

ARTIFICIAL INTELLIGENCE IN PAKISTANI HIGHER EDUCATION: EVALUATING HEC POLICY, EDUCATIONAL PRACTICES, STUDENT SKILLS, AND A STRATEGIC FRAMEWORK FOR AI INTEGRATION

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ABSTRACT

Artificial Intelligence (AI) is transforming higher education globally, creating opportunities to enhance teaching, learning, research, and institutional governance. However, its effective integration requires coherent policies, pedagogical readiness, digital competencies, and context-sensitive implementation strategies. This study examines the integration of AI in Pakistani higher education, focusing on Higher Education Commission (HEC) policies, educational practices, students' AI-related skills, and the development of a strategic framework for sustainable adoption. It investigates the alignment between national policy directions and institutional practices, explores students' competencies and perceptions regarding AI-enabled learning, and identifies the institutional, technological, ethical, and pedagogical factors influencing implementation. Adopting a systematic research approach, the study seeks to generate evidence-based insights into the opportunities and challenges associated with AI integration across Pakistan's higher education institutions. Particular attention is given to digital inequality, academic integrity, data privacy, faculty preparedness, and equitable access to AI technologies. The anticipated outcome is a contextually grounded strategic framework that connects policy, institutional capacity, curriculum development, faculty training, and student competency enhancement. By bridging the gap between policy aspirations and educational practice, this research aims to contribute to informed policymaking and responsible AI adoption in Pakistani universities. Ultimately, it seeks to support an inclusive, ethical, and sustainable higher education ecosystem aligned with emerging technological demands and national educational priorities.

I. INTRODUCTION

Artificial intelligence (AI) has emerged as an important development in contemporary higher education, influencing teaching methods, learning activities, academic research, student assessment, and institutional

administration. In particular, generative artificial intelligence (GenAI) applications can produce text, summarize information, explain concepts, support writing, generate computer code, and assist users in analyzing complex information. These capabilities have created new opportunities for personalized learning, academic support, research productivity, and the development of digital competencies. However, they have also raised concerns regarding the reliability of AI-generated information, academic integrity, data privacy, algorithmic bias, and students' dependence on automated assistance. A systematic mapping review of 407 publications identified pedagogical enhancement, writing support, professional development, institutional adoption, and ethical implications among the major themes in AI-related educational research, demonstrating that AI integration involves both educational opportunities and institutional challenges (Yusuf et al., 2024). The increasing use of generative AI has also challenged conventional assumptions about teaching, learning, and assessment in universities. Students can use AI tools to obtain explanations, generate ideas, improve written assignments, and receive immediate feedback, while educators can employ them to prepare instructional materials, design learning activities, and support formative assessment. Nevertheless, the production of a high-quality assignment with AI assistance does not necessarily demonstrate that a student independently understands the subject matter.

Weng et al. (2024) reviewed research on generative AI, assessment, and learning outcomes in higher education and identified the need to reconsider conventional assessment practices and develop approaches that better evaluate students' knowledge and competencies in AI-supported learning environments. These developments make it necessary to examine not only whether AI is being used in higher education but also how it is being used, what skills students possess, and what institutional arrangements are required for responsible adoption. The relevance of AI integration is particularly significant for Pakistan, where universities operate under varying technological, financial, administrative, and pedagogical conditions. The country's higher education sector includes institutions with different levels of digital infrastructure, faculty expertise, research capacity, and access to emerging technologies. These differences make it important to understand how AI applications are being incorporated into educational activities and whether students and teachers have adequate support for using them effectively. Pakistan-specific research has begun to investigate these questions. For example, Umar and Ashraf examined university students' perceptions of generative AI credibility, reliability, benefits, and ethical concerns through a survey of 500 students from higher education institutions in Lahore, providing context-specific evidence about students' experiences with these technologies (Umar & Ashraf, 2024).

The Higher Education Commission (HEC) of Pakistan is an important institution in this context because its policy and regulatory functions influence academic standards, higher education development, and institutional practices. The development of national guidance concerning generative AI creates an opportunity to establish clearer expectations for universities regarding responsible use, academic integrity, and the integration of AI into educational activities. HEC's official policy portal lists a framework on the use of generative AI tools in higher education institutions, making the policy environment an important subject for systematic examination (Higher Education Commission). However, the availability of a policy framework does not, by itself, establish the extent to which universities have implemented its recommendations or whether students and faculty members understand them. These matters require descriptive investigation of institutional practices, awareness, implementation arrangements, and perceived challenges. Student competencies represent another important dimension of AI integration. Responsible engagement with AI requires more than the ability to access an application or formulate a prompt. Students need to evaluate the accuracy of generated responses, verify references, identify possible bias, protect confidential information, recognize limitations, and exercise independent academic judgment. These competencies must be developed alongside critical thinking, problem-solving, creativity, communication, and self-directed learning. A review of generative AI and higher education assessment emphasizes the importance of reconsidering learning outcomes and developing assessment approaches that reflect the competencies required in AI-supported educational environments (Weng et al., 2024). Consequently, examining student skills is essential for determining whether AI use is accompanied by the knowledge and judgment required for effective and ethical academic engagement.

AI Integration in Higher Education

International literature indicates that generative AI has become an important subject of research in higher education because of its potential to influence teaching, learning, assessment, and academic research. AI

applications can provide conversational assistance, support academic writing, generate instructional materials, facilitate programming, and help students explore unfamiliar concepts. However, their educational value depends on how they are incorporated into learning activities and whether users can evaluate the quality of the generated information. Baig and Yadegaridehkordi (2024), in a systematic literature review of 57 studies published between 2023 and 2024, examined ChatGPT applications, adoption, and use among students, academic staff, researchers, and other higher education stakeholders. Their review demonstrated the diversity of emerging applications while identifying the need for further research into adoption patterns, effective use, and limitations. The international literature also emphasizes that AI integration should be examined in relation to institutional policies and educational practices rather than technology availability alone. Chiu (2024) discussed the implications of generative AI for educational practices, policies, and research, emphasizing the need to reconsider teaching, learning, assessment, and institutional arrangements in response to these technologies. This perspective is relevant to the present study because AI adoption requires coordination between institutional rules and the everyday activities of educators and students.

HEC Policy and AI Governance in Pakistan

Policy and governance are central to the responsible integration of AI in higher education. National frameworks can establish principles for academic integrity, transparency, responsible use, and institutional accountability, while university-level policies can translate those principles into practical requirements for students and faculty members. In Pakistan, HEC's Framework on Use of Generative AI (GenAI) Tools in Higher Education Institutes (HEIs) provides an official policy reference for understanding the national approach to AI integration. The framework adopts a balanced orientation that recognizes the importance of academic integrity while allowing productive use of AI and encouraging AI literacy among graduates (HEC, 2026). The existence of national guidance, however, does not establish that its provisions are uniformly understood or implemented across universities. Descriptive investigation is required to document institutional awareness, the availability of university-level guidelines, faculty training, student understanding of acceptable AI use, and the procedures adopted to address academic integrity concerns. These areas are especially important because institutions may differ in their administrative capacity, technological resources, disciplinary requirements, and experience with emerging educational technologies. Policy evaluation in the present study should therefore focus on the status, awareness, interpretation, and implementation of AI-related guidance, rather than presuming that the policy has either succeeded or failed. Relevant indicators may include whether universities have issued formal AI policies, whether students know when AI assistance must be disclosed, whether teachers have received implementation guidance, and whether institutional procedures address privacy, authorship, and responsible use.

AI-Supported Educational Practices in Pakistani Universities

AI-supported educational practices include the use of conversational systems for explanations, brainstorming, summarization, writing assistance, research support, programming, lesson preparation, and feedback. The extent and purpose of adoption may differ according to students' academic disciplines, teachers' experience, access to digital resources, and the expectations established by individual universities. Consequently, documenting actual practices is necessary for understanding how AI is being incorporated into Pakistan's higher education environment. Evidence from Pakistan illustrates the relevance of this inquiry. Asad and Aijaz (2025) investigated the relationship between generative AI use, continuous learning, and skill enhancement among 475 students from universities in Sindh. Their correlational survey reported a moderate positive relationship between generative AI and continuous learning, with a correlation coefficient of $r=.453$. The study provides context-specific evidence that AI use and students' learning experiences are related, although a correlational result does not establish that AI use directly causes improvements in learning or skills.

Student Skills, AI Literacy, and Responsible Use

Student skills are a central component of AI integration because effective use requires more than access to an application. Students need to understand how to interact with AI systems, assess generated responses, identify unreliable information, verify academic references, recognize potential bias, and make responsible decisions about the use of automated assistance. These abilities can be considered components of AI literacy and should be examined alongside students' conventional digital skills and broader academic competencies. Research conducted in Pakistan provides a relevant foundation for this dimension. Umar and Ashraf (2026) surveyed 500 students from

higher education institutions in Lahore to investigate perceptions of generative AI credibility, reliability, benefits, and ethical concerns. Their findings indicated that students used generative AI for academic activities such as brainstorming, summarization, and writing assistance. The study also highlighted the relevance of students' technical and critical skills and their perceptions of the reliability of AI tools. These findings provide a context-specific basis for investigating students' use and understanding of generative AI in Pakistani universities.

Institutional Readiness, Challenges, and Ethical Considerations

Institutional readiness concerns the capacity of universities to incorporate AI into academic activities in a sustainable and responsible manner. It includes technological infrastructure, access to appropriate applications, faculty expertise, administrative support, policy clarity, and opportunities for professional development. Differences in these areas may influence the extent to which AI applications are accessible and usable across institutions. Therefore, AI integration should be examined in relation to institutional conditions rather than being treated as a uniform process. The international review by Yusuf et al. (2024) identified ethical implications, individual and institutional adoption, educational applications, and professional development among the major themes in generative AI research. The review also highlighted the need for further investigation of AI's effects and its ethical implications across different cultural contexts. This is relevant to Pakistan because findings from other countries may not fully represent the technological, institutional, linguistic, and educational circumstances of Pakistani universities. Ethical concerns include inaccurate AI-generated information, fabricated references, plagiarism, undisclosed AI assistance, privacy risks, and potential bias. These issues require institutional guidance and student awareness. Universities also need to consider whether faculty members possess the knowledge and resources to establish appropriate AI-use rules and design assessments that continue to measure meaningful learning.

Strategic Framework for AI Integration

The literature suggests that effective AI integration requires alignment between policy, educational practices, student competencies, institutional readiness, and ethical responsibility. A strategic framework for Pakistani higher education should therefore consider these dimensions together rather than treating AI adoption as an isolated technical initiative. The objective should be to provide a structured basis for describing current conditions and identifying priorities for responsible integration. First, policy and governance should establish clear expectations concerning appropriate AI use, academic integrity, disclosure, data protection, and institutional accountability. Second, institutional capacity development should address digital infrastructure, staff training, technical support, and access to suitable tools. Third, pedagogical integration should encourage educators to use AI in ways that support learning objectives and maintain meaningful assessment of student understanding. Fourth, student competency development should emphasize AI literacy, critical evaluation, source verification, and ethical judgment. Finally, continuous monitoring should help institutions document implementation, identify difficulties, and review their practices. Asad and Aijaz (2025) findings on generative AI, continuous learning, and skill enhancement in Pakistan indicate the value of examining student learning experiences as part of this broader strategy. Similarly, HEC's national framework provides a policy reference against which institutional awareness and implementation practices can be described (HEC, 2026).

Rationale of the Study

The rationale for conducting this study arises from the growing use of artificial intelligence (AI) in higher education and the need to understand its integration within the specific context of Pakistan. AI technologies are increasingly being used by university students and teachers for academic writing, information retrieval, research assistance, lesson preparation, assessment, and personalized learning; however, their adoption also raises concerns regarding academic integrity, the reliability of AI-generated information, ethical use, data privacy, and students' independent learning skills. In Pakistan, the effectiveness of AI integration depends not only on the availability of these technologies but also on the clarity and implementation of Higher Education Commission (HEC) policies, the preparedness of universities, the educational practices of teachers, and students' ability to use AI critically and responsibly. Despite growing interest in AI-supported education, there is a need for a comprehensive understanding of how these dimensions are reflected in the current practices and experiences of Pakistani higher education institutions. Therefore, this descriptive study seeks to examine HEC policy and governance, identify existing AI-supported teaching and learning practices, describe students' AI-related skills and competencies, and

explore the institutional opportunities and challenges associated with AI integration. The study is also motivated by the need to develop a strategic framework that can guide universities in adopting AI in ways that support educational quality, academic integrity, equitable access, and responsible technological innovation. By bringing these dimensions together, the research aims to provide a context-specific description of the current situation and generate evidence-informed recommendations for HEC, university administrators, faculty members, curriculum developers, and other stakeholders seeking to strengthen AI integration in Pakistan's higher education sector.

Significance of the Study

This study is significant because it provides a comprehensive understanding of artificial intelligence (AI) integration in Pakistani higher education by examining Higher Education Commission (HEC) policy, educational practices, student skills, and the development of a strategic framework for responsible AI adoption. As AI technologies increasingly influence teaching, learning, assessment, and academic research, it is important to understand how these technologies are being used and what institutional support is required for their effective integration. The study may assist HEC in identifying areas where policy guidance, implementation strategies, and ethical standards require further development. It may also help university administrators assess institutional readiness, strengthen digital infrastructure, formulate appropriate AI-use policies, and plan faculty professional development. For teachers, the study can provide insights into AI-supported teaching methods, assessment practices, and strategies for maintaining academic integrity. For students, it highlights the importance of developing AI literacy, critical thinking, information verification, problem-solving, and ethical decision-making skills. Furthermore, the study may help curriculum developers and educational policymakers identify opportunities to incorporate AI competencies into academic programmes while addressing challenges related to unequal access, data privacy, and the reliability of AI-generated information. From an academic perspective, the research can contribute to the emerging literature on AI in Pakistan by bringing policy, educational practices, student competencies, and institutional preparedness together within a descriptive framework. Ultimately, the study may provide an evidence-informed foundation for developing a contextually appropriate strategic framework that promotes responsible, inclusive, and academically sound AI integration in Pakistani higher education.

II. DESCRIPTIVE ANALYSIS

The integration of artificial intelligence (AI) into Pakistani higher education represents a significant opportunity to transform teaching, learning, research, assessment, and institutional governance. However, the successful adoption of AI requires more than the availability of digital tools or the increasing frequency of their use by students and faculty members. It requires a coordinated approach that aligns national policy, institutional capacity, educational practices, student competencies, ethical safeguards, and mechanisms for continuous evaluation. This study highlights the importance of understanding AI integration as a comprehensive educational and institutional transformation rather than an isolated technological development. Its central conclusion is that AI can contribute meaningfully to the improvement of higher education in Pakistan when its implementation is guided by clear policies, responsible pedagogical practices, competency-based learning, equitable access, and evidence-informed decision-making. First, the study underscores the importance of the Higher Education Commission (HEC) in establishing a coherent national direction for AI integration. As a central regulatory and coordinating body within Pakistan's higher education sector, HEC can help universities develop consistent principles for the responsible use of AI in teaching, learning, research, and assessment. Clear guidance is necessary to address academic integrity, authorship, transparency, data protection, intellectual responsibility, and the appropriate use of AI-generated content. Nevertheless, the effectiveness of national guidance depends on its translation into practical institutional procedures. Universities require policies that explain acceptable and unacceptable AI use, establish disclosure requirements where appropriate, clarify responsibilities for academic misconduct, and provide fair procedures for resolving disputes. Accordingly, policy development should be accompanied by implementation guidance, institutional consultation, faculty training, and periodic review. The study therefore emphasizes that effective AI governance must combine national coordination with sufficient flexibility to accommodate differences in institutional resources, disciplinary requirements, and educational objectives.

Second, the integration of AI into educational practices requires a fundamental reconsideration of conventional teaching and assessment approaches. AI-enabled applications can support personalized learning, formative

feedback, academic writing, programming, research assistance, information analysis, and the explanation of complex concepts. When appropriately incorporated into instructional design, these applications may provide additional learning opportunities and enable educators to respond more effectively to students' diverse needs. However, the educational value of AI cannot be determined solely by its convenience or efficiency. Excessive dependence on automated systems may discourage independent inquiry, weaken analytical engagement, and create difficulties in determining whether submitted work genuinely reflects students' understanding. Pakistani universities should therefore adopt pedagogical approaches that use AI to complement, rather than replace, the intellectual contributions of students and educators. Faculty members should receive appropriate professional development to evaluate AI applications, design meaningful learning activities, and establish transparent expectations for their use. Assessment practices should increasingly emphasize critical reasoning, oral explanation, practical demonstrations, reflective analysis, and authentic problem-solving. Such approaches can preserve academic standards while enabling students to develop the capacity to use emerging technologies responsibly.

Third, the development of student AI literacy emerges as a fundamental requirement for sustainable integration. Students must acquire more than the technical ability to access and operate AI applications. They need to understand the limitations of AI-generated information, formulate effective prompts, verify factual claims, assess the credibility of references, recognize potential biases, protect confidential information, and acknowledge the contribution of AI to their academic work. These competencies should be developed alongside critical thinking, creativity, communication, collaboration, independent learning, and ethical judgment. AI literacy should not be restricted to students enrolled in computer science or information technology programmes because AI is increasingly relevant to business, education, social sciences, engineering, health-related disciplines, and the humanities. Integrating discipline-specific AI competencies into university curricula would help students understand how these technologies can be used appropriately within their professional fields. Moreover, universities should evaluate whether students can independently explain, justify, and apply the knowledge produced through AI-supported activities. The objective should be to develop graduates who can use AI effectively without surrendering their responsibility for academic decisions, professional judgments, or the accuracy of their work. Fourth, institutional readiness is essential to bridging the gap between policy aspirations and practical implementation. Differences in technological infrastructure, internet access, financial resources, faculty expertise, and administrative capacity may influence how effectively Pakistani universities adopt AI. Institutions with limited resources may experience difficulties in providing suitable digital facilities, conducting staff development programmes, or establishing secure and reliable AI-supported learning environments. These challenges indicate the need for a phased and context-sensitive implementation strategy. Universities should begin by assessing their technological infrastructure, institutional policies, existing digital competencies, faculty development requirements, and student support mechanisms. Based on these assessments, they can identify priorities, allocate resources, introduce pilot initiatives, and gradually expand successful practices. HEC and other relevant stakeholders can support this process by encouraging institutional collaboration, facilitating the exchange of effective practices, and promoting accessible professional development opportunities. Particular attention should be given to reducing disparities between institutions so that AI integration does not reinforce existing inequalities in educational opportunities.

Fifth, ethical responsibility and academic integrity must remain central to AI-related decision-making. AI systems may produce inaccurate information, fabricated references, biased interpretations, or responses that appear authoritative despite lacking adequate evidence. Their use may also create risks involving privacy, confidentiality, intellectual property, and the unauthorized disclosure of research materials. Universities should establish safeguards that promote transparency, accountability, fairness, and responsible data management. Students and faculty members should be encouraged to verify AI-generated content against credible academic sources and retain responsibility for the material they submit or publish. Institutional responses to suspected misuse should rely on clear rules, contextual assessment, and fair procedures rather than treating automated AI-detection results as conclusive evidence. Ethical governance should also address equitable access to AI resources and the needs of students with different levels of digital experience. By embedding these principles into university policies and curricula, institutions can foster an academic culture in which technological innovation is accompanied by intellectual honesty and professional responsibility. Building on these considerations, the study proposes a strategic approach to AI integration based on six interconnected priorities: policy alignment and governance,

institutional capacity development, pedagogical transformation, student competency development, ethical safeguards and equitable access, and continuous monitoring and evaluation. These priorities should operate as complementary components rather than independent initiatives. Effective policies require institutional resources; meaningful pedagogical innovation requires trained educators; responsible student engagement requires appropriate competencies; and sustainable investment requires evidence of educational value. Universities should consequently establish measurable indicators to evaluate implementation, including policy awareness, faculty training, student AI literacy, quality of AI-supported instruction, academic integrity, access to resources, and learning outcomes. Regular assessment would enable institutions to identify shortcomings, revise practices, and respond to emerging technological developments. Importantly, the success of AI integration should be measured by improvements in educational quality and student development rather than by the number of AI tools adopted or the frequency of their use.

III. CONCLUSION

In conclusion, responsible AI integration offers Pakistani higher education an opportunity to strengthen educational quality, expand learning support, improve institutional effectiveness, and prepare graduates for an increasingly technology-driven society. Realizing these benefits requires coordinated action by HEC, university leadership, faculty members, students, curriculum developers, and relevant technology stakeholders. National policy must provide clear direction, universities must develop the capacity to implement it, educators must adopt pedagogically sound practices, and students must acquire the competencies necessary for critical and ethical engagement with AI. At the same time, institutional differences and resource inequalities must be addressed to ensure that the benefits of technological advancement are not limited to comparatively well-resourced universities. The study therefore concludes that the future of AI in Pakistan's higher education sector should be guided by a balanced vision that combines innovation with academic integrity, technological capability with human judgment, and institutional modernization with educational equity. By adopting a coordinated, inclusive, and evidence-informed strategic framework, Pakistan can work towards a higher education system in which AI serves as a means of strengthening human learning, research excellence, and responsible academic development rather than becoming a substitute for them.

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