



Beyond AI Adoption: Aligning the National Curriculum Framework 2021 and Outcome-Based Education with AI-Enhanced Higher Education in Bangladesh

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ABSTRACT

Artificial intelligence (AI) is creating new opportunities for university teaching, learning, and assessment, but its use does not necessarily lead to improved educational outcomes. This paper examines how AI-supported education in Bangladesh can be aligned with Outcome-Based Education (OBE) and informed by selected competency-oriented principles of the National Curriculum Framework (NCF) 2021. Drawing on a targeted integrative literature review and an interpretive synthesis of educational theories, academic research, and policy documents, the study develops a conceptual framework connecting national and institutional conditions, responsible AI governance, curriculum alignment, and intended learning outcomes. Constructive alignment informs the relationship between learning outcomes, teaching activities, and assessment; TPACK highlights the pedagogical and technological expertise required of educators; and UNESCO guidance contributes principles for ethical and inclusive AI use. The framework places university-level OBE at the centre of curriculum planning while treating NCF 2021 as a complementary school-level reference for competency development. It also proposes feedback mechanisms through which assessment evidence and learner experiences may inform curriculum improvement. The paper contributes a Bangladesh-focused synthesis that can guide institutional discussion and future research. Because the review was targeted and the framework has not been empirically tested, its distinctiveness, feasibility, and educational effects require further investigation.

Keywords: Artificial intelligence; higher education; Outcome-Based Education; National Curriculum Framework 2021; curriculum alignment; responsible AI; Bangladesh.

1. INTRODUCTION

1.1. AI and the Transformation of Higher Education

Artificial intelligence (AI) is changing how students engage with academic content, how teachers prepare learning activities, and how universities approach assessment. The rapid development of generative AI has made tools capable of producing explanations, summarizing texts, assisting with academic writing, and generating feedback widely accessible. A systematic mapping review by Yusuf et al. (2024) identified educational applications ranging from writing assistance and pedagogical enhancement to professional learning, while also highlighting ethical concerns and gaps in the research. These developments suggest that AI has become an important consideration in contemporary higher education.

AI can help students explore difficult concepts and develop ideas, while educators may use it to prepare resources and teaching activities. Yet these possibilities do not guarantee better learning. Chan and Hu (2023) identified both perceived benefits and concerns among university students using generative AI. UNESCO (2023) similarly emphasizes human agency, privacy, equity, and pedagogical suitability.

The central question, therefore, is not simply whether AI can perform academic tasks, but whether its use helps



students develop the knowledge, skills, and judgment expected of university graduates. This distinction matters because AI-generated responses can contain inaccuracies, and uncritical dependence on such responses may undermine independent reasoning and academic integrity. Universities consequently need to consider AI as part of a broader educational discussion about curriculum, assessment, and responsible learning practices (Bond et al., 2024).

1.2. Moving Beyond AI Adoption Toward Meaningful Curriculum Integration

The availability of AI tools alone does not establish their educational value. Meaningful integration requires aligning technology use with intended learning outcomes, teaching activities, and assessment. Educational purpose, rather than technological availability, should guide these decisions.

This approach is consistent with the principle of constructive alignment, which emphasizes coherence between intended learning outcomes, teaching and learning activities, and assessment (Biggs & Tang, 2011). For example, AI may help students compare alternative explanations, practice applying concepts, or receive formative feedback. However, where a course requires students to demonstrate independent analysis, assessment must provide credible evidence of their own understanding rather than merely reward a polished AI-generated response.

These concerns matter in higher education, where students must develop disciplinary knowledge, critical thinking, problem-solving, communication, and professional judgment. AI use should therefore follow learning objectives and assessment requirements, with clear institutional guidance and opportunities to develop AI literacy (UNESCO, 2023; Yusuf et al., 2024). Its value depends on what students learn, not how often they use it.

1.3. Higher Education and Educational Policy in Bangladesh

In Bangladesh, AI presents opportunities to rethink university teaching, learning support, and curriculum development. At the same time, its integration needs to be considered in relation to differences in institutional capacity, digital access, faculty preparedness, and students' learning needs. These are important contextual factors to investigate rather than assume to be uniform across all universities.

An established policy foundation for university curriculum development is the University Grants Commission of Bangladesh's Template of Outcome Based Education (OBE) Curriculum (Revised) (University Grants Commission of Bangladesh [UGC], 2021). The template provides a formal reference for designing outcome-oriented curricula in the country's higher education sector. Within this approach, AI raises practical questions about how intended learning outcomes should guide teaching activities, how assessment should demonstrate student achievement, and how academic standards can be maintained when students use AI-supported tools.

A context-sensitive approach is therefore necessary. Universities need to consider not only what AI can do, but also how its use fits their curriculum goals, teaching practices, institutional resources, and expectations for graduate competence. The aim should be to identify educationally appropriate uses of AI without assuming that a single implementation model will suit every institution or discipline.

1.4. NCF 2021 and OBE as Complementary Conceptual Foundations

Bangladesh's National Curriculum Framework (NCF) 2021 offers a national perspective on competency-oriented education, emphasizing the relationship among knowledge, skills, attitudes, and values (National Curriculum and Textbook Board [NCTB], 2021). Although the framework primarily addresses school education, selected principles may provide a useful conceptual reference for discussing competency development and educational continuity between school and university. Their relevance to higher education, however, requires critical interpretation rather than direct application. In this paper, NCF 2021 is treated as a complementary educational reference, while the University Grants Commission of Bangladesh's revised Outcome-Based Education (OBE) curriculum template provides the more direct foundation for university-level curriculum design (UGC, 2021).

Accordingly, the study uses OBE to examine university learning outcomes and selected NCF 2021 principles to consider educational continuity. Together, these perspectives inform the discussion of AI-supported teaching and assessment, ethical responsibilities, and diverse student needs.

1.5. Research Problem and Knowledge Gap

Research on artificial intelligence in higher education has examined its applications in teaching, learning, and assessment, alongside concerns about academic integrity, privacy, and responsible use (Bond et al., 2024; Chan & Hu, 2023; Zawacki-Richter et al., 2019; Yusuf et al., 2024). However, further examination is needed to understand how these developments relate to university-level Outcome-Based Education (OBE) and selected competency-oriented principles of Bangladesh's National Curriculum Framework (NCF) 2021. In particular, it is important to consider how responsible AI use can be connected with program learning outcomes, course learning outcomes, teaching activities, and assessment within the country's higher education context.

This study draws on academic literature, conceptual frameworks, and national policy documents to examine how institutional conditions, responsible AI integration, curriculum alignment, and intended educational outcomes can be understood together. It identifies areas of agreement and limitations in existing approaches without assuming that comparable frameworks are absent. The proposed synthesis offers a context-sensitive perspective, although its distinctiveness requires further comparison with existing models.

1.6. Research Aim, Objectives, and Question

The aim of this paper is to develop a context-sensitive conceptual framework for aligning AI integration in Bangladeshi higher education with Outcome-Based Education, informed by relevant principles of the National Curriculum Framework 2021.

The study has three objectives:

1. To critically examine existing literature and relevant policy documents concerning AI-enhanced higher education, OBE, and competency-oriented learning.
2. To identify the pedagogical, ethical, institutional, and contextual considerations relevant to integrating AI into university curricula.
3. To develop a conceptual framework connecting responsible AI use, curriculum alignment, and intended learning outcomes in Bangladeshi higher education.

The study is guided by the following research question:

How can AI integration in Bangladeshi higher education be aligned with Outcome-Based Education and informed by relevant principles of the National Curriculum Framework 2021 to support ethical, inclusive, and meaningful learning?

The synthesis aims to inform curriculum design and institutional decisions while identifying relationships for future empirical research. Whether it extends existing approaches to AI integration and outcome-oriented curricula remains to be established.

2. LITERATURE REVIEW AND CONCEPTUAL FOUNDATIONS

2.1. AI Applications and Challenges in Higher Education

Artificial intelligence has attracted growing attention in higher education because of its potential to support teaching, learning, assessment, and academic work. The emergence of generative AI has expanded these possibilities by allowing users to generate explanations, summarize information, develop ideas, and receive as-



sistance with writing and problem-solving. A systematic mapping review by Yusuf et al. (2024), which examined 407 publications, identified themes including pedagogical enhancement, writing assistance, professional development, and ethical implications. These findings illustrate the range of educational applications being explored, while also showing that the discussion extends beyond the technical capabilities of AI.

Earlier research also demonstrates that AI in higher education is not limited to generative tools. Zawacki-Richter et al. (2019), in a systematic review of research on AI applications in higher education, identified areas such as profiling and prediction, assessment and evaluation, adaptive systems, and intelligent tutoring. Their review highlighted the importance of examining the pedagogical foundations of AI applications and the limited involvement of educators in some strands of the research. This observation remains relevant when considering whether AI tools are being selected to address genuine educational needs or primarily because the technology is available.

For students, AI can provide additional explanations, support brainstorming, and help clarify unfamiliar concepts. For teachers, it may assist in preparing learning materials, developing classroom activities, and generating formative feedback. Chan and Hu (2023) found that university students recognized potential benefits of generative AI while also expressing concerns about accuracy, academic integrity, privacy, and overdependence. UNESCO (2023) similarly emphasizes the need for human-centered approaches that protect learners' interests and preserve human agency.

These findings suggest that AI should not be treated as an automatic solution to educational challenges. Its usefulness depends on the task, the quality of its outputs, students' ability to evaluate those outputs, and the teacher's role in guiding learning. AI-generated content may contain errors or reproduce biases, while excessive reliance on automated assistance may reduce opportunities for independent reasoning. The literature therefore supports a balanced view: AI offers meaningful educational possibilities, but its integration requires pedagogical judgment, ethical safeguards, and evidence of learning value.

2.2. AI-Enhanced Curriculum Design, Teaching, and Assessment

AI integration becomes educationally meaningful when it is connected to curriculum design rather than introduced as a separate technological activity. Curriculum decisions establish what students should learn, which experiences will help them achieve those aims, and how their progress will be assessed. AI-supported activities should serve these purposes instead of displacing them.

Biggs and Tang (2011) explain this relationship through constructive alignment, in which intended learning outcomes, teaching and learning activities, and assessment tasks are designed to reinforce one another. Applied to AI-enhanced education, this principle means that the use of a particular tool should follow from the intended outcome. For example, if students are expected to develop analytical reasoning, an AI activity might require them to compare generated explanations, identify unsupported claims, and justify their own conclusions. Simply asking AI to produce an answer would provide weaker evidence of the student's independent analytical ability.

AI can also support formative learning by providing practice questions, alternative explanations, or preliminary feedback. However, such feedback needs to be checked for accuracy and relevance. Teachers remain responsible for deciding whether AI-generated materials are appropriate for the course and whether they address the needs of particular learners. UNESCO (2023) cautions against allowing technological capabilities alone to determine educational practice.

Assessment presents a particularly important challenge. When AI can produce fluent written responses, conventional assignments may no longer provide sufficient evidence of students' independent understanding. This does not mean that all AI use should be prohibited. Instead, curriculum designers may need to make expectations explicit, distinguish permitted from restricted uses, and combine written work with activities that reveal students' reasoning, application, and reflection. These approaches should be guided by the learning outcomes and the disciplinary context.



For Bangladeshi universities adopting OBE, this discussion has direct conceptual relevance. AI-supported activities can be mapped to course learning outcomes and program learning outcomes, but their inclusion should be justified by the competencies they are intended to develop. The central issue is not how many AI tools a course uses; it is whether their use contributes to clearly defined and appropriately assessed learning.

2.3. Outcome-Based Education in Bangladeshi Universities

Outcome-Based Education (OBE) provides an important foundation for discussing curriculum development in Bangladesh because it places intended learning outcomes at the center of program design. Rather than defining a curriculum solely by the topics to be covered, OBE emphasizes what students should know, understand, and be able to demonstrate upon completing a course or program.

The University Grants Commission of Bangladesh published a revised Template of Outcome Based Education (OBE) Curriculum in 2021, providing an official reference for outcome-oriented curriculum development in the country's higher education sector (University Grants Commission of Bangladesh [UGC], 2021). The template connects program objectives and learning outcomes with course structures, teaching and learning strategies, and assessment. This provides a basis for considering how AI-supported activities might fit within university curricula.

The Bangladesh National Qualifications Framework (BNQF) also provides a relevant policy reference by defining qualification levels and learning-outcome expectations across the education system, including higher education at Levels 7 to 10 (Ministry of Education, 2021). Its emphasis on knowledge, skills, and responsibility complements the outcome-oriented approach reflected in the UGC curriculum template.

From an OBE perspective, AI integration should begin with the intended learning outcomes. If a program expects students to demonstrate problem-solving, professional communication, critical analysis, or disciplinary competence, curriculum designers need to consider whether a proposed AI activity helps students develop and demonstrate those capabilities. For instance, students in a professional program might use AI to explore alternative solutions to a problem, but they should also be required to assess the reliability of those solutions and justify their final decisions.

OBE also raises questions about the evidence used to judge learning. AI-generated answers, automated feedback, and digitally supported assignments may contribute to the learning process, but they do not necessarily demonstrate what an individual student understands. Assessment design must therefore remain consistent with the intended outcomes and provide credible evidence of student achievement.

The UGC template offers a policy foundation for these considerations, but it does not, by itself, establish how AI should be integrated into every discipline or institutional context. The proposed conceptual framework should consequently treat OBE as a curriculum-alignment structure and examine how AI can support its implementation while maintaining academic standards, learner responsibility, and meaningful assessment.

2.4. NCF 2021: Competency-Oriented Learning and Potential Relevance to Higher Education

Bangladesh's National Curriculum Framework 2021 provides a national reference for competency-oriented education. Published by the National Curriculum and Textbook Board (NCTB, 2021), the framework outlines educational principles and curricular directions for school education. Its emphasis on developing learners' knowledge, skills, attitudes, and values offers a useful perspective for discussing educational capabilities that remain relevant as learners progress to higher levels of study.

NCF 2021 provides a national perspective on competency-oriented education but does not directly regulate higher education, as it covers pre-primary through Grade 12 (NCTB, 2021). This study therefore uses selected principles as a conceptual reference for competency development and responsible technology use, while recognizing the different aims and requirements of university education.

This distinction is important when considering AI. Competency-oriented learning requires students to do more



than reproduce information. Depending on the discipline and course, they may need to interpret evidence, solve problems, communicate ideas, exercise judgment, and apply knowledge in unfamiliar situations. AI can provide opportunities to practice some of these capabilities, but it can also obscure whether students have developed them independently.

The relationship between NCF 2021 and university-level OBE should be understood as complementary rather than equivalent. NCF 2021 primarily governs the school-education context, and its principles cannot be directly transferred to higher education as regulatory requirements. Nevertheless, its emphasis on integrating knowledge, skills, attitudes, and values offers a conceptual basis for considering continuity in learners' competency development across educational stages. Such continuity is relevant to university education because capabilities involving critical thinking, problem-solving, communication, and responsible judgment may be developed further through discipline-specific learning outcomes. The UGC's revised OBE curriculum template and the BNQF provide the more appropriate university-level references for defining and assessing those outcomes. Accordingly, the proposed framework uses selected NCF 2021 principles as contextual educational perspectives, while university curriculum alignment remains grounded in OBE and relevant higher education qualification expectations. This distinction avoids assuming equivalence between school and university curricula and recognizes that the applicability of particular competency principles requires contextual interpretation.

2.5. Ethical, Inclusive, and Human-Centered AI Integration

Ethical responsibility and inclusion are central considerations in the educational use of AI. Although AI tools may make learning resources and assistance more accessible, the benefits are not necessarily distributed equally. Differences in internet connectivity, access to suitable devices, paid subscriptions, language support, and digital literacy may affect students' ability to use these tools. These factors are particularly important to investigate in a diverse higher education system rather than assuming that all students have the same opportunities.

UNESCO (2023) recommends a human-centered approach to generative AI in education and research, emphasizing data protection, human agency, inclusion, and the need for appropriate institutional safeguards. These principles are relevant to curriculum design because students may submit personal information or academic work to external platforms without fully understanding how their data may be processed. Institutions and educators therefore need to consider privacy, transparency, and acceptable use when recommending AI tools.

Academic integrity is another concern. Students need clear guidance about when AI assistance is permitted, how its contribution should be acknowledged, and which forms of independent work remain essential. At the same time, ethical policy should distinguish between responsible assistance and inappropriate substitution of AI-generated work for students' own learning. Assessment design, academic guidance, and AI literacy can work together to clarify these expectations.

Inclusion also requires attention to language and accessibility. Tools may differ in their ability to interpret local contexts, handle particular languages, or produce reliable subject-specific explanations. An AI-supported curriculum should therefore avoid assuming that the same tool will serve every learner equally well. Human oversight remains important for evaluating outputs, addressing bias, and ensuring that technology supports rather than weakens educational participation.

These considerations suggest that ethics and inclusion should not be treated as additional features introduced after AI adoption. They should inform decisions about tool selection, curriculum activities, assessment, and institutional support from the beginning.

2.6. Theoretical Foundations: Constructive Alignment, Technology Integration, and Responsible AI

Three complementary perspectives inform the proposed framework.

First, constructive alignment provides a basis for connecting intended learning outcomes with teaching activities and assessment (Biggs & Tang, 2011). In an AI-enhanced curriculum, this means selecting AI-supported activities according to what students are expected to learn and demonstrate.

Second, the Technological Pedagogical Content Knowledge (TPACK) framework developed by Mishra and Koehler (2006) explains how effective technology integration depends on the relationship among technological knowledge, pedagogical knowledge, and subject-matter knowledge. This perspective helps explain why AI adoption alone is insufficient: educators must understand both the technology and its relevance to the subject being taught.

Third, human-centered and responsible AI principles provide an ethical foundation for integration. UNESCO (2023) emphasizes the importance of human agency, inclusion, privacy, and appropriate oversight. These principles help ensure that curriculum decisions account for potential harms as well as educational opportunities.

These theoretical perspectives contribute distinct but interconnected functions to the proposed framework. Constructive alignment provides the principal curriculum-design logic by connecting program learning outcomes, course learning outcomes, AI-supported teaching activities, and assessment evidence. TPACK explains the pedagogical and disciplinary expertise required for educators to select, evaluate, and appropriately integrate AI tools into these activities. UNESCO's Guidance for Generative AI in Education and Research (2023) contributes ethical principles relating to human agency, privacy, inclusion, and oversight, while UNESCO's AI competency frameworks for teachers and students (Miao & Cukurova, 2024; Miao et al., 2024) provide additional perspectives on AI literacy, educator preparedness, and responsible engagement with AI. In the proposed synthesis, constructive alignment principally informs the curriculum-alignment component, TPACK informs faculty preparedness and pedagogical decision-making, and UNESCO guidance and competency frameworks inform the cross-cutting governance and AI-literacy dimensions. Their integration offers a rationale for linking institutional conditions, responsible AI use, curriculum design, and intended educational outcomes without treating these established perspectives as interchangeable or claiming that their combination has already been empirically validated in Bangladesh.

2.7. Synthesis of the Literature and Implications for Framework Development

Research on AI in higher education spans curriculum design, teaching, assessment, educator preparedness, learning outcomes, and responsible use. In a systematic review of 33 studies, Liang et al. (2025) identified opportunities for developing educational materials and supporting assessment, alongside challenges in academic implementation. Curriculum and assessment are therefore established areas of inquiry, not unexplored topics.

In Bangladesh, institutional conditions are relevant to understanding AI integration in higher education. However, evidence about AI adoption and faculty experiences does not, by itself, establish how AI should be systematically connected to program learning outcomes, course learning outcomes, teaching activities, and assessment. Further research is needed to examine these relationships within the country's higher education context.

The UGC's revised OBE curriculum template provides a university-level reference, while NCF 2021 addresses school education. Selected NCF 2021 principles are therefore treated as complementary educational perspectives rather than university requirements.

The targeted search suggests a possible gap in how university-level OBE, selected NCF 2021 principles, and responsible AI integration are considered together in Bangladesh. Because the search was not exhaustive, it cannot establish the absence of comparable frameworks. This paper therefore offers a context-sensitive



conceptual synthesis whose distinctiveness requires a broader, reproducible review and comparison with existing models.

3. RESEARCH METHODOLOGY

3.1. Research Design: Integrative Literature Review and Conceptual Synthesis

This study employed an integrative literature review and conceptual synthesis approach to examine how artificial intelligence (AI) can be aligned with Outcome-Based Education (OBE) and informed by relevant principles of Bangladesh's National Curriculum Framework (NCF) 2021 in higher education. The review brought together empirical research, theoretical literature, and relevant policy documents to identify concepts and relationships that could inform a context-sensitive conceptual framework. The analysis focused on curriculum alignment, responsible AI integration, institutional readiness, and intended educational outcomes. The framework was developed through a critical synthesis of these sources rather than through primary data collection or empirical testing. An integrative review is appropriate because the topic draws on different forms of literature, including empirical studies, theoretical contributions, and policy documents. It allows these sources to be examined together to develop a broader conceptual understanding rather than simply summarizing individual studies (Torraco, 2005; Whittemore & Knafl, 2005).

Accordingly, the study's findings are conceptual and interpretive. They provide a basis for examining potential relationships among responsible AI integration, curriculum alignment, institutional readiness, and intended educational outcomes, rather than evidence of causal effects or demonstrated educational effectiveness.

3.2. Literature Sources, Search Terms, and Selection Criteria

A targeted exploratory literature search was conducted on October 18, 2026, to identify scholarly and policy-based perspectives relevant to aligning artificial intelligence (AI) with Outcome-Based Education (OBE) and competency-oriented learning in Bangladeshi higher education. The search drew on publicly accessible scholarly search results, publisher websites, and official institutional and policy sources. The thematic scope included AI and generative AI in higher education, outcome-based curriculum development, constructive alignment, teaching and assessment practices, educator AI competencies, institutional readiness, ethical governance, and educational policy in Bangladesh. The review was designed to support conceptual synthesis rather than to provide exhaustive or statistically generalizable coverage of the available literature.

The exploratory search considered combinations of the terms "artificial intelligence," "generative AI," "higher education," "curriculum design," "outcome-based education," "learning outcomes," "constructive alignment," "competency-based education," "assessment," "responsible AI," "Bangladesh," and "National Curriculum Framework 2021." Sources were considered for inclusion when they contributed directly to understanding AI-supported teaching and assessment, curriculum alignment, educator competencies, institutional conditions, ethical safeguards, or relevant educational policies. Eligible source types included peer-reviewed empirical studies, literature reviews, theoretical and conceptual contributions, recognized international educational guidance, and official Bangladesh policy documents. Literature with limited relevance to these dimensions was not prioritized. No fixed publication-year restriction was imposed because the synthesis required both foundational educational theories and recent AI-related scholarship. The selection process was purposive and conceptually driven rather than based on a fully documented systematic-screening protocol.

The review also incorporated established theoretical and policy sources. Constructive alignment provided a basis for examining relationships among learning outcomes, teaching activities, and assessment (Biggs & Tang, 2011). The Technological Pedagogical Content Knowledge (TPACK) framework informed the discussion of technological, pedagogical, and disciplinary knowledge (Mishra & Koehler, 2006). UNESCO's guidance on generative AI provided an ethical and human-centered perspective (UNESCO, 2023). Bangladesh's revised OBE curriculum template and NCF 2021 were examined as distinct policy references relevant to university curriculum design and competency-oriented educational principles, respectively (UGC, 2021; NCTB, 2021).



Source selection was guided by relevance to the research question rather than by an exhaustive database-screening procedure. The review drew on accessible scholarly publications, established educational theories, and official policy documents. It did not include a comprehensive search of Scopus, Web of Science, ERIC, or comparable subscription-based databases, and complete records of retrieval, duplicate removal, and full-text exclusion were not maintained. No standardized quality-appraisal instrument was applied. These limitations restrict claims about the completeness of the literature reviewed and the originality of the proposed framework in relation to all existing models.

The study is therefore presented as a targeted integrative literature review and conceptual synthesis rather than an exhaustive review. It examines potential relationships among responsible AI governance, institutional readiness, curriculum alignment, and intended educational outcomes. Its conclusions remain exploratory and do not establish that comparable frameworks are absent from existing scholarship.

3.3. Selection of Relevant Policy Documents

Three Bangladesh policy documents informed the final conceptual synthesis: NCF 2021, the UGC's revised OBE curriculum template, and the Bangladesh National Qualifications Framework (BNQF) 2021. The BNQF was incorporated during manuscript revision to strengthen the higher education policy context. The National Curriculum Framework 2021, issued by the National Curriculum and Textbook Board (NCTB), covers pre-primary through Grade 12. It is used in this paper as a contextual source for considering the potential continuity of selected competency-oriented educational principles, rather than as a direct regulatory framework for university curricula.

The BNQF provides an additional reference for learning outcomes and qualification levels in higher education (Ministry of Education, 2021). It complements the UGC template by situating university qualifications within the broader national qualifications framework.

The University Grants Commission of Bangladesh's revised Template of Outcome Based Education (OBE) Curriculum provides the more direct policy reference for university-level curriculum design. It informs the discussion of program learning outcomes, course learning outcomes, teaching and learning strategies, and assessment.

The policy documents were interpreted according to their institutional authority, educational scope, relevance to learning outcomes, and applicability to university curriculum development. The UGC's revised OBE curriculum template was treated as the principal university-level curriculum reference because of its direct relevance to program and course learning outcomes, teaching strategies, and assessment. The Bangladesh National Qualifications Framework (BNQF) was used as a complementary reference for qualification levels and expected learning capabilities. In contrast, NCF 2021 was interpreted selectively as a school-level competency-oriented framework with potential conceptual relevance to educational continuity. The analysis distinguished formal policy applicability from the transferability of broader educational principles; therefore, selected NCF competencies were not treated as mandatory university requirements. Academic publications were considered for their theoretical or empirical relevance to the proposed framework, while recognizing that no standardized methodological quality-appraisal procedure was undertaken. None of the policy documents was interpreted as requiring AI adoption in university curricula.

3.4. Thematic Analysis and Synthesis

The literature and policy documents were interpreted through a conceptually guided thematic synthesis focused on curriculum alignment, learning outcomes, technological and pedagogical competence, institutional conditions, academic integrity, inclusion, and responsible AI governance. The synthesis involved identifying recurring educational concerns, examining how these concerns were represented in relevant theoretical and policy perspectives, and organizing their conceptual relationships within outcome-oriented university curriculum design. Constructive alignment was used to interpret relationships among learning outcomes, teaching activities, and assessment; TPACK informed the interpretation of educator knowledge and

pedagogical technology integration; and responsible AI principles informed the treatment of ethical safeguards, inclusion, and human oversight. These complementary perspectives supported the organization of the proposed framework into interrelated dimensions. The thematic categories represent an interpretive synthesis of selected sources rather than the results of a formal systematic coding procedure.

The resulting synthesis was organized into four interrelated dimensions: (1) national and institutional context, (2) responsible and inclusive AI governance, (3) curriculum alignment, and (4) intended educational outcomes. These dimensions were informed by theoretical literature, research on AI applications in education, relevant competency frameworks, and selected national policy documents. Table 1 presents an interpretive source-to-theme mapping that identifies the principal publications and policy documents associated with each dimension.

The mapping illustrates the conceptual basis for the proposed framework rather than the results of a formal, independently verified coding procedure. The synthesis did not involve statistical meta-analysis, independent duplicate coding, or empirical testing. Accordingly, the framework's proposed relationships should be understood as theoretically informed propositions rather than empirically validated findings. Further research is needed to assess their relevance and examine the framework's contribution in relation to existing models.

Table 1. Interpretive Mapping of Literature and Policy Sources to the Proposed Framework Components

Framework dimension	Supporting publications or policy documents	Contribution to conceptual synthesis
1. National and institutional context	UGC (2021); Ministry of Education (2021); NCTB (2021); Akter et al. (2026); Bond et al. (2024)	University OBE curriculum guidance; national qualification levels and learning outcomes; selected school-level competency principles; AI-adoption conditions; institutional and ethical considerations
2. Responsible and inclusive AI governance	UNESCO (2023); Miao & Cukurova (2024); Miao et al. (2024); Chan & Hu (2023)	Human agency, privacy, ethical safeguards, educator and learner AI competencies, and concerns about responsible AI use
3. Curriculum alignment	Biggs & Tang (2011); Mishra & Koehler (2006); Liang et al. (2025); Belkina et al. (2025); Sun et al. (2026)	Constructive alignment, teacher knowledge for technology integration, AI-supported curriculum design, teaching, and assessment
4. Intended educational outcomes	UGC (2021); NCTB (2021); Biggs & Tang (2011); Miao et al. (2024)	Program and course learning outcomes, competency-oriented development, student AI literacy, and assessment of intended capabilities
Cross-component feedback and improvement	Biggs & Tang (2011); UGC (2021); UNESCO (2023)	Conceptual rationale for using assessment evidence, human oversight, and institutional review to inform ongoing curriculum improvement

Note. This table is an interpretive mapping of sources discussed in the manuscript, not a quantitative coding matrix or a systematic assessment of all available literature. Individual sources may inform more than one framework dimension. The proposed feedback relationship is a conceptual inference drawn from the combined perspectives rather than a relationship empirically established by these sources.

Table 1 shows how the framework draws on complementary sources. National policy and AI adoption research inform the institutional context, while UNESCO guidance and competency frameworks support responsible AI governance. Constructive alignment, technology integration theory, and research on AI-enhanced teaching inform curriculum design. OBE and competency-oriented learning provide a basis for interpreting intended educational outcomes.

The synthesis suggests that these dimensions can be considered together when examining responsible AI integration in Bangladeshi higher education. However, the relationships among them are proposed rather than



empirically established. The table therefore serves to make the framework's conceptual foundations more transparent without implying that the included publications collectively validate the model.

3.5. Procedure for Developing the Conceptual Framework

The conceptual framework was developed in three related stages. First, the selected literature and policy documents were organized according to their relevance to institutional context, responsible AI governance, curriculum alignment, and intended educational outcomes. Table 1 summarizes the relationship between the identified framework dimensions and the supporting literature, making the conceptual basis of the synthesis more transparent.

Second, the dimensions were considered through the complementary perspectives of constructive alignment, TPACK, and responsible AI principles. This stage focused on how institutional conditions and ethical safeguards may influence the integration of AI-supported activities into outcome-oriented curriculum design.

Third, the dimensions were brought together into a proposed context-sensitive framework for Bangladeshi higher education. The framework connects national and institutional conditions with responsible AI governance, curriculum alignment, and intended educational outcomes. It also proposes that assessment evidence and learner experiences may inform curriculum revision and institutional improvement. These relationships are represented in Figure 1 and expressed as five propositions for future empirical investigation.

The framework remains conceptual, and its distinctiveness and practical relevance require further comparison and empirical evaluation.

3.6. Methodological Limitations

The study relied on a targeted public-web search rather than a reproducible search across multiple academic databases. Without complete exportable records, reliable counts of identified, screened, and excluded studies cannot be reported. Purposive source selection may also have overlooked relevant research or frameworks that could affect the interpretation of the research gap.

The synthesis did not include a formal quality appraisal, independent duplicate screening, or a standardized risk-of-bias assessment. In addition, the available Bangladesh-focused literature identified in the targeted search provides evidence concerning AI adoption, faculty experiences, and institutional support, but is insufficient to establish whether the proposed combination of OBE, NCF 2021 principles, and responsible AI is absent from existing frameworks.

Finally, the proposed framework remains conceptual and has not been empirically validated. Future research should conduct a reproducible search of relevant databases, compare existing frameworks using explicit criteria, and investigate the framework's relevance across different universities and disciplines in Bangladesh.

4. PROPOSED CONCEPTUAL FRAMEWORK

4.1. Rationale and Design Principles of the Proposed Framework

The proposed conceptual framework seeks to explain how artificial intelligence (AI) can be integrated into university curricula in Bangladesh in ways that support meaningful learning, responsible technology use, and clearly defined educational outcomes. Its central argument is that AI adoption should not be treated as an independent educational objective. Instead, AI-supported activities should be selected and evaluated according to their contribution to curriculum goals, students' learning needs, and the competencies that higher education programs are intended to develop.

This approach draws on research highlighting both the educational opportunities and the limitations of AI. Zawacki-Richter et al. (2019) identified several applications of AI in higher education, including assessment, prediction, and adaptive learning, while also highlighting the need for stronger pedagogical involvement in AI



research. More recent discussions of generative AI similarly emphasize the importance of human oversight, ethical safeguards, and educational purpose (UNESCO, 2023). These perspectives suggest that effective integration requires coordination among institutional conditions, curriculum design, teaching practices, and assessment.

The proposed framework is guided by four principles: contextual relevance, outcome alignment, ethical responsibility, and inclusive participation. Contextual relevance requires attention to the circumstances of Bangladeshi universities, while outcome alignment connects AI-supported activities with intended learning outcomes. Ethical responsibility addresses academic integrity, privacy, accuracy, and human judgment, and inclusive participation recognizes differences in digital access, AI literacy, and language support.

These principles connect institutional conditions, responsible AI integration, curriculum alignment, and intended educational outcomes within Bangladeshi higher education. The framework draws on established educational and ethical perspectives, while its distinctiveness requires further comparison with existing models.

4.2. National and Institutional Context: NCF 2021, OBE, and University Priorities

The first component concerns the national educational context and the institutional conditions that influence AI integration. Bangladesh's National Curriculum Framework (NCF) 2021 provides a competency-oriented perspective on school education, while the University Grants Commission's revised Outcome-Based Education (OBE) curriculum template offers a more direct reference for university curriculum design (National Curriculum and Textbook Board [NCTB], 2021; University Grants Commission of Bangladesh [UGC], 2021).

These documents serve different purposes and should not be treated as interchangeable. NCF 2021 primarily addresses school education; therefore, its relevance to university education lies in the potential continuity of selected educational principles, such as competency development, critical thinking, and responsible technology use. OBE, by contrast, provides a curriculum-oriented structure for defining program and course learning outcomes and aligning them with teaching and assessment.

The framework proposes that AI integration should be informed by both the relevant national educational context and the specific priorities of individual universities. Institutional readiness is an important consideration within this component. It includes the availability of appropriate digital infrastructure, faculty preparedness, institutional guidance on AI use, student access to learning resources, and support for professional development. These conditions may influence whether AI-supported learning activities can be implemented consistently and equitably.

Consequently, the framework does not assume that all universities in Bangladesh have the same capacity or needs. Instead, it treats institutional readiness and contextual relevance as conditions that shape decisions about the appropriate use of AI.

4.3. Responsible AI Integration: Ethics, Inclusion, and Human Oversight

The second component focuses on the principles that should guide AI use in teaching and learning. The proposed framework treats ethical responsibility, inclusion, AI literacy, and human oversight as interconnected requirements rather than optional additions to technological adoption.

Ethical responsibility includes protecting student information, acknowledging AI assistance where required, maintaining academic integrity, and evaluating the reliability of AI-generated content. Generative AI systems can produce plausible but inaccurate responses, making critical evaluation essential. UNESCO (2023) emphasizes a human-centered approach to generative AI in education, including safeguards for privacy, human agency, and equitable participation.

Inclusion requires universities to consider whether students have meaningful opportunities to benefit from AI-supported learning. Differences in connectivity, device availability, affordability, language support, and digital



skills may affect participation. An inclusive approach should therefore consider accessible alternatives and avoid making access to a particular commercial AI tool an unnecessary condition for academic success.

AI literacy is equally important. Students and educators need to understand what AI systems can and cannot do, recognize possible errors and biases, and make informed decisions about when AI assistance is appropriate. Human oversight ensures that educators retain responsibility for pedagogical decisions, assessment standards, and the interpretation of student performance.

Within the proposed framework, these principles guide both institutional policy and classroom practice. They are intended to help universities integrate AI without compromising student autonomy, educational fairness, or the integrity of academic work.

4.4. Curriculum Alignment: Program Outcomes, Course Outcomes, Learning Activities, and Assessment

The third component connects responsible AI use with the practical design of university curricula. Its principal theoretical foundation is constructive alignment, which emphasizes coherence among intended learning outcomes, teaching and learning activities, and assessment (Biggs & Tang, 2011).

Under this approach, curriculum designers begin by identifying what students should know and be able to demonstrate. They then determine whether AI-supported activities can help students achieve those outcomes and how their achievement can be assessed. For example, where a course requires analytical reasoning, students might use AI to generate alternative explanations, compare them with academic sources, identify inaccuracies, and justify their own conclusions. The educational task is not simply to obtain an AI-generated answer but to evaluate evidence and demonstrate independent judgment.

The framework distinguishes program-level outcomes from course-level outcomes while recognizing their relationship. Program learning outcomes describe the broader capabilities expected of graduates, whereas course learning outcomes specify what students should demonstrate within individual courses. AI-supported teaching activities and assessments should contribute to these outcomes in a coherent way.

Assessment design requires particular attention. Where students are permitted to use AI, assessment instructions should clarify the boundaries of acceptable assistance. Depending on the intended outcome, educators may combine written assignments with presentations, problem-solving activities, reflective explanations, practical demonstrations, or other forms of assessment that provide credible evidence of student understanding.

This component therefore positions AI as a possible means of supporting curriculum outcomes, not as a substitute for curriculum planning or professional judgment. The appropriate form of integration will depend on the discipline, learning objectives, assessment requirements, and students' needs.

4.5. Intended Outcomes: Disciplinary Competence, Critical Thinking, Digital Literacy, and Responsible AI Use

The fourth component concerns the educational outcomes that the framework is intended to support. Four areas are proposed: disciplinary competence, critical thinking, digital literacy, and responsible AI use.

Disciplinary competence refers to students' ability to apply subject-specific knowledge and skills to relevant academic or professional tasks. AI may provide opportunities for practice and feedback, but students must still demonstrate that they understand the underlying concepts and can apply them appropriately.

Critical thinking involves evaluating information, examining assumptions, comparing explanations, and reaching justified conclusions. AI-supported activities may provide material for this kind of analysis when students are required to assess the quality and credibility of generated responses rather than accept them uncritically.

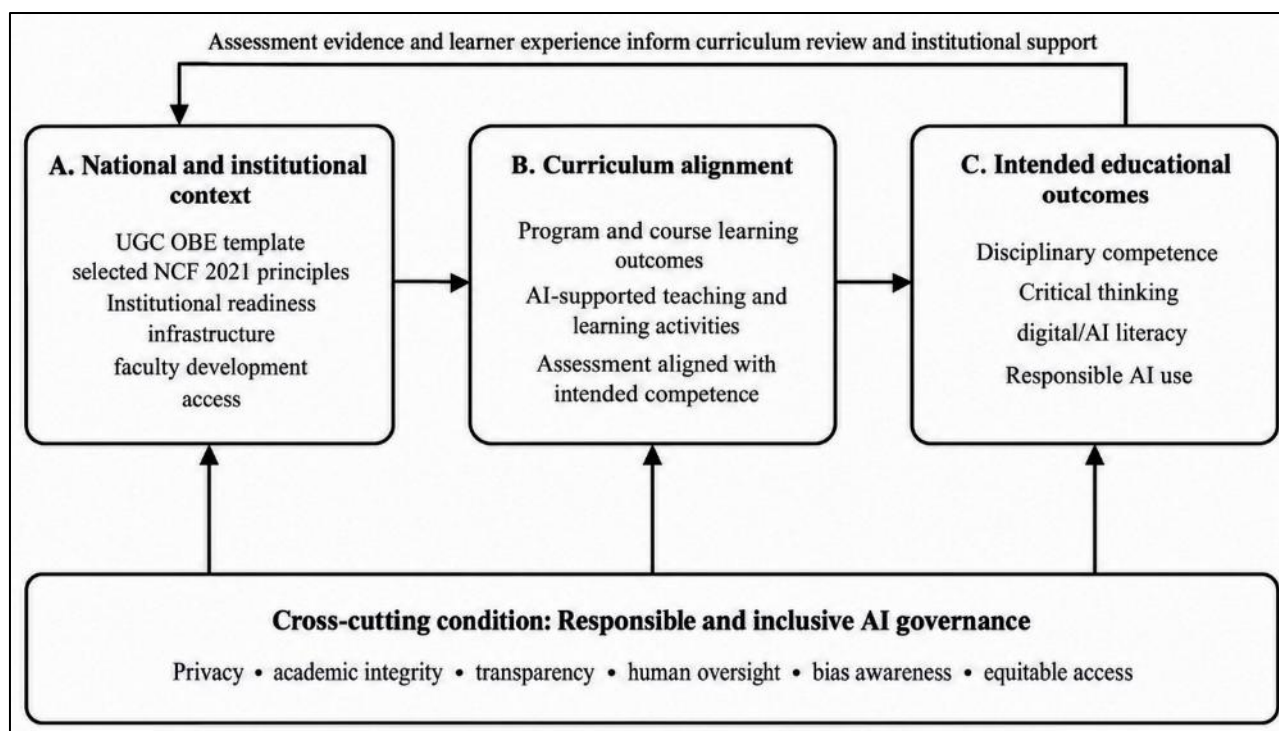
Digital literacy includes the ability to use digital tools appropriately, evaluate information, and understand the limitations of technology. Responsible AI use extends this capability to the ethical and academic dimensions of AI, including transparency, privacy, appropriate attribution, and awareness of potential bias.

These outcomes are proposed as priorities for curriculum design, not as guaranteed effects of AI use. Their achievement depends on the quality of learning activities, teaching support, assessment, and institutional conditions. Future empirical research would be needed to establish whether particular implementations of the framework contribute to these outcomes.

4.6. Relationships Among Framework Components

Figure 1 illustrates how institutional conditions, curriculum alignment, and intended educational outcomes are connected in the proposed framework. National policy references, university priorities, digital infrastructure, and faculty capacity establish the context in which decisions about AI use are made. Within this context, curriculum alignment begins with program and course learning outcomes and considers which AI-supported activities and assessments can provide meaningful opportunities for students to develop and demonstrate the expected competencies. Responsible and inclusive AI governance applies across these decisions through safeguards for privacy, academic integrity, transparency, accessibility, and human oversight. The intended outcomes include disciplinary competence, critical thinking, digital literacy, and responsible AI use. The framework also proposes a feedback process in which assessment evidence and learner experiences inform curriculum revision and institutional support. These relationships are conceptual propositions that require empirical examination rather than demonstrated causal pathways.

Figure 1. Proposed context-sensitive framework for responsible AI integration in Bangladeshi higher education.



Note. The arrows represent proposed relationships for future empirical investigation rather than established causal effects. Responsible and inclusive AI governance operates as a cross-cutting condition, while assessment evidence and learner experiences provide feedback for curriculum improvement and institutional support.



4.7. Conceptual Propositions for Future Empirical Testing

Based on the framework's proposed relationships, five propositions are offered for future empirical investigation:

Proposition 1 (curriculum alignment): Greater alignment among AI-supported learning activities, intended course and program learning outcomes, and assessment practices is expected to be associated with stronger evidence of students' achievement of the targeted competencies.

Proposition 2 (institutional readiness): Greater institutional readiness—including clear guidance, infrastructure, access support, and faculty development—will be associated with higher-quality implementation of responsible AI-supported teaching and assessment.

Proposition 3 (faculty AI literacy): Higher faculty AI literacy will be associated with stronger curriculum alignment because educators are better able to select suitable AI uses, evaluate outputs, and design outcome-aligned learning and assessment activities.

Proposition 4 (responsible governance and inclusion): Clearer responsible-AI guidance and more equitable access arrangements will be associated with fewer reported barriers to participation and more consistent adherence to acceptable-use expectations.

Proposition 5 (feedback and improvement): Institutions that systematically use assessment evidence and learner feedback to revise AI-supported curriculum activities will demonstrate greater improvement in curriculum alignment across successive review cycles.

The propositions are hypotheses for future testing, not findings established by the present conceptual review. Potential indicators include rubric-based ratings of outcome–activity–assessment alignment; documented institutional AI guidance and faculty development; scenario-based measures of faculty AI literacy; student and faculty reports of access barriers and acceptable-use clarity; and records of curriculum revisions linked to assessment evidence. Possible methods include course-document analysis, expert review, faculty and student surveys, interviews, and longitudinal case studies. Any instrument should be piloted and its validity and reliability assessed before substantive conclusions are drawn.

5. DISCUSSION

5.1. Theoretical Contribution to AI-Enhanced Curriculum Design

The framework's contribution is to examine AI integration through the relationship between educational intentions, institutional conditions, and evidence of student learning. Constructive alignment provides the basis for identifying the competencies that students should demonstrate and selecting teaching and assessment activities accordingly (Biggs & Tang, 2011). TPACK adds the educator's capacity to make informed pedagogical and disciplinary decisions about technology use (Mishra & Koehler, 2006). Responsible AI guidance extends these considerations to privacy, fairness, transparency, and human oversight (UNESCO, 2023).

Bringing these perspectives into the Bangladeshi higher education context highlights a practical distinction between adopting AI tools and embedding them in an outcome-oriented curriculum. For example, an institution may provide access to AI applications without establishing whether those applications support course learning outcomes or whether its assessments still demonstrate students' own capabilities. The proposed framework makes that distinction explicit by treating institutional readiness and governance as conditions for curriculum alignment rather than as substitutes for it.

The contribution is therefore a policy-sensitive conceptual synthesis, not a new theory of educational technology or evidence that AI improves learning. Its value lies in providing a structure for examining how

institutional decisions, curriculum design, and assessment might be evaluated together. Future comparative and empirical studies are needed to determine whether this synthesis provides advantages over existing approaches.

5.2. Implications for OBE Implementation in Bangladeshi Universities

The framework has practical implications for universities implementing Outcome-Based Education (OBE).

Under an outcome-oriented approach, curriculum decisions should begin with the capabilities students are expected to demonstrate. AI-supported activities can then be selected according to their contribution to program learning outcomes, course learning outcomes, and appropriate assessment practices.

For example, an AI tool might help students explore alternative solutions to a disciplinary problem. However, if the intended outcome involves critical analysis, students should also evaluate the reliability of the generated information and explain their own reasoning. This approach allows AI to support learning without replacing the intellectual work that assessment is intended to measure.

The framework also highlights the importance of faculty development. Teachers need opportunities to understand AI capabilities and limitations, redesign assessment where necessary, and establish clear expectations for acceptable AI use. University administrators and curriculum committees can support these efforts by developing institutional guidance and reviewing whether AI-supported activities align with program outcomes.

These implications are consistent with the outcome-oriented direction reflected in the University Grants Commission of Bangladesh's revised OBE curriculum template (UGC, 2021). Nevertheless, the proposed framework does not establish that AI integration will automatically improve OBE implementation. Its value and feasibility will depend on institutional conditions and subsequent empirical evaluation.

5.3. Relevance and Limitations of Connecting NCF 2021 Principles to Higher Education

The relevance of NCF 2021 to this study lies in educational continuity rather than direct policy application. As a school-level framework, NCF 2021 addresses competency development through knowledge, skills, attitudes, and values (NCTB, 2021). These broad educational concerns can inform discussion of capabilities that university students continue to develop, including critical thinking, communication, problem-solving, and responsible judgment. However, their relevance to a particular university course must be established through its disciplinary aims and intended learning outcomes.

This distinction has implications for curriculum design. A competency emphasized during school education should not automatically be adopted as a university learning outcome without considering the level of knowledge, independence, and professional judgment expected of graduates. The UGC's revised OBE curriculum template and the BNQF provide more appropriate references for defining and assessing university-level capabilities. NCF 2021 consequently serves as a complementary conceptual perspective, while the university's OBE structure determines how the relevant competencies are translated into teaching activities and assessment.

The connection proposed in this study remains interpretive. Further analysis of specific competency statements and university learning outcomes would be needed to establish how educational continuity can be demonstrated in practice.

5.4. Ethical, Institutional, and Pedagogical Implications

Responsible AI integration requires coordination among institutional policy, teaching practice, and student learning. Ethical considerations include data privacy, academic integrity, the reliability of AI-generated content, and the possibility of biased or misleading outputs. UNESCO (2023) emphasizes human agency, inclusion, and appropriate safeguards in educational uses of generative AI. These principles support the framework's position that human oversight should remain central to curriculum and assessment decisions.

Institutional readiness also matters. Differences in digital infrastructure, faculty preparedness, language support, and student access may affect how AI-supported learning activities can be implemented. Universities should therefore avoid assuming that a single approach will work equally well across all disciplines and institutions.

Pedagogically, AI should support rather than displace meaningful student engagement. Educators need to identify when AI assistance is appropriate, communicate expectations clearly, and design activities that encourage independent judgment. Such an approach can allow experimentation with AI while protecting the educational purpose of university study.

5.5. Comparison with Existing Frameworks and the Study's Distinctive Contribution

A comparison with existing approaches is necessary before the proposed framework's distinctiveness can be established. Constructive alignment links intended learning outcomes, teaching and learning activities, and assessment (Biggs & Tang, 2011), while TPACK explains the interaction among technological, pedagogical, and disciplinary knowledge (Mishra & Koehler, 2006). These frameworks offer useful foundations for curriculum and teaching design, but neither was developed specifically as a national, institution-to-outcome model for responsible AI integration in Bangladesh.

Several more recent approaches narrow the apparent gap. UNESCO's AI Competency Framework for Teachers sets out teacher competencies across human-centered practice, AI ethics, AI foundations and applications, AI pedagogy, and professional learning (Miao & Cukurova, 2024). UNESCO's student framework defines AI competencies for school curricula and therefore requires caution when applied to university education (Miao et al., 2024). Belkina et al. (2025) systematically reviewed empirical GenAI implementation case studies in higher education and connected the evidence with pedagogical models including the Conversational Framework, SAMR, and GenAI-TPACK. Sun et al. (2026) proposed a GenAI-responsive competency framework for university teachers spanning GenAI literacy, curriculum and learning design, teaching and learning, and assessment. These publications show that AI competencies, curriculum design, and assessment are already being addressed directly in recent frameworks.

Bangladesh-focused adoption research also provides relevant contextual evidence. For example, Akter et al. (2026) examined factors associated with AI adoption intentions among stakeholders in Bangladeshi higher education using UTAUT/UTAUT2-related constructs. Such adoption research can inform discussion of facilitating conditions and institutional context, but adoption intentions do not by themselves demonstrate curriculum alignment or improved learning outcomes.

The potential contribution of the proposed framework lies primarily in its context-sensitive organization of established educational and responsible AI perspectives within the policy and institutional environment of Bangladeshi higher education. Unlike approaches that focus principally on educator knowledge, student AI competencies, or technology-adoption determinants, the proposed synthesis places the UGC's OBE curriculum structure at the center of the relationship between institutional readiness, AI governance, teaching and assessment practices, and intended educational outcomes. Selected NCF 2021 principles provide a complementary perspective on competency development, while the BNQF situates outcome expectations within Bangladesh's broader qualification structure. A further feature is the proposed feedback relationship through which assessment evidence and learner experiences may inform curriculum revision and institutional support. These features constitute a potentially useful contextual integration rather than proof of theoretical novelty. As Table 2 illustrates, the framework overlaps with established approaches in several respects; therefore, its distinctive contribution remains provisional until a broader, reproducible comparison and empirical investigation establish its additional analytical or practical value.

Table 2. Preliminary Comparison of Existing Educational and AI Integration Frameworks with the Proposed Context-Sensitive Synthesis

Approach	Main focus	Relevance to this manuscript	Remaining distinction / limitation
Constructive alignment (Biggs & Tang, 2011)	Coherence among outcomes, learning activities, and assessment.	Provides the core logic for mapping AI-supported activities to OBE outcomes.	Does not by itself specify AI governance or Bangladesh-specific institutional conditions.
TPACK (Mishra & Koehler, 2006)	Interaction of technology, pedagogy, and subject knowledge.	Explains why educators need pedagogical and disciplinary judgment when choosing AI tools.	Not a national policy-to-outcome model and not specific to GenAI ethics.
UNESCO AI Competency Framework for Teachers (Miao & Cukurova, 2024)	Teacher AI competencies across ethics, AI foundations, pedagogy, and professional learning.	Informs faculty readiness and responsible AI teaching.	Teacher competency focus; does not alone map UGC OBE, institutional conditions, and student outcome evidence.
UNESCO AI Competency Framework for Students (Miao et al., 2024)	Student AI competencies designed to inform school curricula.	Provides a comparator for AI literacy, ethics, and human-centered use.	Explicitly school-curriculum oriented; transfer to universities requires justification.
GenAI implementation review (Belkina et al., 2025)	Empirical case studies of GenAI implementation in higher education, analyzed with educational models.	Shows that practical GenAI integration and GenAI-TPACK have already been reviewed.	Does not specifically establish alignment with Bangladesh's OBE policy context.
GenAI-responsive university-teacher framework (Sun et al., 2026)	Teacher competence in GenAI literacy, curriculum/learning design, teaching, and assessment.	Directly relevant to curriculum and assessment design in higher education.	Teacher-centered framework; the present model must show whether a broader institution-to-outcome mapping adds analytical value.
Bangladesh AI-adoption study (Akter et al., 2026)	Factors associated with AI attitudes, intentions, and adoption in Bangladeshi higher education.	Provides local evidence relevant to facilitating conditions and institutional context.	Adoption determinants are not direct evidence of curriculum alignment or educational effectiveness.
Proposed OBE–responsible-AI synthesis	Context, governance, curriculum alignment, intended outcomes, and feedback.	Potentially connects local policy context with outcome-aligned and ethically governed AI use.	Distinctiveness remains provisional until the expanded search and direct comparison are completed.

6. PRACTICAL AND POLICY IMPLICATIONS

The framework offers guidance for considering responsible, outcome-aligned AI integration in Bangladeshi higher education. The following recommendations address institutional policy, curriculum development, faculty preparation, and assessment. They are proposed directions for institutional consideration, not interventions with demonstrated effectiveness.



6.1. Recommendations for University Policymakers and Administrators

University policymakers and administrators should develop clear institutional guidelines for AI use in teaching, learning, research, and assessment. These guidelines should address academic integrity, data privacy, transparency, acceptable AI assistance, and human oversight. Implementation should reflect institutional resources and disciplinary needs rather than assume that all universities can adopt the same tools or practices. The University Grants Commission of Bangladesh and university quality assurance bodies could review whether existing guidance adequately addresses AI literacy, transparency, academic integrity, data protection, and alignment with intended learning outcomes. Any additional guidance should incorporate input from educators, curriculum specialists, students, and other relevant stakeholders while allowing flexibility across institutions and disciplines.

For practical implementation, Bangladeshi universities could adopt a phased and context-sensitive approach rather than assuming uniform institutional readiness. An initial institutional review could examine digital infrastructure, internet connectivity, students' access to devices, affordability of AI tools, Bangla- and English-language support, faculty AI literacy, and existing academic integrity procedures. On the basis of this review, universities could identify feasible AI-supported learning activities, establish acceptable-use guidance, and develop targeted professional development for educators. Institutions with limited resources could prioritize accessible or low-cost tools, non-AI learning alternatives, and smaller-scale curriculum pilots before expanding implementation. University quality assurance bodies and curriculum committees could periodically examine whether AI-supported activities remain aligned with intended learning outcomes and whether access arrangements create unintended disadvantages. These recommendations represent proposed implementation considerations rather than evidence of established practice across Bangladeshi universities.

6.2. Recommendations for Curriculum Developers and Quality Assurance Teams

Curriculum committees and quality assurance teams should examine whether AI-supported learning activities contribute directly to program learning outcomes and course learning outcomes. Curriculum reviews could identify where AI may support analytical reasoning, problem-solving, feedback, and disciplinary practice, while also identifying activities in which independent student performance remains essential. Relevant competency-oriented principles from the National Curriculum Framework (NCF) 2021 may inform this discussion, but their application should be justified carefully because the framework primarily addresses school education. University curriculum design should remain grounded in the relevant higher education context and the principles of Outcome-Based Education (OBE).

6.3. Recommendations for Faculty Development and Student AI Literacy

Universities should provide professional development opportunities that help educators evaluate AI tools, design appropriate learning activities, and recognize limitations such as inaccurate outputs and bias. Students should also develop AI literacy, including the ability to evaluate generated information, protect personal data, acknowledge AI assistance where required, and make independent academic judgments. Such initiatives should account for differences in digital access, language needs, and prior experience.

6.4. Recommendations for Responsible AI-Supported Teaching and Assessment

Educators should communicate clearly when AI use is permitted, restricted, or required, and explain how students should disclose their use of AI. Assessment should be aligned with intended learning outcomes and designed to provide credible evidence of student understanding. Depending on the task, this may involve written analysis, oral explanation, practical application, reflection, or evaluation of AI-generated material. Universities should review these approaches periodically and use feedback from educators and students to guide improvements. Future research will be needed to determine which recommendations are most effective across different institutional and disciplinary settings in Bangladesh.

Consider a university course in which students are expected to evaluate evidence and justify decisions about a discipline-specific problem. The instructor could permit students to use generative AI to develop preliminary



explanations or identify alternative solutions. Students would then compare these outputs with reliable academic sources, identify unsupported claims, and explain why they accept or reject particular recommendations. Their final submission could include an analytical report and a short oral presentation in which they defend their reasoning. Assessment criteria would focus on disciplinary understanding, evaluation of evidence, independence of judgment, and appropriate acknowledgement of AI assistance. Where access to AI tools is limited, an equivalent activity using instructor-provided materials could be offered. This example demonstrates how an AI-supported task might contribute to course learning outcomes while maintaining academic integrity and equitable participation. Its effectiveness would require evaluation in an actual teaching setting.

7. LIMITATIONS AND FUTURE RESEARCH

7.1. Limitations of Conceptual and Literature-Based Research

The study has several limitations. The framework was developed through literature review and conceptual synthesis without primary empirical data, so its proposed relationships remain unvalidated. Its scope also depends on the relevance and quality of the selected sources, while rapid developments in AI may affect their continued applicability. Differences in institutional resources, student populations, and disciplinary priorities across Bangladeshi universities may further limit the framework's generalizability.

7.2. Need for Empirical Evaluation Across Universities and Disciplines

Future research should examine whether the proposed framework is relevant and practical across public and private universities and different academic disciplines in Bangladesh. The educational value of AI may vary according to intended learning outcomes, assessment requirements, institutional readiness, and students' prior experience. Empirical evaluation is therefore necessary before drawing conclusions about the framework's effectiveness or generalizability.

7.3. Directions for Future Research

Future research could proceed in three stages. First, a structured expert-review study involving university educators, curriculum specialists, quality-assurance professionals, and policymakers could assess the framework's relevance, clarity, and completeness. Second, multiple case studies across public and private universities and across disciplines could examine how institutional readiness, responsible-AI governance, and outcome alignment are implemented in practice. Third, survey or mixed-methods studies could operationalize the propositions and test associations among faculty AI literacy, institutional readiness, curriculum alignment, and evidence of student learning. Longitudinal designs would be especially useful for examining whether feedback-informed curriculum revisions are associated with improved alignment over time. Measures of student outcomes should be linked to the stated learning outcomes and should not rely solely on self-reported AI use or adoption intention.

8. CONCLUSION

This paper examined how AI integration in Bangladeshi higher education can be connected to Outcome-Based Education and informed by selected competency-oriented principles of NCF 2021. The central argument is that educational value should be determined by what students are expected to learn and demonstrate, not simply by the availability or frequency of AI use.

Drawing on constructive alignment, TPACK, responsible AI guidance, and relevant national policy documents, the study proposed a framework connecting institutional conditions, ethical governance, curriculum alignment, and intended educational outcomes. The UGC's OBE curriculum template provides the principal reference for university-level curriculum design, while selected NCF 2021 principles contribute a complementary perspective on competency development and educational continuity.

For universities, the proposed framework suggests that decisions about AI-supported teaching should begin with course and program learning outcomes. Institutions should also consider faculty preparedness, access to appropriate technologies, transparent rules for AI assistance, and assessment practices that provide credible evidence of independent student understanding. Assessment results and learner feedback may then inform subsequent curriculum improvements.

The framework remains conceptual and has not been empirically validated. Its potential contribution lies in organizing existing educational and responsible AI perspectives around Bangladesh's curriculum and institutional context. Future research should investigate its feasibility across universities and disciplines, test the proposed relationships, and establish whether outcome-aligned AI integration contributes to measurable educational benefits.

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