

# Application Of Artificial Intelligence In The Digital Age For Teaching-Learning Process In Higher Education

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## **Abstract**

India is working towards bridging the digital divide and ensuring that everyone has access to digital and technological skills. Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines. The Centre for AI and Digital Policy (CAIDP) is a global research organization advising national governments and international organizations on AI and digital policy. Its aim is to promote democratic values, the rule of law, and fundamental rights.

Recently, this organization published its annual report reviewing and assessing AI policies and practices worldwide. It highlights that AI-based learning technologies are a recommended approach to overcoming current educational challenges. The goal is to raise the Gross Enrolment Ratio (GER) in higher education, including vocational education, to 50% by 2035. Enhancing the quality of education will require a large-scale expansion of high-quality educational opportunities. Thus, AI is considered a key tool to achieve this objective.

NEP-2020 also emphasizes that existing digital platforms and ongoing ICT-based educational initiatives must be optimized and expanded to meet both current and future challenges in providing quality education for all. The time has come to rethink traditional educational models, equipping teachers with technological skills and knowledge, while fostering positive attitudes towards technology among educators to create a better learning environment.

AI is expected to play a vital role in achieving these goals. Teachers can be introduced to new digital tools and given opportunities to experiment with them, helping them develop their own ideas for integrating technology into the classroom. AI can enable learners to pass traditional exams with minimal cognitive effort. Teacher educators need to explore how the presence of AI technologies affects the roles of teachers and learners, learning activities, task design, and assessment criteria.

UNESCO is also committed to supporting Member States in harnessing the potential of AI technologies to achieve educational progress towards SDG 4 by 2030, while ensuring that their application in educational contexts is guided by the core principles of inclusion and equity.

The purpose of this paper is to study various initiatives to develop AI skills for teaching to achieve higher education goals. It explores the concept of AI, its various applications and uses, and the importance of AI in the teaching-learning process. Additionally, the paper focuses on the development of cognitive skills, encouragement of critical thinking, the role of teachers in fostering open-minded environments, and the challenges associated with using AI in higher education. It concludes that AI-based educational initiatives can support learners in building a better future and achieving the educational goals necessary for 21st-century learning.

**Key words:** Artificial intelligence, digital, teaching, education, skills.

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## 1.0 INTRODUCTION

Education gives us direction to lead a better life smoothly. It is the means of delivering values and knowledge to develop a competent well-being, enhanced with creativity, cognitive thinking, and essential life skills. Technology makes it easier to achieve educational goals, and its impact on various sectors is significant. AI tools offer an easy way to understand concepts and provide a pathway to reach goals. These tools quickly supply materials and resources, enabling teachers to effectively teach any topic and create a better educational environment in the classroom.

Artificial Intelligence (AI) has the capability to perform tasks that typically require human intelligence, such as problem-solving, decision-making, and natural language processing. The rapid advancement of technology has reshaped several sectors, including education. AI, one of the most significant developments, offers intelligent solutions that improve the teaching-learning process, enhance administrative efficiency, and support personalized education. In higher education, AI serves both educators and students by providing dynamic, data-driven, and interactive learning experiences. However, the integration of AI comes with challenges, including ethical concerns, high costs, and resistance to change, which require strategic planning. AI is increasingly playing a significant role in transforming

higher education by improving the teaching-learning process. It not only automates routine tasks but also enhances personalized learning, accessibility, and engagement.

Artificial intelligence is currently progressing at an accelerated pace, already making a profound impact on the nature of services within higher education. In the 1950s, Alan Turing proposed a solution to the question of when a system designed by a human can be considered 'intelligent.' Turing introduced the imitation game, a test where a human listener tries to distinguish between a conversation with a machine or another human; if the distinction is not detected, we can acknowledge the presence of an intelligent system, or artificial intelligence (AI) (Popenici and Kerr, 2017).

It is important to note that the focus on AI solutions dates back to the 1950s. In 1956, John McCarthy offered one of the first and most influential definitions: "The study of artificial intelligence is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it" (Russell and Norvig, 2010).

### 1.1 Concept of Artificial Intelligence ( AI)

AI refers to the simulation of human intelligence processes by machines, particularly computer systems. These processes include learning, reasoning, and self-correction.

AI is a technology in which machines can learn and understand logic similarly to humans. It is believed to simplify many complex aspects of human life. AI functions by combining various data inputs, iterative processing, and intelligent algorithms. This allows the software to learn automatically from patterns or features within the data.

AI is considered a broad field of study with a wide scope, encompassing theories, methods, technologies, and subfields, including machine learning, neural networks, cognitive computing, computer vision, and natural language processing (Fitria, 2021).

### 1.2 AI Technologies

- **Machine Learning:** Enables systems to learn from data and improve performance over time.
- **Natural Language Processing:** Helps machines understand and generate human language.
- **Computer Vision:** Allows computers to interpret visual data such as images and videos.

These technologies enable machines to perform tasks such as decision-making, problem-solving, and communication. They are also used to analyze large datasets, predict outcomes, and generate real-time insights, fostering a more efficient learning environment.

## 2.0 Importance of AI: AI's Role in Transforming Society and Higher Education

AI is crucial for its potential to revolutionize how we live, work, and engage with the world. It has been effectively integrated into higher education to help achieve the goal of increasing the Gross Enrolment Ratio (GER) in higher education, including vocational programs, to 50% by 2035. In several areas, AI performs tasks more efficiently than humans, particularly repetitive, detail-oriented ones—such as analyzing large sets of legal documents to ensure relevant fields are accurately completed.

Due to its ability to process vast datasets, AI provides enterprises with valuable insights into operations that may have otherwise gone unnoticed. Generative AI tools, a rapidly growing category, are becoming essential in industries ranging from education and marketing to product design.

While AI has the potential to make the world a better place, it also presents challenges (Siau, 2018). Recent advancements have positioned AI as a transformative force, set to revolutionize human life. Despite its growing presence in higher education, many educators remain unaware of AI's scope and capabilities (Hinojo-Lucena et al., 2019). Traditionally, artificial intelligence focuses on filtering information, managing constraints, recognizing patterns, and making logical inferences—activities essential for addressing real-world problems in automated ways (Drigas et al., 2009).

In recent years, AI has become functional across various sectors. From self-driving cars to drone deliveries, AI is replacing human labour with systems that don't experience fatigue, don't demand leave, and require no unions. AI is steadily making inroads into education, where it is proving to be a powerful ally for teachers. It performs routine tasks such as taking attendance, grading tests, delivering study materials, navigating content on screens, providing educational video links, and evaluating performance.

By automating these customary tasks, teachers can redirect their time and energy toward addressing students' weak areas and enhancing subject knowledge. AI thus helps bridge the gap between teaching and learning. Once the necessary infrastructure is in place, AI-based applications become significantly more cost-effective and efficient than human labor. AI also improves other administrative services within higher education institutions, such as management operations (Bhatnagar, 2020).

## 2.1 How AI is Revolutionizing Higher Education

**Personalized Learning:** AI systems tailor content and delivery based on individual students' learning speeds, strengths, and areas for improvement.

**Increased Accessibility:** Tools such as text-to-speech, real-time translation, and virtual assistants enhance learning for students with disabilities.

**Administrative Efficiency:** AI automates tasks like grading, scheduling, and attendance tracking, freeing teachers to focus on more meaningful work.

**Remote Learning Support:** AI-powered technologies enable hybrid and online education through real-time transcripts, chatbots, and automated assessments.

## 3.0 Applications of AI in Higher Education

The use of AI in higher education institutions, especially in today's complex and competitive environment, comes with several challenges, including high costs, lack of expert personnel, weak soft skills, limited social skills, ethical concerns, technical disruptions, and workforce displacement. While machines are not yet ready to replace humans entirely, they play a crucial role in enhancing human capabilities.

To prevent complete reliance on machines, educators must cultivate higher-order thinking, creativity, metacognition, and interpersonal skills in students—abilities that machines cannot replicate. This approach helps maintain a balance between hard and soft skills (Bhatnagar, 2020).

### 3.1 Applications of AI in Various Sectors

**AI for Adaptive Learning Platforms:** AI-powered adaptive systems customize course content based on students' progress. Platforms like Coursera and Khan Academy adjust quizzes and videos according to students' learning pace.

**AI for Chatbots and Virtual Assistants:** AI chatbots, such as IBM's Watson, provide 24/7 support by answering student queries and offering administrative assistance. Virtual assistants also help students navigate academic processes, including enrollment and scheduling.

**AI for Automated Grading and Feedback:** AI-based grading systems assess multiple-choice tests, essays, and coding assignments, offering instant feedback. This reduces the burden of manual grading on educators, giving them more time for student engagement.

**AI in Hybrid and Online Learning:** AI technologies, such as automated transcription and real-time analytics, enhance remote learning platforms by improving accessibility and student engagement.

**AI in the Chandrayaan-3 Mission:** India's third lunar mission, conducted by the Indian Space Research Organisation (ISRO), utilized AI-driven systems to ensure mission success, particularly in autonomous and remote operations. The Pragyan rover employed AI to analyze lunar soil samples and transmit processed data back to Earth for further study.

## 4.0 Uses of AI

The use of Artificial Intelligence (AI) technology is increasingly evident across various sectors, including education. AI has significantly transformed educational curricula, particularly in technology, science, mathematics, and engineering. However, its impact is not limited to these fields—AI is poised to reshape education as a whole.

AI plays a vital role in facilitating various functions, including those in education. Teachers and lecturers can better understand students' needs and provide tailored support, while students can learn according to their individual requirements without unnecessary challenges. AI is recognized as a tool that can enhance the learning process and help achieve educational goals more effectively (Fitria, 2021b).

## 5.0 Advantages of AI Integration in Higher Education

**Real-Time Monitoring and Assessment:** AI enables teachers to track students' performance and participation in real-time, facilitating timely intervention and support.

**Virtual Labs and Simulations:** AI-powered virtual labs offer practical experiences without the limitations of physical resources, allowing students to engage in hands-on learning.

**Assistive Technology for Students with Disabilities:** Tools like speech-to-text converters and AI-powered readers ensure inclusive education, making learning accessible to all students.

**Teacher Support Systems:** AI assists educators by generating lecture notes, grading assignments, and providing insights into student progress, helping teachers focus on instructional improvement.

**Student Counselling and Mental Health Support:** AI-powered applications can detect early signs of mental health issues and recommend appropriate counseling resources for students.

**Science and Technology Applications:** AI serves as a transformative force in various fields of science and technology by enhancing precision, efficiency, and speed. It also strengthens cybersecurity by detecting suspicious activities and mitigating cyber threats.

## 6.0 Challenges of Using AI in Higher Education

**High Implementation and Maintenance Costs:** AI technologies involve significant initial investments in hardware, software, and training. Many institutions, especially in developing regions, struggle to afford these costs.

**Resistance to Change:** Some educators and students may be resistant to adopting AI-driven methods due to a lack of familiarity or fear of job displacement.

**Lack of Technical Expertise:** Implementing and managing AI systems requires specialized knowledge, which many educational institutions lack.

**Dependence on Technology:** Over-reliance on AI might reduce the emphasis on human interaction and critical thinking in education, leading to a depersonalized learning experience.

**Ethical Issues:** The use of AI in assessments and decision-making can raise ethical concerns regarding accountability and transparency.

## 7.0 Initiatives to Develop AI Skills in Higher Education

**AI Curriculums:** Universities have begun introducing specialized courses and degrees in AI, data science, and machine learning.

**AI Labs and Research Centers:** Institutions collaborate with industry partners to create research labs focused on AI innovation and practical applications.

**AI Awareness program:** Short-term programs expose students and faculty to AI tools and their practical uses.

**Collaborations with Tech Companies:** Platforms like Microsoft, Google, and IBM offer AI certifications, tools, and learning resources for students and teachers.

## CONCLUSION

AI is transforming the teaching-learning process in higher education, offering new opportunities for personalized, accessible, and efficient learning. It allows educators to focus more on mentoring and less on administrative tasks. However, challenges such as data privacy, ethical considerations, and the need for technical skills must be addressed to ensure the responsible and effective use of AI in education. Institutions must find a balance between leveraging AI and maintaining the human touch in learning environments. With thoughtful implementation, AI can significantly enhance educational outcomes and better prepare students for future careers.

In the digital age, AI will continue to play a transformative role in education. When planned and implemented effectively, AI can improve learning outcomes, enhance administrative efficiency, and equip students for a workforce increasingly driven by AI.

It is crucial for higher education institutions to invest in faculty training programs, develop AI infrastructure, and collaborate with technology companies to access resources and expertise. Furthermore, AI systems must align with ethical standards and privacy regulations to ensure responsible use. Striking a balance between technology and human interaction is essential for maintaining meaningful learning experiences.

Curriculum planners can incorporate digital tools to foster critical thinking, creativity, and higher-order thinking skills. Students should be encouraged to explore and experiment with new tools openly, rather than resorting to using them covertly.

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