
CO2	- Arrange remedial classes focusing on problem-solving - Increase tutorial sessions (weekly) - Provide step-by-step solved examples - Improve CO-aligned question design - Conduct prerequisite review sessions	Teaching-learning process	Course Teacher	Immediate & Next offering
CO3	- Continue current teaching approach - Introduce advanced design problems for further improvement	Teaching-learning process	Course Teacher	Continuous

6. Conclusion

This paper presented a complete OBA implementation for the Analog Electronics-II course. The results highlight that while conceptual learning outcomes are achieved, higher-order analytical skills require further improvement. The integration of CQI provides a structured mechanism for continuous enhancement. Future work includes post-implementation analysis to evaluate the effectiveness of corrective actions.

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E-Readiness and Practical Filmmaking Education: Exploring Knowledge, Skills and Learning Quality in Online Higher Education in Bangladesh

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Abstract
As Bangladesh advances its Digital Bangladesh vision, incorporating affordable e-learning has become crucial for expanding access to higher education, especially for students unable to attend face-to-face classes. With widespread mobile phone use and increasing access to technology, the country is well-positioned to adopt online and blended learning models. This study examines the link between institutional e-readiness and students' knowledge, skills, and attitudes toward online filmmaking courses at a private university in Dhaka. Using a quantitative survey, the research shows that students' filmmaking knowledge and skills significantly influence their perceptions of the quality of online, practice-based filmmaking courses. In contrast, access to technology and digital skills has a limited impact on the development of filmmaking abilities through online learning. These results highlight the importance of discipline-specific readiness in delivering effective online education in creative and practical fields such as filmmaking.

Keywords: E-Learning, E-Readiness, Filmmaking, Bangladesh

1. Introduction

E-learning is transforming education globally, especially in the Global South, where digital initiatives are often tied to broader development agendas. In Bangladesh, the government's long-standing Digital Bangladesh vision, launched in 2009, has recently evolved into the Smart Bangladesh initiative (2024), aiming to foster a knowledge-based society and strengthen digital inclusion. Within this context, exploring the country's readiness for online education is crucial to understanding both national ambitions and the challenges faced in practice-based learning environments. To achieve the vision, especially in education, the Ministry of Education, with UNESCO's support, has formulated the Master Plan for ICT in Education in Bangladesh (2012-2021). The chapter on higher education focuses on Internet facilities, digital libraries, ICT labs, professional development, research, and collaboration to improve the quality of teaching and learning. ICT-based distance learning also focused only on the Bangladesh Open University. Pedagogical approaches such as online or blended learning have not been mentioned in the plan. A review of the plan in 2018 shows the significant improvement achieved through another project, the Higher Education Quality Enhancement Project (HEQEP). The core responsible organisation for executing the plan, the University Grants Commission (UGC) of Bangladesh, fails to lead the field (Ministry of Education, 2019).

As a consequence, when Bangladesh faced the COVID-19 pandemic in March 2020, only a few private universities were able to switch to online teaching and learning from the very beginning (Alamgir, 2020). Higher education has stopped for most students. Under pressure from various stakeholders, UGC has begun work on an Online Education Learning Policy (Abdullah, 2020) and eventually approved the Blended Learning Policy for Bangladesh in February 2022 (UGC Bangladesh, 2022; Ujjwal K, 2022).

According to the Bangladesh Telecommunication Regulatory Commission (BTRC), Genilo (2018) reported a significant growth in Internet users in Bangladesh from 2000 to 2015. BTRC predicted that Facebook users would reach 3.48 million by December 2018, thereby increasing access to online resources. A 2016 survey by BBC Media Action found that all adults had access to a mobile phone, with smartphone and Internet usage rising from 10 per cent in 2014 to 16 per cent in 2016 (Hossain et al., 2017). Additionally, 75 per cent of urban youth have access to both (Genilo et al., 2018). Access to the Internet brings new possibilities for blended learning, online learning, and m-learning. These new e-learning approaches are student-centred, cost-effective, and flexible in terms of location and time. In the USA, 96 per cent of universities offer e-learning, and it is predicted that by 2020, more than 50 per cent of students will be educated through e-learning (Charmonman et al., 2009).

Readiness is crucial for success in e-learning. Bangladesh's higher education institutions should utilise an e-readiness scale to assess their strengths and weaknesses. Students may receive a better education at a reduced cost if e-learning is successfully implemented in higher education, and teachers may spend more time on their research after the initial semesters. National ICT policies must reflect e-learning pedagogy to be effectively implemented. Bangladesh is still struggling with the national e-learning policy. This study aims to address a knowledge gap by focusing on the pedagogy of filmmaking. Converting a skill-based course, such as filmmaking, into e-learning presents particular challenges. Teachers could better design filmmaking courses for online or blended learning by understanding the relationships among various e-learning variables.

The research objectives are detailed below:
1) To study the significance of the relationship between students' readiness, teachers' readiness, technology readiness, administrative readiness, and filmmaking knowledge relating to filmmaking practical courses through online learning in a private university in Bangladesh.
2) To study the significance of the relationship between students' readiness, teachers' readiness, technology readiness, administrative readiness, and filmmaking skills relating to filmmaking practical courses through online learning in a private university in Bangladesh.
3) To study the significance of the relationship between filmmaking knowledge, filmmaking skills, and students' attitudes to the quality of online learning relating to filmmaking practical courses in a private university in Bangladesh.

The study took place at the University of Liberal Arts Bangladesh, where the researcher has worked since 2012. The university's filmmaking program made it an ideal research setting. The target population included students experienced in online learning who had completed the courses Digital Cinematography and Fictional Narrative Production.

2. Literature Review and Hypotheses Development

In recent years, many researchers have contributed to shaping the new pedagogy by analysing the uses of e-learning from different aspects, such as its use at different educational levels, in different cultural contexts, problems and perspectives of e-learning in different contexts and levels, implementation of different assessment tools and techniques, impacts of e-learning on student learning outcomes, future of e-learning, best practices, etc. Catherall (2005) discussed the UK government's policy on e-learning in higher education. She argued that UK government policy has shifted from "a supply-based to a demand-based" system to be resilient to 21st-century needs. Mishra and Sharma (2005) listed 11 institutions in India that offer various e-learning programs. They recommended establishing the Indian Council for Online Learning (ICOL) and the e-learning consortium to monitor, accredit and promote e-learning. They also emphasised professional development programs for teachers to improve e-learning standards and effectiveness in India. Kanuka and Rourke (2006) concluded that e-learning can adapt to global competition, enhance learning quality, eliminate barriers, and boost profitability. E-learning can remove the barriers of time, place, and status that discourage part-time students or workers. Consequently, it changes campus culture.

Technological development shaped and reshaped e-learning from time to time, but the quality of education in e-learning depends mostly on choosing appropriate LMS (Fertalj et al., 2006), suitable CMS (Krouska et al., 2017), ICT technologies, and software (Drozdova et al., 2012) and multimedia elements (Simonics, 2013). At the technological level, new products are continually being developed to fully support ICT and their use in education (Drozdova et al., 2012). The institutional context also affects course design and can limit potential assessment methods through the management of the education system and decisions on resource availability. Therefore, the organisational structure is vital for the success of the e-learning program, which includes tutors, students, courses, and ICT (McPherson, 2002). Numerous articles have been written on the challenges associated with e-learning, which can be categorised into four main areas: 1) challenges related to course content and structure, 2) challenges stemming from the characteristics of individual students or teachers, 3) technological challenges, and 4) contextual challenges.

Mannan (2015), the Vice-Chancellor of Bangladesh Open University, claimed that the Government of Bangladesh is working on developing an e-learning policy. Chowdhury and Khatun (2013) argued that some private universities, such as BRAC University and South East University, had initiated a few academic and research programs through e-learning, in addition to the Bangladesh Open University. The major challenges identified in the above-mentioned academic works include a lack of policy and national strategy, an absence of a regulatory or accreditation body, a lack of professional development programs, high Internet costs, establishment and

maintenance costs, and weak ICT infrastructure in the country. One impactful experiment in Bangladesh was conducted by Khalil et al. (2012); however, the students found the e-learning experience interesting, pleasant, and different. This suggests that e-learning may be a viable alternative to traditional teaching and learning at private universities in Bangladesh. In response to this situation, most private universities began offering online instruction, a move also recommended by UGC ("UGC Urges Varsities to Conduct Online Educational Activities," 2020). Students and teachers have endeavoured to adapt to the new teaching and learning format, taking into account their capacity, experience, and feasibility.

2.1 The Relation between Students' Readiness, Teachers' Readiness, Technology Readiness, and Institution Readiness with Knowledge and Skills

E-learning is a teaching method that leverages information and communication technologies for efficient information transfer, aided by the rapid advancement of computer and electronic technologies (Offir & Lev, 1999). E-learning has evolved into an educational model in which students and teachers use classroom materials and interact without time or location constraints through communication technologies (Horzum, 2003). Web-based teaching allows students to participate actively anytime, anywhere in the educational program and learning activities that are only available to them through a computer and an Internet connection. As online learning becomes more prevalent, universities are developing online programs and organisations, focusing more on enhancing the quality of online teaching (He et al., 2014; Rovai & Downey, 2010). Effective preparation is crucial in the design and organisation phases of e-learning to ensure its success and enhance student outcomes. It is important to evaluate participants' attitudes and satisfaction after online training to ensure a successful e-learning experience. Key factors influencing satisfaction include interactivity, task orientation, support (both classroom and technological), discussion opportunities, flexibility, and ergonomic considerations (Wickersham & McGee, 2008).

Universities must assess student readiness and expectations to develop effective e-learning programs that ensure student satisfaction. In distance learning, integrating teacher training courses with information and communication technologies is essential. However, distance education should complement face-to-face training in teacher education. Fayne (2014) emphasised that online programs must be meticulously designed for distance education in teacher training and recommended offering them alongside in-person instruction. Therefore, the following hypotheses were formulated:

Hypothesis 1: There is a significant cause-and-effect relationship between students' readiness (H1a), teachers' readiness (H1b), technology readiness (H1c), institution readiness (H1d), and filmmaking knowledge relating to filmmaking practical courses through online learning in a private university in Bangladesh.

Hypothesis 2: There is a significant cause-and-effect relationship between students' readiness (H2a), teachers' readiness (H2b), technology readiness (H2c), institution readiness (H2d), and filmmaking skills relating to filmmaking practical courses through online learning in a private university in Bangladesh.

2.2 The Relation between Knowledge and Skills with Students' Attitude in the Quality of Online Learning

The Technology Acceptance Model (TAM) identifies factors influencing students' intentions to use technology. As the model has evolved, it now includes new elements for better analysis. Today's students, having grown up with the internet and social media, rely heavily on digital technology. Consequently, digital applications are a familiar learning medium for them. The media used in universities are continually updated and expanded. In the near future, university information access will be more multimedia, mobile, and compact. Universities are adopting strategies to integrate technology into education, increasingly shifting communication online.

Research by Martin and Bolliger (2018), Bao (2020), Author (2021), and Chakraborty et al. (2020) has explored students' perceptions of online education during the pandemic. The shift to online learning brought significant challenges, prompting studies to improve the quality and engagement of e-learning for students and teachers. Recent research (Bao, 2020; Essadek & Rabeyron, 2020; Author, 2021; Islam et al., 2020; Paea et al., 2021) shows that online education has heightened depression and anxiety among high school and university students. Cao et al. (2020) recommended monitoring college students' mental health during periods of stress and pressure. Mishra et al. (2020) found that travel restrictions and shifts in student behaviour and attitudes towards digital learning during the pandemic have spurred further research to explore this new educational environment and its factors. This has led to the following hypothesis:

Hypothesis 3: There is a significant cause-and-effect relationship between filmmaking knowledge (H3a), filmmaking skills (H3b), and students' attitudes toward the quality of online learning relating to filmmaking practical courses in a private university in Bangladesh.

Based on the literature review and hypotheses above, the researchers have constructed the conceptual framework as shown in Figure 1.

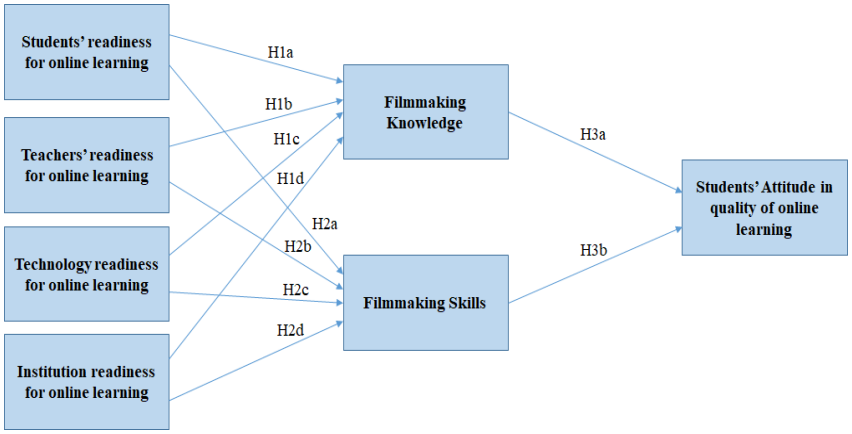


Fig.1 Conceptual Framework

3. Methodology

This study selected two courses from nine major concentration courses using convenience sampling, a nonprobability sampling technique in which participants are chosen based on their availability and proximity. While this method can weaken generalizability, it is common in developmental research due to the high costs of probability sampling and the often unsuitable nature of such samples for investigating developmental issues (Jager et al., 2017). The researchers used the student enrollment statistics from the student registrar's department for both courses. The maximum number of students recorded was 60 students across three different semesters in the academic year 2020, which could be accommodated. Therefore, according to Krejcie and Morgan (1970), the sample size for this study would be 52 students at a 95 per cent confidence level and a five per cent margin of error. The questionnaire has been divided into two parts; no screen questions were placed inside the questionnaire, as the researcher can approach students via social media that the filmmaking program established, since the courses have been issued with a five-point Likert Scale to respond to the statements using the scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Part one: demographic profile, with five questions on gender, filmmaking courses, age, internet skills, and experience in online learning. Then, part two: variables, namely students' readiness, teachers' readiness, technology readiness, and institution readiness (independent variables); intermediate variables comprise filmmaking knowledge and filmmaking skills; and, lastly, students' attitudes toward the quality of online learning, a total of 50 questions. The questionnaires were distributed online. Data collection was conducted from June to October 2021. The data were screened to ensure that respondents were students enrolled in filmmaking programs at private universities in Bangladesh, in two courses: Digital Cinematography and Fictional Narrative Production. The data was collected through Google Forms, and SPSS was used for data analysis. The mean of subscale items was used to analyse the correlation among variables.

4. Validity and Reliability

Three filmmaking experts reviewed the questions. The results of this stage's CVIs were found applicable; each question has an average score of more than 0.5. There are 50 items in the second stage of this study, and 36 of them in the I-CVIs received a perfect 1 rating from a three-member expert panel. The other 14 items scored 0.67, which are applicable. Also, the S-CVI/Ave is 0.907, and the S-CVI/UA is 0.72, indicating that the instrument is valid.

All Alpha values are above 0.9; specifically, the subscales range from 0.905 to 0.976, indicating excellent internal consistency or reliability. The reliability coefficients for the subscales are shown in Table 1.

TABLE 1 RELIABILITY COEFFICIENT FOR SUBSCALES

Students of Filmmaking Courses (n=54)	Cronbach's Alpha	Number of Items
Technology Readiness for Online Filmmaking Courses (TRO)	0.974	6
Student Readiness for Online Filmmaking Courses (SRO)	0.905	8
Teacher Readiness for Online Filmmaking Courses (TeaRO)	0.976	8

Administrative Readiness for Online Filmmaking Courses (ARO)	0.949	9
Filmmaking Knowledge through Online Filmmaking Courses (FKO)	0.953	7
Filmmaking Skills through Online Filmmaking Courses (FSO)	0.950	7
Students' Attitude in Quality of Online Learning (SAO)	0.962	5

The inter-item and inter-subscale correlation matrices have been checked, and no negative or extremely low values have been found. Table 2 shows the inter-subscale correlation matrix. Clark and Watson (1995) suggested the lower accepted level of mean inter-item correlation is 0.15-0.20. Conversely, 0.40-0.50 refers to a higher inter-item correlation. The average inter-item correlation matrix for these seven subscales was 0.53, indicating higher intercorrelation.

TABLE 2 CORRELATION COEFFICIENT FOR SUBSCALES

	TRO	SRO	TeaRO	ARO	FKO	FSO	SAO
TRO	1.000	0.392	0.702	0.551	0.361	0.208	0.172
SRO	0.392	1.000	0.536	0.489	0.738	0.541	0.742
TeaRO	0.702	0.536	1.000	0.665	0.582	0.458	0.413
ARO	0.551	0.489	0.665	1.000	0.613	0.486	0.464
FKO	0.361	0.738	0.582	0.613	1.000	0.707	0.715
FSO	0.208	0.541	0.458	0.486	0.707	1.000	0.621
SAO	0.172	0.742	0.413	0.464	0.715	0.621	1.000

Clark and Watson (1995) argued that a scale could not be established without checking it with 200-300 respondents. Conversely, the researcher in this stage reports only the instrument's reliability (n=54). Hence, the instruments did not propose any scale.

5. Results and Findings

The survey on the cause-and-effect relationships among the study's variables received 54 responses from 62 enrolled students in the Digital Cinematography and Fictional Narrative Production courses in Fall 2020 and Summer 2021. The demographic distribution in Table 3 shows that very few female students (13 per cent) were enrolled in filmmaking courses at the research location. Most of the students (83 per cent) were between the ages of 18 and 25, and they frequently accessed the Internet (74 per cent) in the online learning period. However, students were almost equally distributed across courses and semesters.

TABLE 3 DEMOGRAPHIC STATUS OF THE PARTICIPANTS

Category	Variables	Frequency	Percent
Sex	Female	7	13
	Male	47	87
	Total	54	100
Course	Digital Cinematography	29	53.7
	Fictional Narrative Production	25	46.3
	Total	54	100
Semester	Fall 2020	26	48.1
	Summer 2021	28	51.9
	Total	54	100
Age Group	Age 18 to 25	45	83.3
	Age 26 to 35	9	16.7
	Total	54	100
Access to Internet	Less than three times per week	4	7.4
	More than three times per week	10	18.5

	Uncountable / whenever required	40	74.1
	Total	54	100

The cause-and-effect relationships among variables have been checked at different phases. Homoscedasticity and linearity were checked using scatter plots. A P-P plot checked the normality of residuals, and the histogram also shows that the dependent variables are normally distributed. Regression is very sensitive to outliers. The researcher has checked for outliers by examining Standardised Residuals, which can be interpreted as Z-scores (see Table 4). The independence of observations was checked by examining the Durbin-Watson statistic (see Table 5). The data (n=54) confirmed the absence of outliers and independence of observations.

TABLE 4 RESIDUAL STATISTICS FOR THE DEPENDENT VARIABLES

Dependent Variable: Filmmaking Knowledge Through Online Learning Systems in Filmmaking Courses				
(n=54)	Minimum	Maximum	Mean	Std. Deviation
Predicted Value	0.7725	5.2949	3.4312	1.01022
Residual	-2.16282	1.35387	0	0.74687
Std. Predicted Value	-2.632	1.845	0	1
Std. Residual	-2.784	1.743	0	0.962

Dependent Variable: Filmmaking Skills Through Online Learning Systems in Filmmaking Courses				
(n=54)	Minimum	Maximum	Mean	Std. Deviation
Predicted Value	1.5089	4.4908	3.2884	0.69442
Residual	-2.25883	2.08303	0	0.84644
Std. Predicted Value	-2.563	1.732	0	1
Std. Residual	-2.566	2.366	0	0.962

Dependent Variable: Students' Attitude in Quality of Online Learning				
(n=54)	Minimum	Maximum	Mean	Std. Deviation
Predicted Value	1.1137	4.5072	3.137	0.95734
Residual	-2.64857	1.98953	0	0.8865
Std. Predicted Value	-2.113	1.431	0	1
Std. Residual	-2.931	2.202	0	0.981

TABLE 5 MODEL SUMMARY FOR THE DEPENDENT VARIABLES (N=54)

Dependent Variable: Filmmaking Knowledge Through Online Learning Systems in Filmmaking Courses					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
2.1	.804[a]	0.647	0.618	0.77676	1.323

[a] Predictors: (Constant), Technology Readiness of Online Learning, Students' Readiness of Online Learning, Teachers' Readiness of Online Learning, Administrative Readiness of Online Learning

Dependent Variable: Filmmaking Skills Through Online Learning Systems in Filmmaking Courses					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
2.2	.634[a]	0.402	0.353	0.88032	1.967

[a] Predictors: (Constant), Technology Readiness of Online Learning, Students' Readiness of Online Learning, Teachers' Readiness of Online Learning, Administrative Readiness of Online Learning

Dependent Variable: Students' Attitude in Quality of Online Learning

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
2.3	.734[a]	0.538	0.52	0.90372	2.145

[a] Predictors: (Constant), Filmmaking Skills Through Online Learning Systems in Filmmaking Courses, Filmmaking Knowledge Through Online Learning Systems in Filmmaking Courses

A Pearson product-moment correlation was conducted to examine the relationships between filmmaking knowledge through online learning systems, technology readiness for online learning, students' readiness for online learning, teachers' readiness for online learning, and administrative readiness for online learning in filmmaking courses at a Bangladeshi private university. Filmmaking knowledge is strongly related to students' readiness for online learning, $r(52)=0.74$, $p < .001$, compared to administrative readiness for online learning, $r(52)=0.61$, $p < .001$, teachers' readiness for online learning, $r(52)=0.58$, $p < .001$, and technological readiness of online learning, $r(52)=0.36$, $p < .001$. A complete list of correlations is presented in Table 6. These findings indicated that students' readiness for online learning explains much more variability in filmmaking knowledge through an online learning system than other variables. The effect size for students' readiness for online learning ($r^2=0.55$) indicates that students' readiness accounted for a large portion (55 per cent) of the variability in filmmaking knowledge.

TABLE 6 CORRELATIONS FOR FILMMAKING KNOWLEDGE (FK) THROUGH ONLINE LEARNING SYSTEMS IN FILMMAKING COURSES (N=54)

	TRO	SRO	TeaRO	ARO	FK
Technology Readiness of Online Learning (TRO)		.392**	.702**	.551**	.361**
Student Readiness of Online Learning (SRO)			.536**	.489**	.738**
Teacher Readiness of Online Learning (TeaRO)				.665**	.582**
Administrative Readiness of Online Learning (ARO)					.613**

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Again, Pearson's product-moment correlation was conducted to examine the relationships among filmmaking skills through online learning systems, technology readiness for online learning, students' readiness for online learning, teachers' readiness for online learning, and administrative readiness for online learning in filmmaking courses at the research location. The result showed filmmaking skills are strongly related to students' readiness for online learning, $r(52)=0.54$, $p < .001$, compared to administrative readiness of online learning, $r(52)=0.49$, $p < .001$, and teachers' readiness for online learning, $r(52)=0.46$, $p < .001$. The correlation between filmmaking skills through online learning and technological readiness for online learning is not significant. A complete list of correlations is presented in Table 7. These findings indicated that students' readiness for online learning explains much more variability in filmmaking skills through the online learning system than do teachers' or administrative readiness for online learning. The effect size for students' readiness for online learning ($r^2=0.29$) indicates that students' readiness accounted for a large portion (29 per cent) of the variability in filmmaking skills.

TABLE 7 CORRELATIONS FOR FILMMAKING SKILLS (FS) THROUGH ONLINE LEARNING SYSTEMS IN FILMMAKING COURSES (N=54)

	TRO	SRO	TeaRO	ARO	FS
Technology Readiness of Online Learning (TRO)		.392**	.702**	.551**	0.208
Student Readiness of Online Learning (SRO)			.536**	.489**	.541**
Teacher Readiness of Online Learning (TeaRO)				.665**	.458**
Administrative Readiness of Online Learning (ARO)					.486**

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Another Pearson product-moment correlation was conducted to examine the relationships among students' attitudes toward the quality of online learning, the filmmaking knowledge and skills acquired through online

learning systems in filmmaking courses at a Bangladeshi private university. Students' attitudes toward the quality of online learning are strongly related to filmmaking knowledge through online learning systems, $r(52)=0.72$, $p < .001$, and to filmmaking skills through online learning systems, $r(52)=0.62$, $p < .001$. A list of correlations is presented in Table 8. These findings indicated that filmmaking knowledge through online learning systems explains more variability in students' attitudes toward the quality of online learning than does filmmaking skills through online learning systems. The effect size of filmmaking knowledge through online learning systems ($r^2=0.51$) and filmmaking skills through online learning systems ($r^2=0.39$) indicates that the level of filmmaking knowledge through online learning systems accounted for a significant portion (51 per cent) and the level of filmmaking skills through online learning system accounted for a substantial portion (39 per cent) of the variability in students' attitude in quality of online learning.

TABLE 8 CORRELATIONS FOR STUDENTS' ATTITUDE IN QUALITY OF ONLINE LEARNING (N=54)

	FK	FS	SAO
Filmmaking Knowledge (FK) through online learning systems in filmmaking courses		.707**	.715**
Filmmaking Skills (FS) through online learning systems in filmmaking courses			.621**
Students' Attitude in Quality of Online Learning (SAO)			

Note. ** Correlation is significant at the 0.01 level (2-tailed).

The demographic results confirmed that there were very few female students in the filmmaking courses at the research location, and that students were widely accessing the Internet during the online learning period. The Pearson correlation coefficient measured the relations among the different variables. Before that, the data was checked and confirmed to meet different preconditions for the statistical test. There were two phases of the correlational test. The correlation between filmmaking knowledge and filmmaking skills acquired through online learning systems was examined using students' attitudes toward the quality of online learning in filmmaking practical courses. All the correlations were significant, except the one between filmmaking skills through online learning and the technological readiness for online learning. The findings confirmed a strong relationship between the variables. However, a high level of e-readiness in terms of technological access and skills reduces the significance of the correlation between the technological readiness for online learning and filmmaking skills developed through online learning.

6. Discussion

The Pearson correlation coefficients were measured for each variable. There were significant positive correlations across all aspects, except for the correlation between technological readiness for online learning and filmmaking skills through online learning, which confirmed hypotheses 1 and 3. Hypothesis 2 came as partially true, which would be true with the revised hypothesis: 'There is a significant relationship between students' readiness, teachers' readiness, administrative readiness, and filmmaking skills relating to filmmaking practical courses through online learning in a private university in Bangladesh.' However, the level of filmmaking knowledge through online learning systems accounted for a significant portion (51 per cent), and the level of filmmaking skills through online learning systems accounted for a substantial portion (39 per cent) of the variability in students' attitudes toward the quality of online learning.

Planning for this study began in 2019, taking into account recent infrastructural development, government policy, and opportunities for e-learning in Bangladesh (Bangladesh, 2018). It is a coincidence that the COVID-19 pandemic hit Bangladesh in March 2020, and subsequently, all educational institutes suspended face-to-face learning and were forced to shift to online learning (Sakib, 2020). The situation is not that different elsewhere in the world. However, the pandemic has accelerated the implementation of e-learning in many countries, including Bangladesh. Researchers took this opportunity to study more e-learning (Al-Salman & Haider, 2021; Chang & Fang, 2020; Chung et al., 2020). The University of Liberal Arts Bangladesh (ULAB), the research site for this study, is fully prepared to adopt e-learning. They started investing in e-learning in 2007, adopted 'Moodle,' a well-known learning management system, in 2014, trained the teachers, and began using it in 2017("OP-ED," 2020). So, when the crisis happened, ULAB was able to switch to online teaching and learning within a day, even before receiving direction from the government or the UGC regulatory body. Also, ULAB took many initiatives to cope with the pandemic (*Shifting to Full Online Teaching*, 2021). Eventually, ULAB placed 27th position in the 'Crisis Management' category in World's Universities with Real Impact (WURI) 2021 ("WURI Ranking 2021," 2021). There are several challenges in managing a skill-based online program, such as a filmmaking

program. The lack of policy and guidelines for e-learning is one of the significant challenges that received a positive vibe due to the recent e-learning experience during the COVID-19 pandemic.

E-readiness is related to the success of e-learning initiatives. Kaur and Abas (2004) showed that learners were not excited about e-learning, as both learners and teachers were only moderately ready for it. On the other hand, Yilmaz (2017) suggested that learners' self-efficacy with computers, the Internet, and online communication are the sub-factors of e-readiness. Learners' control and motivation towards e-learning are also important sub-factors. This study considers technological access and skills, students' and teachers' attitudes toward online learning, and institutional competency as sub-scale variables. The design of e-learning activities integrates social, cognitive, and facilitatory presences while adapting assessments to meet new learning requirements (Rapanta et al., 2020). Most higher education institutions in India (Saha et al., 2021) and Bangladesh (Shifat et al., 2021) were not ready to migrate from face-to-face to online learning. As a result of the COVID-19 pandemic and the forced migration it caused, many learners felt dissatisfied. The students complained about slow internet, practical classes, and minimal scope to practice communication skills (Saha et al., 2021; Shifat et al., 2021). Researchers constantly emphasise the technological aspects of e-readiness (Al-araibi et al., 2019; Coopasami et al., 2017; Mosa et al., 2016). However, this study shows no significant relationship between technological readiness and filmmaking skills in practical courses delivered through online learning at a private university in Bangladesh. Rohayani (2015) argued that skills and attitude are the most significant factors influencing e-learning, whereas Dale et al (2014) emphasised knowledge and attitude. This study draws significantly on Wiess et al.'s (2018) perspectives on knowledge, skills, and attitudes. The result confirmed that filmmaking knowledge and skills significantly affect students' attitudes toward the quality of online learning in filmmaking practical courses at a private university in Bangladesh.

7. Recommendations

Several secondary sources confirm the availability of adequate infrastructure for e-learning in Bangladesh. However, many students and teachers disagree with this because of a fixed mindset, and unusual expectations that further increased with the erroneous e-learning practice in the crisis (pandemic) situation. Online learning or blended learning emphasises asynchronous learning. In contrast, during the pandemic, most Bangladeshi educational institutions converted their face-to-face classroom activities into synchronous online lectures due to unpreparedness for e-learning. GoB rightly prioritised the blended learning policy, but the government should immediately start working on an online education policy. Otherwise, the group of students will eventually move to pursue overseas online programs.

The study found a strong to moderate positive correlation among the variables, except for technological readiness and filmmaking skills, indicating that, in online education, filmmaking skills are not dependent on technological access or skills. Further research is required to explain why technological readiness and filmmaking skills did not correlate significantly. Also, more studies are recommended for other skills-based subjects in ULAB and other universities in Bangladesh.

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An Intelligent Quality Assurance Framework: Predicting Program Learning Outcome Attainment Using Machine Learning for Continuous Quality Improvement in Outcome Based Education

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Abstract
Quality education is established as a vital sustainable development goal by the United Nations, pertaining to the delivery of a standardized skillset among learners. To make a proper alignment with the above goal, international education cohorts, such as the Washington Accords, incorporated the concept of Outcome-Based Education. And this notion has gained significant interest from industry, academia, governments, accreditation bodies and students. In response, many higher educational institutions adopted this concept but rely on ad hoc techniques, which leads to a trial-and-error approach. Moreover, conventional approaches to Course Learning Outcome and Program learning Outcome achievement are reactive and not predictive. This study proposes a quality assurance framework that employs intelligent predictive techniques to forecast Program Learning Outcome achievement based on a synthetic dataset of 500 students across eight assessment tools mapped to Bloom's Taxonomy, and also demonstrates the efficacy of Intelligent models in capturing complex, non-linear relationships between Course Learning Outcome and Program Learning Outcome. Experimental evaluation on the test dataset yielded a Mean Absolute Error of 3.17% and a R^2 score of 0.584, indicating the potential to identify Program learning Outcomes. Furthermore, the integration of confusion matrices and feature importance analysis ensures that Intelligent predictions align with Bloom's Taxonomy and international accreditation standards, offering the Institutional Quality Assurance Cell a predictive, data-driven tool to improve the Continuous Quality Improvement loop and ensure no student is left behind in the attainment of targeted competencies.

***Keywords**:* Outcome-Based Education, Random Forest, Continuous Quality Improvement, Bloom's taxonomy, Institutional Quality Assurance Cell.

1. Introduction

Education is an important mediator for the economic advancement of a society, and academic institutions must provide academic excellence to equip students with the necessary abilities to thrive in their professional endeavors. Outcome-Based Education (OBE) has brought a systematic, learner-oriented paradigm where the effectiveness of education is measured by the acquisition of measurable skills instead of conventional measures like teaching time or course grades [1]. One of the core values of OBE is constructive alignment, which is used to provide a systematic mapping of Course Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs) with specific assessment strategies [2-3]. This correspondence allows institutions to measure quantitatively whether the desired learning outcomes are attained or not.

In this context, the Institutional Quality Assurance Cell (IQAC) of a university goes beyond the mundane calculation of PLO achievement. The main difficulty is how to convert the attainment data into practical information that will facilitate Continuous Quality Improvement (CQI) activities [4]. Traditional methods of assessment, such as summative assessments like grading final examination scores, are descriptive in nature; this gives retroactive information regarding student performance, but is not analytical enough to make proactive decisions [5-6]. Specifically, conventional techniques lack the capacity to address critical CQI concerns, such as identifying which underperforming CLOs will most adversely impact specific PLOs in subsequent academic cycles. Notably, these traditional methods fail to provide a reliable mechanism for forecasting a student's ultimate PLO achievement during the early stages of a course. Existing OBE assessment systems are primarily retrospective and descriptive, whereas limited studies have explored predictive IQAC-oriented frameworks integrating Bloom's Taxonomy with interpretable machine learning for proactive CQI.

To address these deficiencies, a paradigm shift is required, transitioning the focus from descriptive analytics toward predictive modelling. In this regard, this paper proposed a predictive quality assurance system based on the use of a data-driven approach and predicated on the use of Machine Learning (ML) methods. The key contributions of this proposed work are as follows:

a) To convert heterogeneous assessment data (e.g., quizzes, assignments, projects and examinations) into a structured feature space that is consistent with Bloom's Taxonomy,
b) To use an intelligent ML technique named Random Forest regression model to address the non-linear, complex relationships between assessment performance and PLO attainment,
c) To interpret the model's compatibility, especially feature importance analysis, to determine the most significant aspects of assessments.

With the help of these scopes, it is possible to perform evidence-based pedagogical intervention and, thus, improve the effectiveness of the CQI loop and the overall success of OBE implementation.

2. Methodology

The educational framework follows a hierarchical structure, consistent with the guidelines of the Board of Accreditation for Engineering & Technical Education (BAETE) and OBE practices, as illustrated in Fig. 1.

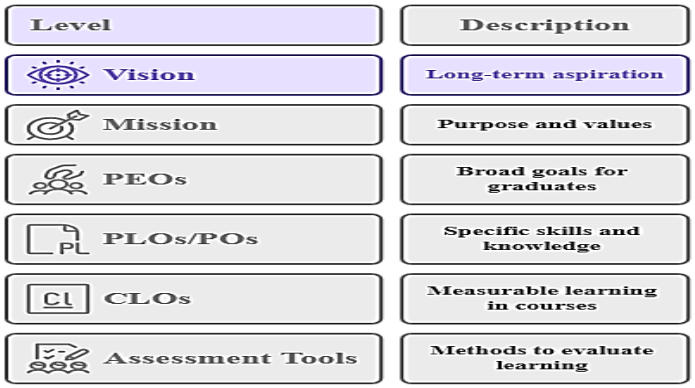


Fig.1 The framework as a flowchart, demonstrating how high-level institutional objectives cascade into measurable outcomes and are subsequently evaluated through structured assessment mechanisms.

This hierarchy ensures that institutional goals are systematically translated into measurable student competencies. At the core of this structure lies the principle of constructive alignment, which requires that each CLO is explicitly mapped to one or more PLOs, and that appropriate assessment tools are designed to measure their attainment. Such alignment guarantees that teaching activities, learning outcomes, and assessment strategies operate cohesively toward achieving program-level competencies.

2.1 Synthetic Dataset Development

To evaluate the proposed Intelligent Quality Assurance Framework, a synthetic dataset was generated to model student performance within an OBE environment. The dataset simulated the academic trajectory of N=500 engineering students, mapping various assessment tools to the cognitive, psychomotor, and affective domains of Bloom's Taxonomy.

2.1.1 Stochastic Modelling of Student Ability

To maintain internal consistency across various assessment tools, each student i is assigned a latent ability factor, denoted as θ_i . In the context of psychometrics and educational modelling, a latent ability factor is an unobserved, underlying trait, such as intellectual capacity, prior knowledge, or cognitive proficiency, that cannot be measured directly but is inferred through a student's performance on observed variables (assessments). This factor represents the student's inherent academic capability and is sampled from a symmetric Beta distribution:

$$\theta_i \sim Beta(\alpha = 2, \beta = 2) \times 100 \quad (1)$$

In equation (1), α and β govern the lower-end (left tail) and higher-end (right tail) distributions, respectively. Setting α=β=2 yields a symmetric, bell-shaped curve, ensuring a realistic student distribution centered on average ability with minimal extreme outliers. The latent ability factor, θ_i , represents a student's unobserved cognitive proficiency, inferred through performance. Individual assessment scores (x_{ij}) are derived as in equation (2):

$$x_{ij} = f(\theta_i) + d_j + \in; where \ \in \sim N(0, \sigma^2) \quad (2)$$

This stochastic term ϵ accounts for real-world variance, such as environmental factors or student-specific fluctuations during testing. By anchoring all evaluations to the latent factor θ_i, the framework ensures logical correlation across different domains while preserving the variance typical of diverse assessment methods.

2.1.2 Mapping Assessments to Bloom's Taxonomy

The framework utilizes eight distinct assessment tools (AT1–AT8) strategically aligned with the hierarchical levels of Bloom's Taxonomy. This alignment ensures that the dataset captures diverse student competencies across the Cognitive, Psychomotor, and Affective domains. The target variable for the model is the PLO1 (Engineering Knowledge) attainment percentage, which corresponds to the weighted outcomes of these assessment scores [6]. The specific mapping and the underlying complexity logic for each tool are detailed in Table 1.

TABLE 4 MAPPING ASSESSMENTS TO BLOOM'S TAXONOMY

Assessment Tool	Domain	Bloom's Level	Complexity Logic
(AT1-AT2) Quizzes (1 and 2)	Cognitive	C2 (Understand)	High correlation with θ, low variance.
(AT3-AT4) Assignments (1 and 2)	Cognitive	C3–C4 (Apply/Analyze)	Moderate difficulty; requires procedural knowledge.
(AT5) Mid-term Exam	Cognitive	C4–C5 (Analyze/Evaluate)	Weighted combination of assignments and baseline ability.
(AT6) Project/Lab	Psychomotor	P3 (Precision)	Measures practical implementation skills.
(AT7) Teamwork	Affective	A3 (Valuing)	Measures collaborative and interpersonal engagement.
(AT8) Final Exam	Cognitive	C5–C6 (Evaluate/Create)	Highest complexity; requires synthesis of all prior modules.

2.1.3 Mathematical Model for PLO Attainment

To compute the attainment of a particular Program Outcome in various courses to use in an IQAC-driven evaluation, a weighted average model is usually used, with course contributions weighted by course credit. This is expressed in the form of an equation (3):

$$PLO_i = \frac{\sum_{j=1}^{n}(w_j \times CLO_{ij})}{\sum_{j=1}^{n} w_j} \quad (3)$$

Where: PO_i represents the attainment percentage of the *i-th Program Outcome*; CO_{ij} denotes the attainment level of the Course Outcome that maps to PO_i in course j; w_j is the credit weight associated with course j; n is the total number of contributing courses.

This equation is essential as far as IQAC is concerned in that courses with higher academic weight have to proportionally contribute to overall PLO attainment. This will eliminate bias that would have been created if all courses were considered equal, irrespective of their importance in terms of credit.

2.1.4 Target Variable (y): PLO Attainment

The target variable represents the final PLO1 attainment percentage, computed using a weighted aggregation model consistent with institutional OBE practices. In this study, PLO1 is derived directly from assessment task scores (AT1–AT8), which are mapped to CLOs and aligned with Bloom's Taxonomy. The PLO1 attainment is calculated as shown in equation (4):

$$PLO1 = \sum_{j=1}^{8} w_j AT_j \quad (4)$$

Where AT_j represents the score obtained in the j-th assessment task and w_j denotes the corresponding weight assigned to each assessment, such that $\sum_{j=1}^{8} w_j = 1$.

The weighting scheme prioritizes higher-order cognitive assessments (e.g., midterm and final examinations) over lower-order tasks (e.g., quizzes), ensuring alignment with Bloom's Taxonomy. As illustrated in Table 2, this formulation enables the integration of heterogeneous assessment components into a unified PLO1 attainment score, maintaining consistency with traditional OBE evaluation while supporting machine learning-based prediction within the IQAC framework.

TABLE 2 SAMPLE PREDICTIVE DATASET (FIRST 5 STUDENTS)

Student ID	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	Target: PLO1 (%)
S001	85	82	78	80	75	88	85	79	79.2
S002	62	58	55	60	65	70	68	63	61.5
S003	45	50	48	52	55	60	62	50	50.8
S004	78	80	72	75	80	82	80	76	77.1
S005	91	88	85	87	90	92	91	88	88.5

2.2 Proposed Machine Learning Framework for IQAC

Traditional OBE-based evaluation systems primarily compute PLO attainment at the end of a semester, limiting their usefulness for timely intervention. To overcome this limitation, the proposed framework introduces a predictive analytics approach, where Machine Learning (ML) models are employed to estimate PLO attainment using early-stage assessment data. This enables IQAC to shift from retrospective evaluation to proactive CQI.

2.2.1 Model Selection

Random Forest Regression (RFR): The primary model, selected to capture non-linear relationships and extract feature importance for IQAC interventions. It was configured with 100 estimators, a maximum depth of 10, and a minimum of 2 samples per leaf.

Multiple Linear Regression (MLR): Implemented as a statistical baseline to benchmark the predictive performance of the RFR model.

2.2.2 Validation Strategy

The dataset was partitioned into an 80% training and 20% testing split. To ensure algorithmic robustness and mitigate single-split bias, a 5-fold cross-validation was applied during training.

2.2.3 Evaluation Metrics

Regression performance was quantified using Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and the Coefficient of Determination (R^2). To operationalize early intervention, continuous predictions were dichotomized using a 60% competency threshold (PASS/FAIL). This enabled the assessment of at-risk student detection via classification metrics, including Accuracy, Recall (Sensitivity), and the F1-Score.

3. Results and Analysis for IQAC Decision Support

The proposed Intelligent Quality Assurance framework was evaluated using standard regression metrics on the test dataset. The Random Forest Regressor achieved a MAE of 3.17, RMSE of 4.02, and R^2 of 0.584, demonstrating strong predictive performance in estimating PLO attainment. Considering the stochastic variability of educational assessment behavior and the heterogeneous nature of learning outcomes, the obtained R^2 value demonstrates moderate-to-strong predictive capability. A 5-fold cross-validation further confirmed model robustness with an average R^2 of 0.57 ± 0.03. In comparison, the Multiple Linear Regression model showed lower accuracy, highlighting the advantage of capturing non-linear relationships in OBE data.

From the IQAC perspective, these results indicate that higher-order and practical assessments play a more significant role in competency attainment, while lower-order assessments, such as quizzes, contribute less, as reflected in fig. 2 and fig. 3. Therefore, assessment strategies should be restructured to emphasize higher cognitive domains in alignment with Bloom's Taxonomy to enhance CQI outcomes [8]. The detailed comparative performance of the models is summarized in Table 3.

TABLE 3 COMPARATIVE PERFORMANCE OF MACHINE LEARNING MODELS

Model	MAE	RMSE	R^2 Score	CV R^2 (Mean ± Std)
Random Forest Regressor	3.17	4.02	0.584	0.57 ± 0.03
Linear Regression	5.48	6.10	0.42	—

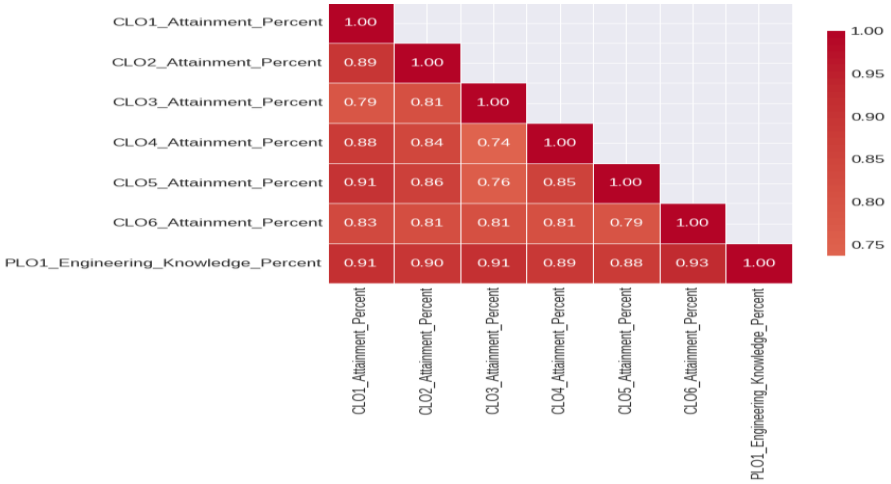


Fig. 2 Correlation heatmap demonstrates that predictions closely follow the ideal diagonal line, confirming that the model captures the overall trend of PLO attainment effectively.

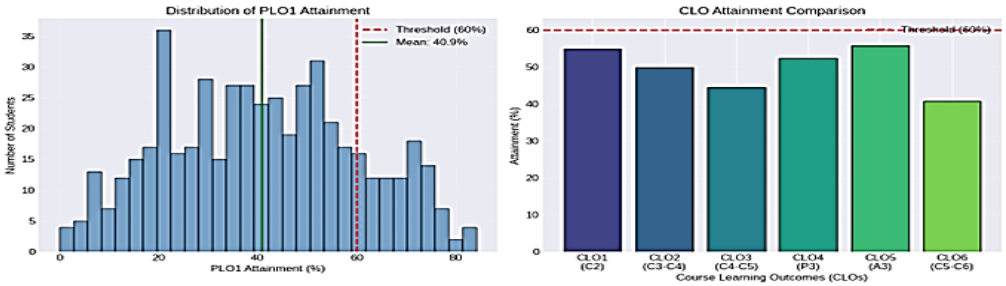


Fig. 3 Distribution of PLO attainment across Bloom's cognitive levels, demonstrating reduced attainment at higher-order cognitive domains

3.1 Feature Importance for CQI Decision Support

As shown in Table 4, the Random Forest model's capacity to measure the relative significance of several assessment components is one of its most important contributions in fig. 4.

TABLE 4 FEATURE IMPORTANCE RANKING

Rank	Assessment Tool	Bloom's Level	Importance	Cumulative Importance
1	Final Exam	C5–C6	29.2%	29.2%
2	Midterm Exam	C4–C5	12.8%	42.0%
3	Project/Lab	P3	9.3%	51.3%
4	Teamwork	A3	5.5%	56.8%
5	Assignment 2	C4	5.3%	62.1%
6	Assignment 1	C3	4.2%	66.3%
7	Quiz 2	C2	3.5%	69.8%
8	Quiz 1	C2	3.2%	73.0%

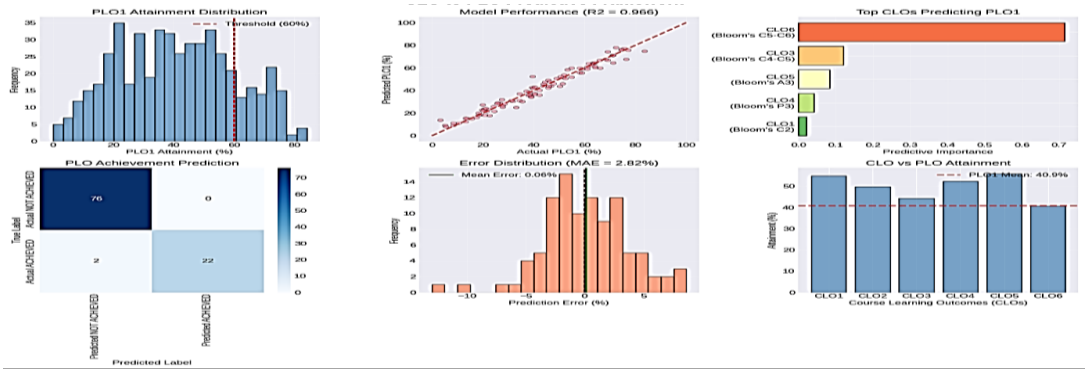


Fig.4 Predictive Analytics Dashboard for Outcome-Based Education (OBE) Quality Improvement.

3.2 IQAC Interpretation of the study

The feature importance analysis yields several pedagogically significant insights:

1) Higher-Order Cognitive Skills dominance: Almost one-third of the total predictive power (29.2%) comes from the final exam (C5-C6), suggesting that higher-order cognitive skills like evaluation and synthesis are the most important factors influencing PLO attainment.
2) Role of Intermediate Assessments: Midterm exams (C4-C5) also have a significant impact (12.8%), emphasizing the value of continuous evaluation over a single, high-stakes test.
3) Significance of Psychomotor Learning (P3): The high predictor of project and lab work (9.3%) provides empirical support for the educational theory that practical learning enhances concept mastery.
4) Limited Impact of Lower-Order Assessments: The total contribution of quizzes (C2) is less than 7%, indicating that recall-based tests have little effect on the achievement of overall competency.

3.3 Strategic Implications for IQAC

To support CQI, the IQAC must implement several key strategic changes. First, evaluation systems should be updated to give more weight to practical tasks and higher-order thinking skills. The curriculum should also move toward hands-on learning through projects and experiential activities. This transition involves reducing the reliance on simple tests that only measure basic recall. Finally, all assessment processes should be designed using Bloom's higher cognitive levels to better measure student growth and complex understanding.

3.4 Implementation Roadmap for IQAC

A six-phase closed-loop protocol is used to operationalize the framework shown in fig. 5:

1. digitalizing data of assessments;
2. performing feature engineering based on mapping according to Bloom's Taxonomy;
3. PLO attainment calculation using weighted aggregation;
4. build ensemble models and more statistical analysis based on previous classes;
5. early prediction deployment by Week 8 for proactive intervention; and
6. CQI-based intervention including supplemental instruction, mentoring, and assessment redesign. This approach satisfies OBE's data-driven quality assurance mission by ensuring that pedagogical improvement is continuously informed by empirical analytics.



Fig.5 Phase-wise Roadmap for IQAC in Higher Educational Institute.

4. Conclusion

This article proposed a new dimension of the application of ML-based predictive analytics to the IQAC of Higher Educational Institute operations in an effective way of improving the efficacy of OBE. The suggested framework allowed shifting evaluation towards proactive and evidence-based quality assurance by allowing the anticipation of PLO achievement early. The model demonstrated strong predictive accuracy with lower error (MAE = 3.17), and higher-order cognitive (C5-C6) and psychomotor (P3) tests were the most significant predictors of student success. Notably, the framework aids in early detection of at-risk students, enabling timely and specific interventions that can enhance the learning outcomes before the end-of-assessment. This evidence underlines the importance of developing a data-driven CQI framework in IQAC, in which ongoing monitoring, predictive analytics, and feedback tools guide teaching and learning, the creation of assessment frameworks, and institutional policy choices. Since the present study utilized a synthetic dataset to validate the conceptual framework, future work should evaluate the proposed model using real institutional OBE assessment data from multiple academic programs to ensure generalizability and practical robustness. Finally, this strategy will ensure that OBE is not merely implemented as a measurement construct, but is operationalized as an evolving, adaptive, and outcome-oriented system that actively drives continuous improvement and ensures the desired graduate competencies are achieved. Meanwhile, this work can be explored in future with the logic mining perspective also [9].

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Institutional Service Quality, Family Support, and Perceived Student Quality: Mediation Effect of Academic Engagement

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Abstract
This study investigates the impact of institutional service quality and family support on students' perceived quality, with academic engagement as a mediating factor in the Bangladeshi higher education context. A quantitative cross-sectional design was employed to collect data from 113 students via a questionnaire. Data were analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach. The findings reveal that institutional service quality and family support do not directly influence perceived student quality; rather, they do so indirectly through academic engagement. The results indicate that institutional resources and family encouragement enhance students' perceived academic competence only when they promote active participation in learning activities. The study contributes by integrating institutional and family factors within an engagement-based framework. It highlights academic engagement as the key mechanism for improving students' perceived quality and educational effectiveness in Bangladesh's higher education institutions.

***Keywords**:* Institutional Service Quality, Family Support, Academic Engagement, Perceived Student Quality, Higher Education Institutions, PLS-SEM

1. Introduction

The quality of higher education has become a growing concern in Bangladesh, where higher educational institutions (HEIs) are increasingly expected to produce graduates equipped with academic competence, employability skills, and career readiness. In this context, perceived student quality (PSQ) reflects students' self-assessment of their academic capability, learning outcomes, and preparedness for future professional challenges. Previous studies indicate that both institutional conditions and family-related factors influence student outcomes. For example, Alam and Khatun (2021) found that structured academic environments, assessment systems, and students' financial conditions significantly affect academic performance, suggesting that students' perceived competence depends on institutional and familial support mechanisms.

Institutional service quality (ISQ) plays a critical role in improving student satisfaction, learning effectiveness, and institutional reputation in higher education. ISQ refers to the extent to which teaching quality, administrative services, facilities, and academic support meet students' expectations (Alemu, 2023). Prior research demonstrates that effective institutional services enhance students' learning experiences, satisfaction, and academic performance (Ali et al., 2016; Sultan & Wong, 2014). However, in developing countries such as Bangladesh, institutional resources do not always translate into improved student outcomes because of limitations in learning environments, inadequate student support systems, and varying levels of student engagement (Rahman & Nasrin, 2024). Alongside institutional factors, family support (FS) remains highly influential within Bangladesh's collectivist social structure, where families provide financial assistance, emotional encouragement, and academic motivation. Research has shown that family social support positively influences students' academic achievement and educational stability over time (Cheng et al., 2012).

Academic engagement (AE), defined as students' active participation in learning-related activities such as class attendance, regular study habits, and academic involvement, has consistently been associated with deeper learning and improved academic success (Kuh, 2009). Engaged students are more likely to use institutional resources effectively, maintain academic motivation, and develop positive perceptions of their academic performance. Accordingly, AE may function as an important psychological and behavioural mechanism through which ISQ and FS influence PSQ.

Despite extensive research on institutional quality, family support, and student engagement, several important gaps remain in the literature. First, most prior studies have examined these variables independently rather than integrating them within a single framework to explain students' perceived quality. Second, limited attention has

been given to the mediating role of AE in linking institutional and family-related factors with PSQ, particularly in developing-country contexts. Third, empirical evidence from Bangladeshi HEIs remains scarce, despite ongoing concerns regarding educational quality, graduate employability, and student development. Addressing these gaps is important because understanding how institutional and familial factors shape students' engagement and perceived quality can help universities and policymakers develop more effective educational strategies.

Therefore, this study aims to examine the effects of ISQ and FS on PSQ among students in Bangladeshi HEIs, while also investigating the mediating role of AE in these relationships. The findings are expected to contribute to the higher education literature by providing a more comprehensive understanding of the factors that influence student quality in developing-country contexts and by offering practical implications for improving student engagement and educational outcomes.

2. Literature Review

2.1 Institutional Service Quality and Perceived Student Quality

The literature consistently indicates that ISQ plays a significant role in shaping students' perceptions of quality and educational experiences in higher education. Studies indicate that teaching quality, administrative services, and institutional facilities positively influence students' satisfaction, commitment, and perceived educational value (Abu-Rumman & Qawasmeh, 2022; Aboubakr & Bayoumy, 2022; Bwachele et al., 2023; Cinkir et al., 2022). Moreover, effective institutional services contribute to positive behavioral outcomes, including student loyalty, favorable word-of-mouth communication, and perceived graduate performance (Chikazhe et al., 2022; Rasheed & Rashid, 2024). Research further demonstrates that improvements in teaching practices, online learning systems, and support services enhance learning outcomes and perceived educational effectiveness (Darawong & Widayati, 2022; Sadoughi & Hejazi, 2023). Additionally, high-quality institutional services help international students adapt more effectively to academic environments (Yılmaz & Temizkan, 2022). Based on this review, this study develops the following hypothesis:

H1: Institutional service quality has a significant impact on perceived student quality.

2.2 Family Support and Perceived Student Quality

The literature highlights FS as an important social resource influencing students' perceived quality and educational experiences in higher education. Studies show that FS enhances students' emotional stability, psychological well-being, and adjustment to university life by reducing stress, anxiety, and depression (Estrella-García-Mendoza et al., 2024; Parker et al., 2025). Supportive family environments also strengthen students' coping skills, resilience, and learning engagement, thereby positively affecting their academic perceptions and experiences (Chen et al., 2023; Yang et al., 2022). In addition, parental involvement and expectations significantly shape students' educational experiences, particularly among first-generation university students (Flanagan-Bórquez & Soriano-Soriano, 2024). Thus, the study hypothesizes as follows:

H2: Family support has a significant impact on perceived student quality.

2.3 Academic Engagement and Perceived Student Quality

AE is widely recognized as a central determinant of students' perceived quality and learning experiences in higher education. Studies show that supportive academic environments and meaningful learning activities enhance student engagement and reduce disengagement (Pham et al., 2022). Engagement is further strengthened when students perceive learning activities as valuable, particularly in online and technology-supported contexts (Al Issa et al., 2024; Conklin & Barreto, 2025). Research also indicates that academic self-concept, teacher support, and positive learning environments significantly improve engagement, leading to better academic achievement and learning outcomes (Guo et al., 2022; Tao et al., 2022). AE promotes active participation, motivation, and meaningful learning experiences (Bergdahl et al., 2024; Owusu-Agyeman, 2022), thus contributing to higher academic performance, persistence, and lower dropout intentions (Acosta-Gonzaga, 2023; Archambault et al., 2022). Hence, the study develops the following hypothesis:

H3: Academic engagement has a significant impact on perceived student quality.

2.4 Institutional Service Quality and Academic Engagement

ISQ plays a significant role in fostering AE among university students. High-quality institutional services improve students' satisfaction and attachment to their institutions (Iqbal & Zikria, 2022; Kankhuni et al., 2023). Research suggests that educational service quality enhances academic performance indirectly by encouraging students'

active participation in learning activities (Oliso et al., 2024). Teacher competence has also been identified as a key mechanism through which service quality strengthens students' engagement, highlighting the importance of instructional effectiveness in academic settings (Akyürek et al., 2025). In addition, theoretical perspectives emphasize that supportive institutional resources stimulate students' motivation, well-being, and sustained involvement in learning processes (Bakker & Mostert, 2024). Thus, the literature confirms that ISQ promotes AE. Accordingly, the study hypothesizes as follows:

H4: Institutional service quality has a significant impact on academic engagement.

2.5 Family Support and Academic Engagement

Parental involvement and supportive family environments enhance students' social-emotional development, which strengthens their participation in academic activities (Martinez-Yarza et al., 2024; Yang et al., 2023). FS also promotes psychological capital, coping abilities, and academic motivation, encouraging students' active involvement in learning processes (Siu et al., 2023). Meta-analytic evidence further confirms that parental involvement positively affects academic achievement through greater engagement and persistence (Wilder, 2023). In addition, family academic support has been linked to higher motivation and academic success, particularly among first-year university students (Marley & Wilcox, 2022). Research also indicates that effective family–school partnerships and supportive parenting styles reduce academic burnout and enhance sustained engagement (Smith et al., 2022; Zhu et al., 2023). Therefore, the study develops the following hypothesis:

H5: Family support has a significant impact on academic engagement

2.6 The Mediating Role of Academic Engagement

Prior literature has increasingly recognized AE as a key explanatory mechanism through which institutional and social factors influence student outcomes in higher education. Early studies established that ISQ affects students' satisfaction, behavioural intentions, and learning outcomes through underlying psychological and academic processes (Amoako et al., 2023; Tan et al., 2022). Subsequent research further consolidated AE as a central mediator linking academic efficacy, motivation, and satisfaction to improved educational outcomes (Meng & Zhang, 2023; Pham et al., 2024; Sharif Nia et al., 2023). However, most of this evidence focuses on performance-, satisfaction-, or intention-based outcomes, with limited attention to students' perceived quality.

Similarly, social and FS have been shown to enhance academic outcomes through AE. Empirical studies demonstrate that perceived social support improves achievement and learning effectiveness by encouraging active engagement in academic activities (Lei et al., 2024; Wu et al., 2023). Further evidence confirms that AE mediates the effects of support systems, self-efficacy, and psychological well-being on academic performance (Chaudhry et al., 2024; Luo et al., 2023; Xu et al., 2023). Nevertheless, the mediating role of AE in shaping students' perceived quality remains underexplored. Addressing this gap, the present study examines AE as a mediating mechanism in the ISQ–PSQ and FS–PSQ relationships. Thus, the following hypotheses have been developed:

H6: Academic engagement mediates the relationship between ISQ and PSQ.
H7: Academic engagement mediates the relationship between FS and PSQ.

3. Research Methods

This study adopted a quantitative, cross-sectional research design to examine the effects of ISQ and FS on the PSQ, with AE as a mediating variable. Conducted as a pilot study of a broader research project, the design aimed to assess the clarity, validity, and reliability of the research instrument (Creswell & Creswell, 2018). Data were collected from the students of the Faculty of Business Studies at Mawlana Bhashani Science and Technology University in Bangladesh.

A self-administered online questionnaire (Google Forms) was distributed via institutional email addresses to ensure respondent authenticity. Of 200 distributed surveys, 113 valid responses were obtained, yielding a 56.5% response rate, consistent with recommended online survey practices in educational research (Saunders et al., 2019). Participation was voluntary, and confidentiality and anonymity were ensured in accordance with ethical guidelines for educational research (Cohen et al., 2018).

The questionnaire contained two sections: demographic information (gender, age, level of study) and measurement items (assessed using a 5-point Likert scale). ISQ was measured using items adapted from Subrahmanyam and Shekhar (2014). FS was assessed through six items from Cheng et al. (2012). AE was

measured using five items from the Student Course Engagement Questionnaire developed by Handelsman et al. (2005). PSQ was evaluated using eleven items adapted from York et al. (2015) and Solberg et al. (1995).

Data analysis was conducted using SPSS 25 and SmartPLS 4. For respondent demographic profiles, descriptive statistics and frequency distribution were analyzed in SPSS. At the same time, PLS-SEM in SmartPLS 4 was employed for hypothesis testing due to its suitability for mediation analysis and small sample sizes (Hair et al., 2019).

4. Findings and Analysis

4.1 Demographic Profile of Respondents

The demographic profile of the respondents indicates a balanced gender distribution, with 56 males and 57 females, suggesting equal participation across genders. The majority of respondents (98) fall within the 22–25 age group, while 15 are between 18 and 21 years old, reflecting a young-adult population typical of master's and undergraduate students. Regarding educational level, most participants (85) are enrolled in the BBA program, whereas 18 are pursuing an MBA.

4.2 Descriptive Statistics and Correlation Coefficient of Study Variables

The study presents descriptive statistics and correlation coefficients for the study variables. The mean scores indicate that respondents expressed high satisfaction with ISQ (M = 4.27, SD = 0.59), suggesting that they perceive their institutions as supportive and well-managed. AE (M = 3.58, SD = 0.67) and PSQ (M = 3.55, SD = 0.57) were moderately high, reflecting that students are generally engaged in academic activities and confident in their learning capabilities. However, FS (M = 3.28, SD = 0.63) scored comparatively lower, indicating that students may receive limited encouragement or involvement from their families in academic matters.

Correlation analysis reveals significantly positive relationships among all constructs at the 0.01 level (2-tailed). AE shows the strongest association with PSQ (r = 0.754), underscoring its role as a key contributor to students' perceived academic competence. ISQ shows moderate to strong correlations with both AE (r = 0.528) and PSQ (r = 0.488), whereas FS shows weaker yet meaningful correlations with AE (r = 0.370) and PSQ (r = 0.264).

4.3 Measurement Model Assessment

Figure 1 (Appendix A) presents the measurement model results, which assess the reliability and validity of the study constructs. During the validation process, due to poor outer loadings, seven items (ISQ1, ISQ11, ISQ12, ISQ14, ISQ16, ISQ19, and PSQ6) were removed to improve the AVE of ISQ and PSQ. The retained indicators, with factor loadings ranging from 0.562 to 0.890, confirm that the items loaded adequately on their respective constructs and contributed significantly to the measurement model (Hair et al., 2017). The composite reliability (CR) values (ranging from 0.848 to 0.933) for all constructs met the recommended level of 0.70, indicating consistent measurement of the latent variables (Hair et al., 2017). Likewise, the average variance extracted (AVE) values for all constructs exceeded the minimum acceptable threshold of 0.50, indicating satisfactory convergent validity (Hair et al., 2017).

Further, the study tested the model's discriminant validity using the Heterotrait-Monotrait Ratio (HTMT) criterion (Appendix B). The HTMT values ranged from 0.324 to 0.801, remaining below the 0.90 threshold, thereby confirming satisfactory discriminant validity among all constructs (Henseler et al., 2015). Additionally, the study assessed collinearity using variance inflation factors (VIFs). Results showed that the VIF scores ranged from 1.114 to 1.651, i.e., below the cut-off value of 5, indicating no collinearity issues (Hair et al., 2017).

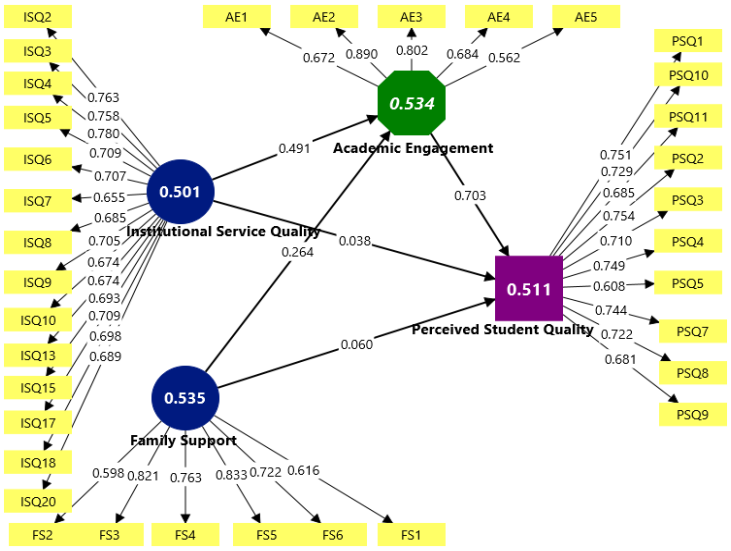


Fig.1 Measurement Model

4.4 Structural Model Assessment

Table 1 presents the results of the structural model analysis. The path analysis reveals that ISQ has an insignificant effect on PSQ ($\beta = 0.038$, $t = 0.469$, $p > 0.05$), thereby rejecting H1. Similarly, the effect of FS on PSQ ($\beta = 0.060$, $t = 0.903$, $p > 0.05$) is insignificant, thus H2 is also rejected. Conversely, AE exhibits a significant effect on PSQ ($\beta = 0.703$, $t = 9.326$, $p < 0.001$), supporting H3. Moreover, both ISQ ($\beta = 0.491$, $t = 6.899$, $p < 0.001$) and FS ($\beta = 0.264$, $t = 3.415$, $p < 0.01$) significantly predict AE, supporting H4 and H5, respectively. The mediation analysis further confirms that AE significantly mediates the relationships between ISQ and PSQ ($\beta = 0.345$, $t = 5.154$, $p < 0.001$) and between FS and PSQ ($\beta = 0.186$, $t = 3.071$, $p < 0.01$), supporting H6 and H7.

The R^2 value for AE is 0.394, indicating that ISQ and FS explain 39.4% of the variance in AE. Hence, the current model demonstrates moderate predictive power (Cohen, 1988). The R^2 value for PSQ is 0.567, signifying that ISQ, FS, and AE together account for 56.7% of the variance in PSQ. This indicates a moderate to substantial predictive accuracy (Cohen, 1988). The f^2 values show that ISQ has a large effect on AE ($f^2 = 0.358$). Similarly, FS shows a medium effect on AE ($f^2 = 0.104$). In contrast, the effects of both ISQ ($f^2 = 0.002$) and FS ($f^2 = 0.007$) on PSQ are negligible. The Q^2 values (0.231 for AE and 0.246 for PSQ) further confirm the model's predictive relevance, as they exceed the recommended threshold of zero (Hair et al., 2019).

TABLE 1 OUTCOMES OF THE STRUCTURAL MODEL

Hs	Paths	β	SE	T values	Decision	R^2	f^2	Q^2	95% Confidence Interval (BC)	
									LL	UL
H1	ISQ→PSQ	0.038	0.081	0.469	Rejected	0.567	0.002	0.246	-0.113	0.201
H2	FS→PSQ	0.060	0.067	0.903	Rejected		0.007		-0.066	0.193
H3	AE→PSQ	0.703	0.075	9.326	Accepted		0.691		0.543	0.840
H4	ISQ→AE	0.491	0.071	6.899	Accepted	0.394	0.358	0.231	0.331	0.613
H5	FS→AE	0.264	0.077	3.415	Accepted		0.104		0.085	0.402
H6	ISQ→AE→PSQ	0.345	0.067	5.154	Accepted				0.215	0.475
H7	FS→AE→PSQ	0.186	0.061	3.071	Accepted				0.056	0.300

Note: t>1.96 at p<0.05; (two-tailed). H = hypothesis, ISQ = Institutional Service Quality, FS = Family Support, AE = Academic Engagement, PSQ = Perceived Student Quality, BC = bias corrected, LL = lower limit, UL = upper limit.

5. Discussion

The present study examined the effects of ISQ and FS on PSQ, with AE as a mediating variable. The findings provide important insights into how students in Bangladeshi HEIs develop perceptions of their academic competence and effectiveness. Although ISQ and FS were expected to influence PSQ directly, their direct effects were insignificant. In contrast, AE had a strong positive effect on PSQ. Moreover, ISQ and FS significantly influenced AE, and their indirect effects on PSQ via AE were also significant, indicating AE's full mediating role.

The insignificant direct effect of ISQ on PSQ suggests that teaching quality, administrative services, and institutional facilities alone are insufficient to enhance students' perceptions of academic quality. Institutional resources become meaningful when they encourage students' active participation in learning activities. In the Bangladeshi context, students may perceive institutional services as basic expectations; therefore, these services create value only when they increase students' academic interest, commitment, and involvement. Similarly, FS does not directly improve PSQ. Although emotional and financial support provide stability and motivation, their influence is most effective when students convert this support into active academic participation. Thus, FS functions more as an enabling factor for engagement than as a direct determinant of perceived academic quality.

The strong positive relationship between AE and PSQ is one of the study's most significant findings. AE includes behavioral and psychological involvement in learning, such as regular study, classroom participation, interest in courses, and reflection on academic activities. Engaged students are more likely to feel academically competent, complete tasks effectively, and perceive their achievements positively. This finding suggests that students' perceived quality is shaped not only by external support systems but also by their active involvement in the learning process. Therefore, AE serves as a central mechanism through which institutional and family resources are transformed into positive perceptions of student quality.

The significant indirect effects (ISQ-AE-PSQ and FS-AE-PSQ) further confirm the full mediating role of AE. This implies that ISQ and FS enhance PSQ only when they strengthen students' academic engagement. The findings highlight that institutional and family support should be viewed as facilitators of engagement rather than direct contributors to perceived quality. The results also indicate that students achieve better academic perceptions when they are motivated, involved, and psychologically connected to their studies.

The study suggests that Bangladeshi universities should focus not only on improving teaching quality, facilities, and administrative services, but also on developing strategies that strengthen student engagement inside and outside the classroom. Similarly, families should encourage students' active academic involvement alongside providing financial and emotional support. The study ultimately confirms that AE is the key pathway through which ISQ and FS influence students' perceived quality.

6. Conclusion

This study examined the effects of ISQ and FS on PSQ, with AE as a mediating variable, in Bangladeshi HEIs. The findings indicate that neither ISQ nor FS directly improves PSQ; rather, their influence operates through AE. The results suggest that institutional services and family support become meaningful when they encourage students' active involvement in learning activities. Thus, AE emerges as the key mechanism connecting external support systems with students' perceptions of academic competence and effectiveness. The study contributes to the higher education literature by integrating institutional and family factors within an engagement-based framework. Practically, the findings emphasize that universities should complement improvements in teaching quality, facilities, and support services with strategies that strengthen student engagement, while families should encourage active academic participation. Promoting engagement-oriented learning environments may ultimately improve student quality and the effectiveness of higher education in Bangladesh.

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Appendix A

Outcomes of the measurement model

Construct	Items	Loadings	α	CR	AVE
Institutional Service Quality	ISQ2	0.763	0.924	0.933	0.501
	ISQ3	0.758			
	ISQ4	0.780			
	ISQ5	0.709			

	ISQ6	0.707			
	ISQ7	0.655			
	ISQ8	0.685			
	ISQ9	0.705			
	ISQ10	0.674			
	ISQ13	0.674			
	ISQ15	0.693			
	ISQ17	0.709			
	ISQ18	0.698			
	ISQ20	0.689			
Family Support	FS1	0.616	0.837	0.872	0.535
	FS2	0.598			
	FS3	0.821			
	FS4	0.763			
	FS5	0.833			
	FS6	0.722			
Academic Engagement	AE1	0.672	0.772	0.848	0.534
	AE2	0.890			
	AE3	0.802			
	AE4	0.684			
	AE5	0.562			
Perceived Student Quality	PSQ1	0.751	0.893	0.912	0.511
	PSQ2	0.754			
	PSQ3	0.710			
	PSQ4	0.749			
	PSQ5	0.608			
	PSQ7	0.744			
	PSQ8	0.722			
	PSQ9	0.681			
	PSQ10	0.729			
	PSQ11	0.685			

Note: α = Cronbach's alpha, AVE = Average variance extracted; CR = Composite reliability

Appendix B

Discriminant validity by HTMT

Construct	Academic Engagement	Family Support	Institutional Service Quality	Perceived Student Quality
Academic Engagement				
Family Support	0.479			
Institutional Service Quality	0.667	0.324		
Perceived Student Quality	0.801	0.368	0.490	

IQAC Vision and Mission

Vision

Fostering excellence through continuous quality improvement.

Mission

- To facilitate designing curriculum and conducting self-assessment by sharing the knowledge of best practices, innovative teaching methodologies within a quality assurance framework.
- To organize faculty and staff development training and workshops to enhance their pedagogical and administrative skills leveraging modern technology.
- To assist academic departments for program accreditation meeting the benchmark of quality education set by the accrediting bodies and organizations.
- To develop a culture of quality consciousness through data-driven decision-making, and stakeholder engagement fostering a sense of trust and integrity.

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