

Artificial Intelligence as a Pedagogical Tool: Enhancing Teaching and Learning Skills among Faculty and Students in Higher Education

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Abstract: Artificial Intelligence (AI) has emerged as a transformative force in higher education, significantly influencing teaching methodologies and learning processes. This study examines AI as a pedagogical tool and explores its role in enhancing teaching competencies among faculty and learning skills among students. The study adopts a qualitative and descriptive approach based on a review of recent literature and contemporary AI applications in higher education. The findings indicate that AI-powered tools such as ChatGPT, Google Gemini, Microsoft Copilot, Grammarly, Perplexity AI, and Intelligent Tutoring Systems facilitate personalized learning, improve instructional efficiency, support research activities, and foster essential twenty-first-century skills, including critical thinking, creativity, communication, and digital literacy. However, challenges relating to academic integrity, data privacy, algorithmic bias, and overdependence on technology necessitate responsible and ethical implementation. The study concludes that AI should be regarded as an intelligent pedagogical partner that complements human expertise and contributes to the development of inclusive, adaptive, and learner-centred higher education systems.

Index Terms: Pedagogical Tools, Teaching Efficiency, Learning Skills, Faculty development, Student Learning, Digital Literacy.

I. INTRODUCTION

The twenty-first century has witnessed an unprecedented technological transformation, with Artificial Intelligence (AI) emerged as one of the most influential innovations in higher education creating immense opportunities to transform teaching and learning processes. AI refers to the ability of computer systems to perform tasks that traditionally require human intelligence, such as learning, reasoning, problem-solving, decision-making, and language processing. Traditional teacher-centred pedagogies are gradually giving way to learner-centred and technology-enabled educational environments that emphasize personalization, collaboration, and skill development. In

this context, AI-powered technologies such as intelligent tutoring systems, adaptive learning platforms, generative AI applications, automated assessment tools, learning analytics, and virtual assistants are revolutionizing educational practices by providing customized learning experiences and enhancing instructional efficiency.

For faculty members, AI serves as a powerful pedagogical tool that can significantly improve teaching effectiveness. AI applications assist educators in designing instructional materials, generating lesson plans, creating assessments, monitoring student progress, and providing timely feedback. By automating repetitive administrative and evaluative tasks, AI enables faculty to devote greater attention to mentoring, critical thinking, and interactive classroom engagement. Furthermore, AI facilitates data-driven decision-making by offering insights into students' learning patterns, thereby enabling instructors to implement targeted interventions and adopt more effective pedagogical strategies.

From the students' perspective, AI creates dynamic and personalized learning environments that cater to diverse learning needs, abilities, and preferences. AI-enabled platforms provide immediate feedback, adaptive content, interactive simulations, and individualized learning pathways that promote active participation and self-directed learning. Such technologies enhance cognitive, analytical, problem-solving, and digital competencies, which are increasingly essential for success in the contemporary knowledge society and workforce. Moreover, AI-supported learning environments encourage collaborative learning, creativity, and lifelong learning habits among students.

Despite its transformative potential, the integration of AI in higher education also presents several challenges. Concerns related to data privacy, ethical considerations, algorithmic bias, digital inequality, overdependence on technology, and inadequate digital competencies among educators and learners necessitate careful planning and responsible implementation. The effectiveness of AI in education depends not merely on technological availability but also on the readiness of institutions, faculty members, and students to adopt and utilize these tools meaningfully and ethically. The present study to explore the transformative role of AI in improving pedagogical practices and learning outcomes while identifying the opportunities and challenges associated with its integration into higher education.

II. DIFFERENT AI TOOLS IN HIGHER EDUCATION

Artificial Intelligence (AI) has emerged as a pedagogical aid that enhances instructional efficiency and supports students in developing critical competencies required in the digital age.

2.1. Generative AI Tools

2.1.1 ChatGPT: ChatGPT is one of the most widely used generative Artificial Intelligence tools in higher education. Developed by OpenAI, it enables faculty and students to interact with an intelligent conversational system capable of generating human-like responses to questions and instructions. Faculty members use ChatGPT to prepare lesson plans, create quizzes, design learning activities and assignments, simplify complex concepts, and generate teaching materials.

Students employ the tool for understanding difficult topics, obtaining explanations, brainstorming ideas, coding assistance, summarizing articles, and improving writing skills. The major advantages of ChatGPT include instant feedback, personalized learning experiences, improved productivity, and enhanced creativity. However, the tool also presents certain limitations, including the possibility of generating inaccurate information, fabricated references, excessive dependency, and concerns regarding plagiarism and academic integrity. Therefore, its outputs require careful verification and responsible use.

2.1.2 Google Gemini: Google Gemini is an advanced multimodal AI system that supports text generation, information retrieval, image interpretation, and collaborative learning activities. The tool is increasingly being integrated into educational settings because of its compatibility with Google Workspace applications such as Google Docs, Google Slides, and Google Classroom. Faculty members utilize Gemini for preparing instructional materials, generating summaries, creating presentations, and designing interactive learning activities. Students use it for academic research, content summarization, and obtaining explanations on complex subjects. Gemini enhances productivity and facilitates collaborative learning by providing rapid access to information and educational resources. Nevertheless, the tool may occasionally generate inconsistent responses and raises concerns related to privacy and data security.

2.1.3 Microsoft Copilot: Microsoft Copilot is an AI-powered productivity assistant integrated with Microsoft Office applications, including Word, PowerPoint, Excel, and Teams. In higher education, Copilot assists faculty members in preparing lecture notes, designing presentations, analyzing educational data, and managing administrative responsibilities. Students employ the tool to draft reports, prepare assignments, organize data, and create visually appealing presentations. The integration of AI capabilities with commonly used software applications significantly improves efficiency and reduces the time required for routine academic tasks. Despite these advantages, the effectiveness of Copilot largely depends on users' digital competencies and institutional access to premium subscriptions. Furthermore, AI-generated outputs require careful review because they may contain factual inaccuracies or contextual errors.

2.2 AI-Based Writing and Communication Tools

2.2.1 Grammarly: This is an AI-based writing assistant designed to improve grammar, spelling, vocabulary, sentence structure, and overall writing quality. It has become an indispensable educational tool, particularly for students and researchers who communicate in English as a second language. Faculty members use Grammarly to prepare academic documents and provide writing guidance, while students rely on the tool to improve assignments, reports, research papers, and professional correspondence. By offering real-time feedback and corrective suggestions, Grammarly helps users develop effective written communication skills and confidence in academic writing. However, excessive reliance on the tool may reduce learners' ability to independently identify and correct writing errors.

2.2.2 QuillBot: It is an AI-powered writing enhancement and paraphrasing tool that assists users in rewriting, summarizing, and improving the readability of written content. In higher education,

faculty members utilize QuillBot to prepare teaching materials and simplify complex academic texts, while students use it extensively for note preparation, paraphrasing literature, and improving the structure of assignments and research papers. The tool contributes to writing fluency and helps learners understand different ways of expressing ideas effectively. However, overdependence on paraphrasing tools may encourage superficial learning and can lead to unintentional plagiarism if proper citations are not provided. Consequently, QuillBot should be employed as a supplementary learning aid rather than a replacement for original writing and critical thinking.

2.3 AI-Powered Research Tools

2.3.1 Perplexity AI: This is an AI-powered search and research assistant that provides concise, referenced answers to user queries. Unlike conventional search engines, it synthesizes information from multiple sources and presents responses with citations, making it particularly useful in academic environments. Faculty members use Perplexity AI to explore emerging educational trends and identify relevant scholarly resources, whereas students employ it for literature reviews, research projects, and obtaining quick explanations of academic concepts. The primary benefits of the tool include time efficiency, improved information accessibility, and support for evidence-based learning. Nevertheless, the reliability of its responses depends on the quality and availability of source materials, and users must critically evaluate the provided references before incorporating them into academic work.

2.3.2 Elicit: Elicit is an AI-assisted research platform specifically designed to support academic inquiry and evidence synthesis. It enables researchers and students to search scholarly literature, summarize findings, identify research gaps, and organize evidence from numerous publications. Faculty members employ Elicit to conduct systematic reviews and explore emerging research trends, while students use it to locate relevant studies and understand existing scholarly debates. By automating many time-consuming research activities, Elicit significantly improves research efficiency and supports evidence-based learning. However, its performance may be constrained by limited access to certain databases, and users must verify the completeness and accuracy of the retrieved information.

2.3.3 Consensus: Consensus is an AI-powered academic search engine that provides evidence-based summaries from peer-reviewed research articles. The tool enables faculty and students to obtain research-backed answers to specific questions without manually reviewing numerous studies. It is particularly valuable for literature reviews, evidence-based teaching practices, and interdisciplinary research. By summarizing findings from scientific literature, Consensus saves considerable time and facilitates informed decision-making. Despite its usefulness, the tool may oversimplify complex research findings and occasionally omit contextual nuances that are essential for comprehensive academic understanding.

2.4. Intelligent Tutoring Systems and Adaptive Learning Platforms

Intelligent Tutoring Systems are AI-driven educational platforms that provide personalized instruction by continuously analyzing students' performance and adapting content according to individual learning needs. These systems simulate one-to-one tutoring experiences by identifying

learning gaps, offering tailored feedback, and recommending appropriate learning activities. Faculty members benefit from such systems by obtaining insights into students' progress and areas requiring intervention, while students experience individualized learning pathways that promote engagement and self-directed learning. Although Intelligent Tutoring Systems significantly enhance learning outcomes and academic performance, their implementation requires substantial technological infrastructure and financial investment. Furthermore, they cannot completely substitute human interaction, emotional support, and mentorship provided by educators.

2.5. AI-Based Assessment and Learning Analytics Tools:

AI-powered assessment and learning analytics systems are increasingly being used to automate grading, monitor attendance, evaluate learning behaviors, and predict academic performance. These tools analyze large volumes of educational data and generate insights that enable educators to make evidence-based pedagogical decisions. Faculty members can identify struggling students, provide timely interventions, and customize instructional strategies based on learning analytics. Students benefit from immediate feedback and continuous assessment opportunities that support academic improvement. However, concerns regarding algorithmic bias, data privacy, and the inability of AI systems to adequately evaluate creativity and subjective responses remain significant challenges that require careful consideration.

2.6. AI-Based Language Learning Tools:

AI-powered language learning applications, such as Duolingo and conversational language assistants, have become popular tools for developing communication skills in higher education. These applications employ adaptive learning techniques, speech recognition, and personalized feedback to facilitate language acquisition. Faculty members can incorporate these tools into language instruction to provide supplementary learning opportunities, while students benefit from individualized practice sessions that improve vocabulary, pronunciation, and grammatical competence. Although these applications encourage independent and continuous learning, they remain limited in assessing contextual language usage and cannot fully replicate the nuanced interactions and cultural understanding facilitated by human instructors.

III. RECENT ADVANCEMENTS IN AI FOR HIGHER EDUCATION

Recent developments indicate that AI is rapidly moving beyond content generation and becoming an integral component of educational ecosystems.

3.1 Multimodal Artificial Intelligence: Modern AI systems can simultaneously process text, images, audio, and video, thereby enabling interactive and immersive learning experiences.

3.2 AI-Powered Virtual Teaching Assistants: Universities are increasingly adopting AI teaching assistants capable of answering student queries, providing academic guidance, and supporting administrative tasks.

3.3 Predictive Learning Analytics: AI algorithms can predict student performance and identify learners at risk of poor academic achievement, enabling timely interventions.

3.4 Personalized Learning Ecosystems: Advanced AI systems create individualized learning pathways based on students' abilities, interests, and learning behaviors.

3.5 AI-Assisted Research and Knowledge Discovery: Emerging AI applications can review thousands of scholarly articles, identify research trends, generate hypotheses, and assist in data interpretation.

3.6 AI-Driven Continuous Assessment: Traditional examinations are gradually being supplemented by continuous and competency-based assessments supported by AI technologies.

IV. USAGE OF AI ADOPTION IN HIGHER EDUCATION

Recent studies demonstrate a remarkable increase in AI adoption within higher education institutions worldwide. Approximately 86% of university students use AI tools in their studies, with more than half utilizing them weekly. Furthermore, nearly 92% of university students reported using generative AI applications in 2025, compared with only 66% in 2024, indicating an unprecedented growth in adoption. Studies also reveal that around 88% of students employ AI tools for assignments and assessments, while 84% use AI for academic research and 76% for writing assistance. Among educators, approximately 44% use AI for research activities, 38% for lesson planning, and 37% for generating classroom materials. These statistics clearly indicate that AI has evolved from an optional educational technology to an essential pedagogical resource in higher education.

Despite its transformative potential, concerns remain regarding ethical issues, data privacy, algorithmic bias, academic integrity, and the possibility of excessive dependence on AI technologies. Therefore, higher education institutions must adopt balanced and responsible AI integration strategies that promote innovation while preserving critical thinking, creativity, and human interaction, which remain the cornerstone of quality education.

V. CONCLUSION

AI has emerged as a transformative pedagogical tool that is redefining the landscape of higher education by enhancing teaching effectiveness, improving learning experiences, and promoting academic innovation. The increasing adoption of AI-powered applications such as ChatGPT, Google Gemini, Microsoft Copilot, Grammarly, QuillBot, Perplexity AI, Elicit, Consensus, Intelligent Tutoring Systems, and learning analytics platforms demonstrates the growing reliance on intelligent technologies to support instructional design, personalized learning, research activities, and academic administration. These tools have significantly contributed to improving faculty productivity and enabling students to develop essential twenty-first-century competencies, including critical thinking, problem-solving, communication, creativity, digital literacy, and self-directed learning.

The findings of the study indicate that AI facilitates personalized and adaptive learning environments by providing immediate feedback, customized educational content, and data-driven

insights into learning behaviours. Simultaneously, AI reduces administrative burdens on faculty members and enables them to devote greater attention to mentoring, collaborative learning, and pedagogical innovation. Recent advancements in multimodal AI, predictive learning analytics, AI-powered virtual teaching assistants, and continuous assessment systems further suggest that artificial intelligence will continue to play an increasingly influential role in shaping future educational ecosystems.

However, despite its immense potential, the integration of AI in higher education is accompanied by significant challenges, including concerns regarding academic integrity, algorithmic bias, data privacy, digital inequality, and the risk of excessive dependence on technology. These issues necessitate the formulation of comprehensive institutional policies, ethical frameworks, and digital literacy initiatives to ensure the responsible and equitable use of AI technologies in educational settings.

In conclusion, Artificial Intelligence should not be perceived as a replacement for human educators but rather as an intelligent pedagogical partner that complements human expertise and enhances educational effectiveness. The future of higher education lies in developing a balanced human-AI collaborative model in which technological innovation and human intelligence work synergistically to create inclusive, adaptive, and learner-centred educational environments. Therefore, higher education institutions must strategically integrate AI into their teaching-learning processes while preserving the fundamental values of critical inquiry, creativity, ethical responsibility, and meaningful human interaction that constitute the essence of quality education.

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