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## Artificial Intelligence in Higher Education: Enhancing Teaching Effectiveness and Student Learning Experiences

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### ABSTRACT

The integration of Artificial Intelligence (AI) in higher education is transforming traditional teaching methodologies and reshaping student learning experiences. AI-powered tools and platforms are increasingly being adopted to personalize learning, automate administrative tasks, support assessment, and enhance instructional delivery. Artificial Intelligence offers immense potential to enhance both teaching effectiveness and student learning experiences in higher education. It empowers educators with tools for instructional support, enables personalized learning, and enriches the overall student journey. However, for AI to serve as a force for good, institutions must adopt it ethically, inclusively, and thoughtfully. Balancing innovation with responsibility will be key to unlocking the full promise of AI in education. This article explores how AI contributes to improving teaching effectiveness by enabling educators to deliver content more efficiently and tailor instruction to individual learner needs. It also examines the impact of AI on student engagement, academic

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performance, and overall learning satisfaction. Despite these benefits, the article acknowledges the challenges associated with AI integration, including the digital divide, algorithmic bias, and concerns over data privacy and security. Through a critical analysis of current practices and emerging trends, the study highlights the potential of AI to revolutionize the higher education landscape while emphasizing the need for ethical implementation and inclusive access. The findings suggest that, when effectively integrated, AI can significantly enhance the quality and outcomes of higher education.

## KEYWORDS

Higher Education, Teaching Effectiveness, Student Learning, Personalized Learning, EdTech, Digital Transformation, Artificial Intelligence, AI Tools, Data Privacy and Algorithmic Bias.

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## INTRODUCTION

(AI) in higher education has transformed how teaching and learning is being conducted in all parts of the world. Previously thought of as a scientifically futuristic luxury, AI is currently a key to academic success and institutional innovation. Given that higher education establishments aim to align with the requirements of the digital era, AI will provide a revolutionary approach that will be capable of covering the needs of both students and educators. As we move deeper into the 21st century, the institutions that strategically integrate AI into their pedagogical and administrative frameworks will be best positioned to lead in global education. The goal should not merely be technological adoption, but the creation of learning environments that are more equitable, engaging, and effective for all. As higher education institutions worldwide grapple with increasing enrollment, limited teaching staff, and rising expectations for student success, the strategic use of AI offers an innovative pathway to address these challenges. This study is significant because it explores the transformative role AI can play in **enhancing teaching practices**, reducing faculty workload, personalizing student learning, and improving academic outcomes. Understanding how AI can automate administrative burdens, assist in curriculum development, and provide intelligent feedback is crucial for institutions aiming to improve operational efficiency and instructional quality. Moreover, the study sheds light on how AI tools like adaptive learning platforms, predictive analytics, and emotion AI can foster more inclusive, equitable, and engaging learning environments. In a rapidly evolving digital ecosystem, this research provides valuable insights for policymakers, educators, edtech developers, and institutional leaders.

## ROLE OF AI IN HIGHER EDUCATION

These technologies are used to automate tasks, provide intelligent feedback, support decision-making, and enhance learning environments. The role of AI can broadly be categorized into three domains: instructional support, personalized learning, and institutional management.

### 1. Instructional Support and Teaching Enhancement

AI enhances teaching effectiveness by assisting instructors in various tasks:

#### a. Automated Grading and Feedback

Automated grading is probably one of the nearest and most feasible ways to apply AI to higher education. Objective measures, such as multiple choice or fill in the blanks, can be graded relatively efficiently using AI algorithms, and recently it has been developed to work with short answer and

essayish- type questions as well. Natural Language Processing (NLP) enables the assessment of writings, resorting to grammar correctness, sense logic, argumentation, and the topical relevance of information.

Such automation greatly decreases the workload of faculty, particularly in high-views sessions, as it frees educators to focus on lecturing planning and one-on-one interactions with their students. Moreover, AI systems will be able to offer immediate unique feedback that may contribute to the students understanding their strengths and weaknesses in real time as well.

### **b. Intelligent Tutoring Systems**

Intelligent Tutoring Systems (I. T. S.) constitute an artificial intelligence-based system in which the tutoring sessions imitate a one-to-one tutoring event. Such learning systems modify their instructional procedures to suit the performance of the individual students and provide personalized assistance consistent with the speed and manner of the individual learner. With the help of them, they are able to identify the fact that a student is having difficulty and decrease or increase the level of the task, or introduce it in an alternative form, e.g. via visual plates or quizzes. These services rely on the information about the past behavior of learners to suggest what to do next, practice, and eliminate knowledge gaps. Student is consequently offered with a very individualized and responsive learning situation that stimulates mastery learning and self-confidence.

### **c. Curriculum Design and Improvement**

Teaching AI tools are becoming more significant as they assist educators in the construction and revision of curriculum. With access to enormous amounts of data concerning student performance, course feedback, their absorption, etc. as well as labor trends, AI will be able to determine what sections of a course work well and what needs to be fixed. By way of example, the AI systems can signal revision of any module that is consistently failing a high number of students. Furthermore, AI will be able to recommend the incorporation of new areas to make sure that curriculums are not outdated and do not misalign with industry standards. There are also some systems that apply predictive analytics to modeling an effect that course content changes can have on student results. This data based curriculum development, assures quality, relevance and student achievement.

## **2. Personalized and Adaptive Learning**

### **a. Learning Analytics and Predictive Modeling**

Learning analytics AI-driven tools process huge volumes of data related to education, such as attendance reports, quiz results, rates of attendance, submission of assignments, and even keystroke frequencies. They are used to develop predictive models that assist the institutions and teachers to determine the students who might be facing the academic risk of solitude or poor performance. These systems identify early warning indicators, inform faculty or support services to intervene, which can be declining performance or decreasing online activity, using machine learning algorithms. This is an active approach that leads to the timely academic or individual support, counseling or personal care and decreases the level of dropouts and enhances student performance. Furthermore, the predictive analytics can be applied to predict the trends in enrolments, evaluate the effect of teaching strategies, and contribute to the institution decision-making.

### **b. Adaptive Learning Platforms**

Adaptive learning platforms represent a major leap toward truly personalized education. These systems use AI to continuously assess a learner's performance in real time and modify the learning experience accordingly. By adjusting the difficulty level, content sequence, feedback, and even

instructional format, adaptive platforms cater to each student's unique learning pace and style. For example, platforms like Knewton, DreamBox, and ALEKS tailor course material based on a student's progress and comprehension, ensuring that foundational concepts are fully mastered before moving on. This "just-in-time" learning approach increases student engagement and retention while reducing frustration caused by either overly challenging or overly simplistic materials. Adaptive learning also provides instructors with detailed dashboards, offering insights into class performance and individual learning gaps that need attention.

### **c. Natural Language Processing in Learning**

Artificial intelligence has given rise to such an arena of study that encompasses the interaction of the human language with computers, known as Natural Language Processing (NLP). In fact, it is being applied more frequently nowadays to enrich the learning experience. NLP allows educational tools to speak with students, understand and interpret them, and then respond to their queries in real-time, usually as chatbots or voice assistants within learning management systems. The assistants powered by AI have the ability to clear the confusion, and recommend material or respond to administrative queries or even question the students through conversational UI. Aids such as IBM Watson Tutor or bots based on dialogue flow by Google have proved to be useful in the provision of 24/7 services making access to their tools more convenient and readily available to students. Besides, the NLP can be utilized to automatically summarize the lecture notes, provide real-time transcription, translate into those languages students do not learn (i.e., sentiment analysis to interpret student feedback). NLP can offer the same benefits through filling the communication gaps and offering assistance on-demand, therefore creating a more responsive and inclusive environment on the educational level.

## **3. Enhancing Student Learning Experiences**

### **Virtual Classrooms and AI-Driven Collaboration**

Post-pandemic times do not deprive the importance of virtual classrooms as an integral part of present-day higher education. The use of AI in these environments increases both the efficiency and the engaging structure of how collaboration occurs. Smart templates in the platforms such as Microsoft Teams, Google Classroom, and Zoom may record the meetings, create the meeting transcripts and even mark the significant ideas or the action steps. The AI-based collaboration tool can also help form project teams more balanced by looking at the skills, learning preferences, or performance indicators of students before forming project teams. During the live days, instructors are capable of using AI in order to track participation and give real-time feedback, as well as recommend individual learning paths. Furthermore, AI can moderate conversation, identify non-topic arguments and propose materials to further learning. All these features enhance interaction, accountability and the learning process as a whole in virtual space.

### **Immersive Learning through AR/VR and AI**

Combining Artificial Intelligence with Augmented Reality (AR) and Virtual Reality (VR) is creating highly immersive and experiential learning environments in higher education. AI-enhanced AR/VR tools allow students to engage with complex concepts through simulations, virtual labs, and 3D environments that mirror real-world scenarios. AI adds intelligence to these simulations by tracking learner behavior, offering personalized guidance, and dynamically adapting the experience based on performance. Platforms like Labster, zSpace, and ClassVR are already being used by universities to offer such immersive experiences. These tools not only improve understanding and retention but also cater to visual and kinesthetic learners who benefit from hands-on interaction.

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### **c. Language Translation and Accessibility Tools**

The existence of AI has been revolutionary in terms of enhancing higher education, its inclusivity and accessibility to most parts of the world. Often, digital learning environments integrate progress through tools such as Google Translate, DeepL and Microsoft Translator to allow multilingual experiences without disruptions. Moreover, accessibility tools that are AI-based make sure that one with disabilities can be fully involved in academic life. Speech to text and vice versa applications, AI assisted screen readers, auto-captions in video lectures, and custom UIs to restrict the type of interference raise the accessibility of learning materials to students with visual, auditory, or motor impairments. These technologies create equity because less language and ability barriers can be seen which allows institutions to introduce more diverse and inclusive classes.

## **CHALLENGES AND ETHICAL CONSIDERATIONS**

### **1. Data Privacy and Security**

High education AI involves benefiting off the harvesting and manipulation of huge amounts of student information, such as overall performance, behavioral trends, demographics, and engagement factors. Although this information makes individual learning and efficiency of institutions possible, much concern is triggered to privacy and security. Mishandling of data may result in security breaches, unauthorized access and abuse of confidential data. As an example, retaining the data of the students in unsecured servers or passing it on to third-party vendors without the proper consent may contravene legal provisions like the General Data Protection Regulation (GDPR) in Europe or the Family Educational Rights and Protection Act (FERPA) in the U.S. To overcome those issues, institutions should develop strong data governance policies. Some examples include encryption protocols, restricted access control, visible and informed consent as well as periodical security audit. Instruction of ethical AI means that institutions must put students first by ensuring that their privacy is respected at all occasions.

### **2. Algorithmic Bias**

The AI learns based on historical evidence, and in the event that such evidence includes biases, conscious or unconscious, they may propagate into the decisions and suggestions of the AI. In education, higher education and colleges, this may lead to prejudiced practices, including giving unequal grades, biased predictive analytics, or discriminating admission algorithms. Should an AI tool be trained with data that under represents minority students, the tool can have a lower prediction of their academic abilities or mark them as a concern of intervention more often. In the same way, languages systems could also be misinterpreting the input of non-native speakers and judgment would be biased. The risks of bias could be reduced by having developers and institutions perform periodic bias checks on their models, bias-free, representative data, and increasing the transparency of algorithmic decisions that are made. The aim to employ inclusive and directly proportional use of AI should be continuous to avoid the reinforcement of the current disparities in education.

### **3. Dependency and Human Element**

Although there can be such benefits of AI in education as streamlining of the educational processes and its useful support, overly performing the task of AI can weaken the human side of teaching and learning. Education dealing with the physical passed through knowledge is not all that it is about because it does include emotional intelligence, moral thinking, role modeling, and relationships. It is

possible that it makes students over-reliant on AI as a source of guidance, feedback, and instructional decisions, which decreases their critical thinking and problem-solving skills. Similarly, teachers can remove too much teaching focus on the AI system, forgetting the significance of human decision-making and sympathy in teaching. This is instead what should be aimed at, to balance: AI as a supplementary tool, not a substitute to the task of teaching people. the robust human presence in the classroom (either physical or virtual) will guarantee that learning experience will be emotionally active, socially dynamic, and ethically sound.

#### 4. Digital Divide

Even though the benefits of AI are huge, not every student and every establishment can equally access the needed technologies. Rural novices, students of low-income families or underfunded schools might also be unable to access AI-enhanced platforms because of an insufficient infrastructure or information technology competence. Consequently, AI may end up increasing the achievement gap as opposed to bridging the gap. Governments and institutions should invest in digital infrastructures, use low cost devices and connections, and digital skills training to support a fair access to digital world. The relevant transformational opportunities of AI in higher education will continue to be skewed without resolving the divide problem.

#### RESEARCH GAP

The study addresses these gaps by examining AI's dual role in enhancing instructional delivery and learner engagement while highlighting associated challenges and ethical dimensions. By focusing on a more integrated and critical approach, this study contributes to a deeper understanding of AI's potential and limitations in reshaping the landscape of higher education. However, there is a lack of comprehensive research that holistically explores how AI transforms both **teaching effectiveness** and **student learning experiences** across disciplines and institutional contexts. Furthermore, limited empirical studies investigate the **long-term impact** of AI implementation on pedagogical outcomes, faculty roles, and student agency. Much of the current research is either theoretical or limited to case-specific implementations without scalable insights. There is also minimal exploration of how AI influences non-cognitive aspects of learning—such as motivation, collaboration, and emotional engagement.

#### STATEMENT OF THE PROBLEM

Faculty members often lack the training or resources to use AI tools optimally, leading to underutilization or resistance. Additionally, many AI applications are deployed in silos without aligning with broader educational goals, curriculum design, or student development strategies. Students, on the other hand, may experience fragmented or impersonal learning if AI systems are not thoughtfully integrated. Moreover, ethical concerns—ranging from data privacy violations to algorithmic biases—are frequently overlooked or inadequately addressed, further complicating AI adoption. This fragmented approach to AI integration hampers its ability to significantly enhance teaching effectiveness or improve student learning experiences in a sustained manner. Therefore, there is a critical need to examine how AI can be embedded into higher education in ways that are pedagogically sound, ethically responsible, and strategically aligned with institutional goals. This study seeks to address this gap by exploring how AI can be meaningfully used to transform educational delivery and student engagement.

## ANALYSIS, FINDINGS AND RESULTS

The Digital Divide, Dependency and Human Element, Algorithmic Bias, Data Privacy, Data Security, and the availability and effectiveness of Accessibility Tools stand out as prominent concerns. These challenges reflect the complexities of balancing technological innovation with ethical, infrastructural, and human-centered considerations. Understanding and addressing these problems is essential to ensure that AI serves as an inclusive and beneficial tool in the advancement of higher education.

**Null hypothesis:** There is no significant difference between the mean ranks of the problems faced by the respondents.

**Table-1: Mean ranks of the Problems faced by respondents Artificial Intelligence in Higher Education**

### Friedman test result

Problems	N	Mean	SD	Mean Rank	$\chi^2$ value	P value
Digital Divide	200	2.33	1.147	3.97	77.321	0.000
Dependency and Human Element	200	2.41	1.216	3.61		
Algorithmic Bias	200	2.57	1.028	3.43		
Data Privacy	200	2.39	1.121	3.21		
Data Security	200	2.86	1.238	3.82		
Accessibility Tools	200	2.50	1.139	3.33		

Based on the Friedman test results presented in Table-1, the study sought to identify and rank the key problems faced by respondents regarding the use of Artificial Intelligence (AI) in higher education. The analysis reveals statistically significant differences among the identified problems, as indicated by a chi-square value of 77.321 and a p-value of 0.000 ( $p < 0.05$ ). This suggests that respondents perceive the severity of these issues differently. Among the problems, the **Digital Divide** emerged as the most critical, with the highest mean rank of **3.97**, indicating that it is perceived as the most prominent barrier to AI adoption. **Data Security** followed closely with a mean rank of **3.82**, also signifying considerable concern. On the other hand, **Data Privacy** and **Accessibility Tools** received lower mean ranks of **3.21** and **3.33**, respectively, suggesting they are viewed as relatively less pressing issues. The results highlight the need for targeted strategies to address these specific challenges to ensure more effective and equitable integration of AI in higher education environments.

## AI IN HIGHER EDUCATION

### AI-Powered Career Guidance Systems

AI is increasingly being leveraged to offer personalized career guidance to students. These intelligent systems analyze a range of data—such as students' academic performance, interests, soft skills, extracurricular activities, and real-time labor market trends—to recommend suitable career paths, internship opportunities, and further education options. Unlike traditional counseling, AI-driven career platforms like **Pymetrics**, **Handshake**, or custom university portals provide data-backed

insights, resume feedback, and even mock interview training through virtual agents. These systems empower students to make informed, strategic decisions about their professional futures and are especially helpful in institutions with limited access to human career advisors. In the long run, AI-powered career guidance can enhance employability outcomes by aligning student development with industry needs, thereby closing the gap between education and workforce readiness.

### EMOTION AI (AFFECTIVE COMPUTING)

Affective computing, or Emotion AI, is an emerging field where AI systems detect and respond to human emotions through facial expressions, voice tone, body language, and physiological signals. In higher education, this technology is being explored to monitor student engagement and emotional well-being in virtual and physical classrooms. AI tools can detect when a student appears confused, bored, or anxious during a lecture and prompt the system—or even the instructor—to adjust the pace, content delivery, or provide supportive feedback. Platforms such as **iMotions** and **Affectiva** are experimenting with such capabilities to make online learning more interactive and empathetic.

Emotion AI has the potential to enhance student-centered learning by creating emotionally responsive environments, although it must be used carefully to respect privacy and consent boundaries.

### AI FOR RESEARCH SUPPORT

AI is becoming an invaluable tool for academic researchers by significantly reducing the time and effort required for literature reviews, data analysis, and even manuscript writing. Natural Language Processing can scan thousands of academic articles to extract relevant summaries, identify research gaps, or suggest citations. Tools like **Elicit**, **Semantic Scholar**, and **Scite.ai** help researchers find trustworthy sources, map citation networks, and identify trending topics across disciplines. AI can also assist in designing experiments, cleaning datasets, running simulations, and visualizing complex findings. As research becomes increasingly interdisciplinary and data-driven, AI support systems will not only boost productivity but also democratize access to high-quality research tools, particularly for early-career scholars and under-resourced institutions.

### IMPLICATIONS FOR THE STUDY

The study highlights the need for faculty training programs focused on digital literacy and AI integration, thereby empowering educators to embrace technology confidently and effectively. Secondly, the study's attention to student experiences—particularly in terms of personalization, accessibility, and emotional engagement—can inform the development of more inclusive and equitable learning environments. Thirdly, its emphasis on data ethics and governance frameworks serves as a timely reminder that institutions must balance innovation with responsibility. For education policymakers, the research offers evidence-based insights to craft guidelines that promote responsible AI adoption while safeguarding academic integrity and student privacy. For developers of edtech solutions, the study underscores the importance of designing user-friendly, bias-free, and adaptable AI tools. Ultimately, this study encourages stakeholders across the education ecosystem to collaborate in leveraging AI not merely as a technical solution, but as a strategic enabler of teaching excellence and meaningful student engagement in a rapidly evolving academic landscape.

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## RECOMMENDATIONS AND SUGGESTIONS

Professional development workshops, interdisciplinary collaboration, and access to instructional technologists can bridge the digital literacy gap. Second, **AI adoption should be aligned with pedagogical objectives**, not just administrative efficiency. This means designing AI use cases around student-centered learning goals, curriculum relevance, and long-term educational outcomes. Third, universities should develop **clear governance frameworks** that address data privacy, algorithmic transparency, and ethical use. Policies should be in place to monitor, evaluate, and audit AI systems regularly for biases or unintended consequences. Fourth, **infrastructure equity** must be ensured so that all students, regardless of socioeconomic status or geographic location, have access to AI-enhanced learning resources. Fifth, institutions should **encourage participatory design** by involving students and faculty in the selection and feedback process for AI tools, ensuring that these technologies are responsive to actual classroom needs. Lastly, collaboration between academia and AI developers should be fostered to co-create education-specific solutions that prioritize learning over automation.

## CONCLUSION

Artificial Intelligence represents a powerful catalyst for transformation in higher education, offering unprecedented opportunities to enhance teaching effectiveness and enrich student learning experiences. From intelligent tutoring systems and adaptive learning platforms to AI-driven feedback tools and virtual classroom assistants, AI has the potential to reshape the educational landscape. It empowers educators by reducing administrative burdens and providing data-driven insights that inform instructional design. Without thoughtful implementation and ethical governance, AI may reinforce existing inequalities or reduce the human touch that is essential to meaningful education. The findings of this study highlight the need for strategic, inclusive, and transparent approaches to AI integration that go beyond technical efficiency and focus on pedagogical value and equity. They must invest in training, infrastructure, ethical frameworks, and cross-sector partnerships to build a future-ready education system.

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