Artificial intelligence's Impact on Higher Education Quality

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Abstract:

The impact of artificial intelligence (AI) in higher education is significant, with potential to transform various aspects of the educational experience. AI applications can assist in administrative tasks, such as simplifying processes, interpreting data, and predicting student success, as well as provide personalized teaching and learning experiences through virtual tours, virtual teaching assistants, and individualized learning plans. AI can also support research by sorting through large datasets, building models, and recommending relevant articles, enabling better-informed decisions in lesson assessment and professional development.

Keywords: Artificial intelligence**;** development stages**;** higher education institutions**;** applications**;** educational process.

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Introduction

In recent years, the integration of artificial intelligence (AI) has had a profound impact on the quality of higher education. AI applications have revolutionized various aspects of the education ecosystem, transforming teaching and learning processes, simplifying administrative tasks, and providing personalized support to students. This transformative technology has opened up new possibilities and opportunities, reshaping the educational landscape profoundly.

One of the key areas where AI has made significant contributions is in enhancing teaching and learning experiences. AI-powered educational software systems by utilizing sophisticated algorithms to monitor and assess students' progress, collecting data on their performance. By analyzing this data, these systems can provide personalized guidance and support, adapting the learning experience to each student's unique needs and learning styles. This personalized approach improves student engagement, motivation, and academic achievement, ultimately enhancing the overall quality of education.

In this modern era, we are witnessing rapid advances in technology, where knowledge, scientific research, and technologies are being developed at a pace never seen before. This tremendous progress allows man to produce knowledge, invent technological applications, renew and develop its structure, and employ it in a context that combines theory, scientific research, and practical application in various areas of life.

Within the framework of this technological development , scientists seek to study and analyze human intelligence, and how to simulate it , by using computer and artificial intelligence applications. It aims to develop systems capable of carrying out tasks that require a level of intelligence that corresponds to developments in the fields of industrial, agricultural, commercial, and educational application. This interest has led to the emergence of artificial intelligence systems, which represent a partial transfer of human intelligence methods to programming systems, and which have contributed to the construction of expert systems that incorporate part of the human experience.

Research in the field of education technology is moving toward the use of artificial intelligence in the development of e-learning environments to increase their

effectiveness in achieving diverse learning outcomes. This is done by studying the design variables of the elements of e-learning environments, and how they affect the components of artificial intelligence and its elements. Research efforts are also focused on identifying appropriate designs for learners' characteristics and needs, and pursuing educational goals efficiently and effectively.

THE FIRST TOPIC : WHAT ARTIFICIAL INTELLIGENCE IS

Artificial intelligence is a theory and science related to the ability of a machine to act and perform actions that require intelligence as humans do. This includes learning, reasoning, image and speech recognition, translation, and similar abilities that simulate human mental abilities and modes of operation. This theory and techniques are being developed to make computers and programs capable of having intelligent behavior. AI can improve business processes, increase operational efficiency, reduce cost, and improve customer relationships. There are a wide range of practical applications for artificial intelligence. But AI faces a number of challenges that make it more difficult to use.

The first requirement: the concept of artificial intelligence
Artificial intelligence is a field in computer science that aims to develop programs and systems capable of simulating the behavior of human intelligence and performing tasks that require data analysis and intelligent decision-making. Artificial intelligence is based on various technologies such as machine learning and artificial neural networks.

The artificial intelligence system works according to the information and knowledge stored in its memory and processes the data and symbols according to the specific instructions and commands. AI's focus is primarily on the system's ability to learn, adapt, solve problems, perceive, and use language, enabling it to interact with the environment and perform similarly to human intelligence.

Machine learning techniques and artificial neural networks are essential tools in the development of artificial intelligence. Machine learning is based on data analysis, pattern detection, and prediction recognition by training the system on a large body of data. Artificial neural networks mimic the structure and function of the neural network in the human brain and are used to process information and make decisions.[1]

Artificial intelligence is defined as a branch of computer science that allows the creation and design of computer programs that simulate human intelligence , so that the computer can perform certain tasks that require thinking, perception, speaking, and movement in a logical and orderly manner. AI focuses on creating advanced systems that can think strategically like humans, thus complementing computer science by developing effective software based on the development of virtual machines with thinking, problem-solving and learning capabilities[2].

Artificial intelligence is a science based on mathematical rules, hardware, and software integrated into automated computers, which aims to carry out various tasks and processes that mimic the style of human intelligence. Artificial intelligence is fast and accurate in finding solutions to complex problems, compared to human capabilities.

Artificial intelligence relies on advanced technologies such as machine learning and artificial neural networks to achieve this goal. Machine learning is used to analyze data, derive patterns, and make intelligent decisions, while artificial neural networks simulate the structure and function of the neural network which processes information similar to the human brain.

Advanced mathematics and technologies are used in the design and development of mathematical models and algorithms that support AI processes, enabling artificial systems to analyze big data and make smart decisions effectively.

The second requirement: the stages of the development of artificial intelligence software

In the mid-twentieth century, few scientists began exploring a new approach to building intelligent machines based on recent advances in neuroscience, mathematical information theory, and the advancement of cybernetics. Before that, a digital computer and a machine capable of simulating human computation were invented. The modern field of artificial intelligence research was established at a conference held at the Dartmouth College campus in the summer of 1956.

The presence of these people has become leaders in AI research for decades, in particular, Marvin Lee Minsky, Newell Allan, and Simon Herbert, who founded AI labs at MIT, Carnegie Mellon University, and Stanford University. Their students wrote programs that surprised most people, in which the computer could solve algebraic problems, prove logical theories, and speak English. [3]

By the mid-sixties, research in artificial intelligence was heavily funded by the US Department of Defense. In 1965, Simon Herbert predicted that machines would be able to perform any human task in twenty years. In 1967, Marvin Minsky predicted that the problem of achieving artificial intelligence would be solved dramatically in one generation.

However, researchers struggled to understand some of the problems they faced in 1974 and responded to criticism of AI. Under constant pressure from Congress to fund more effective projects, the U.S. and British governments decided to cut funding for all targeted exploratory research in AI, the first setback for AI research.

In the early eighties, research in artificial intelligence (AI) experienced a remarkable resurgence with the emergence of expert systems. These programs aimed to replicate the knowledge and analytical abilities of human experts in specific domains. Expert systems received considerable attention , and demonstrated the potential of AI.

Nevertheless, a pivotal moment occurred in 1997, capturing the world's imagination and propelling AI into the mainstream consciousness.. The renowned chess program called "Deep Blue" achieved a historic victory over the reigning world chess champion, Gary Kasparov. This triumph showcased the immense power and potential of AI, not only in the realm of chess but also in various other fields.

Deep Blue's victory over Kasparov marked a significant milestone in AI history. It highlighted the ability of machines to surpass human expertise in complex cognitive tasks. This achievement sparked a widespread fascination with artificial intelligence and its possibilities. People began to recognize that AI could revolutionize not just games but also industries and society as a whole.

The success of Deep Blue demonstrated that AI had far-reaching applications beyond chess. It paved the way for advancements in machine learning, natural language processing, computer vision, and robotics. Researchers and developers became inspired to explore the potential of AI in domains such as healthcare, finance, transportation, and more.

The impact of Deep Blue's victory extended beyond the academic and scientific communities. It captured the attention of the general public and ignited a renewed interest in AI. People started envisioning a future where machines could perform tasks that were once considered exclusively within the realm of human expertise.

Since that historic moment, the field of artificial intelligence has continued to evolve at an astonishing pace. Achievements in AI technologies have led to advancements in autonomous vehicles, voice assistants, recommendation systems, fraud detection, and countless other applications. AI has become an integral part of our daily lives, transforming industries and shaping the way we work, communicate, and interact with technology.

The success of Deep Blue, along with subsequent achievements in AI, has propelled the field to new heights. It has opened up a world of possibilities and challenges, inspiring researchers, developers, and innovators to push the boundaries of what AI can achieve. As we move forward, the impact of AI on society is only expected to grow, empowering us to tackle complex problems, enhance productivity, and create a better future. Since then, artificial intelligence has seen tremendous advances, as new technologies such as machine learning, artificial neural networks, and deep learning have been developed, giving intelligent systems great power in pattern recognition and decision-making. [4]
Research and developments in the field of artificial intelligence continue, and its advances and applications are expected to continue in the future to improve our lives and analyze our challenges in smarter and more effective ways.

The third requirement : Characteristics of artificial intelligence
Experts agree on the importance of artificial intelligence in education in the 21st century due to its numerous advantages, including:
Learning Machine: AI has the ability to learn from data and experiences, enabling it to organize and understand scientific knowledge.
  – Representation Knowledge: AI can analyze language through Natural Language Processing (NLP) and comprehend and interpret speech through

Speech Recognition. It can also understand and analyze images and videos through Computer Vision.

− Problem-solving, Creativity, Emotional and Social Interaction: AI can assist in problem-solving, stimulate creativity, enable emotional and social interaction, and even animate robots. It also includes General Artificial Intelligence (AGI) that encompasses all of the above capabilities.

− Explanation of Course Material and Immediate Feedback: AI can explain course material and provide instant feedback on answers.

− Academic Guidance: AI can provide academic advice and guidance to students, helping them choose the best department To join college or study subjects that suit them.

− Increased Accessibility: AI can reach a large number of students, making classrooms accessible to everyone, especially those who speak different languages or have hearing impairments.

− Predictive Analytics: AI can analyze data to predict students at risk of failure or dropouts, allowing institutions to intervene early and at the right time.

− Administrative and Organizational Support: AI can be used in educational institutions to respond to student inquiries about exam schedules, registration, college admissions, and answer new students' questions about suitable fields of study through conversational AI-powered robots.

− Faster Access to Information: AI enables students to find information quickly and from a single source.

− Liberation from Routine Tasks: AI frees teachers and administrators from routine tasks.

− Big Data Collection and Personalized Learning: AI can collect massive amounts of data from the system, which can be used to feed machine

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learning networks for developing customized educational programs and improving student experiences.

– Artificial Neural Networks: Artificial Neural Networks in AI simulate the neural connections in the brain. Training these networks on specific tasks and observing their performance can provide insights into the learning process itself. This can contribute to the development of new learning theories and educational methodologies.

– Time-saving and Efficient Problem-solving: AI can save time and solve problems in a more efficient manner, reducing the need for additional staff or administrators.

The integration of artificial intelligence in education holds great potential to transform the learning experience, improve educational outcomes, and create more personalized and accessible educational opportunities for students.

SECOND TOPIC: INTEGRATING ARTIFICIAL INTELLIGENCE APPLICATIONS INTO HIGHER EDUCATION INSTITUTIONS

Artificial intelligence (AI) applications have made significant contributions to higher education institutions, revolutionizing various aspects of the learning experience. One key area where AI has had a profound impact is personalized learning. Through intelligent tutoring systems, adaptive learning platforms, and recommendation engines, AI technology can analyze student data and tailor educational content and resources to meet individual needs. This personalized approach enhances student engagement, promotes effective learning, and improves academic outcomes.[5]

The first requirement: Applications of artificial intelligence in higher education institutions

The education systems in developing countries, such as Algeria, often exhibit a notable characteristic: a predominant emphasis on the issuance of certificates to graduates, rather than prioritizing the quality of knowledge and skills imparted. This prevailing trend underscores a significant challenge faced by these nations in their pursuit of educational development.

 While the attainment of certificates may be a tangible measure of educational achievement, it does not necessarily guarantee the acquisition of substantial knowledge or practical skills.

This certificate-focused approach places less emphasis on the holistic development of students and their ability to apply their learning in real-world situations. Consequently, there is a pressing need to shift the focus from the mere delivery of certificates towards a more comprehensive approach that prioritizes the quality of education, ensuring that graduates possess the necessary knowledge, skills, and competencies required to use in their respective fields.

Efforts should be directed towards curriculum improvements, teacher training, and educational reforms that foster critical thinking, problem-solving abilities, and practical application of knowledge. By addressing this challenge, developing countries like Algeria can bridge the gap between educational attainment and the actual quality of education, empowering their graduates to contribute effectively to their societies and participate in the global workforce. [6]

The application of artificial intelligence (AI) in the development of the educational process encompasses several key areas:

Educational software systems with AI components: These systems utilize AI algorithms to monitor and track students' progress, collecting data on their performance. By analyzing this data, the software can provide personalized guidance and support to students, adapting the learning experience to their specific needs and learning styles.

- Computer-based educational systems with knowledge bases: These systems integrate independent databases containing knowledge bases for educational content and strategies. AI algorithms can leverage this knowledge to deliver tailored learning materials, recommendations, and assessments to students. The AI component helps optimize the educational process by dynamically adjusting content delivery based on individual proficiency and progress.

- Smart learning systems: These systems serve as an interface between behavioral and cognitive modes of computer-based learning. They incorporate models for knowledge collection related to specific topics,

enabling learners to acquire a deeper understanding of the subject matter. By leveraging AI techniques, such as natural language processing and machine learning .Smart learning systems can enhance knowledge acquisition and retention.

- Education stakeholders emphasize that the efficiency of the education system should be measured based on the knowledge gained by students, rather than solely focusing on what has been taught. AI-powered educational applications facilitate this shift by providing insights into individual student performance, enabling educators to assess knowledge acquisition and adjust instructional strategies accordingly.

By harnessing the capabilities of AI in education, institutions can enhance the learning experience, promote personalized instruction, and improve educational outcomes. The integration of AI technologies in educational processes holds the potential to transform traditional teaching methods, facilitating adaptive and learner-centered approaches that cater to the unique needs of each student. The smart learning systems used in artificial intelligence technology consist of the following four basic models: [7]

- Knowledge Collection Model: Generates learning content, explanation, and examples related to the curriculum that the intelligent educational system teaches.
- The exercise and Test Model generates the problems and questions that the system offers students to solve as exercises or tests.
- Model Solutions Model: Generates solutions and typical answers to questions and problems related to the learning topic, showing different steps and correct paths.
- Individual Orientation and Instructions form: Guides each student based on their performance and needs, and provides personalized and targeted instruction to improve student performance.

These models are used to develop a personalized learning experience and provide immediate feedback and accurate guidance to students. An intelligent learning system can analyze student performance, identify their strengths and weaknesses, and build personalized learning recommendations for each student. Consequently

, deep learning and machine learning techniques are used in these systems to analyze educational data and provide an effective learning experience.

In addition, AI is used in the development of learning assessment systems, where machine learning techniques are used to analyze student performance and provide a comprehensive and objective assessment. These systems can analyze students' performance patterns, identify points they need to improve, and guide teachers.

In general, smart applications can be used in the development of the educational process to improve the student experience, personalize learning, and provide immediate and accurate feedback. AI can contribute to enhance learning effectiveness and improving student outcomes by providing an advanced and improved learning environment. [8]

The second requirement : Models for applying artificial intelligence in education

Models for the Application of Artificial Intelligence in Education: Artificial intelligence is no longer a luxury addition in the field of education. It has become one of the pillars to improve the educational process in advanced countries and one of the most important means of developing study materials. The following are among the most important applications of artificial intelligence in education:

- Contributing to the establishment of algorithms in creating educational tools that work on reshaping and crystallizing educational curricula to suit the interests of students, in order to reach the shortest paths for delivering study materials. Developing students' ability to communicate with human-like systems, which serves as their greatest motivator and prepares them to interact immediately with humans in all linguistic and social situations to enhance communication skills and increase social skills.

- Thinkster Application: This application combines mathematics curriculum with self-learning. It monitors the mental processing of each student by displaying it on the iPad screen. The application presents users with different questions suitable for their abilities, and once the student writes how they arrived at the answer, the program analyzes their work and identifies why they made a mistake in a specific part of solving the question.

- The company ALEKS in the United States, acquired by the publisher Hills McGrew, is used to determine the extent to which each student grasps a

specific mathematical concept using artificial intelligence and proposes a personalized learning path for them.

- UNESCO has created an online digital repository in partnership with the Ericsson Foundation. This repository contains training materials related to artificial intelligence and other essential educational resources for digital skills, available globally for curriculum designers. Its objectives include evaluating their skills in the field of artificial intelligence, facilitating their integration of artificial intelligence skill development units/courses into school curricula or other educational institutions, facilitating the preparation of trainers (masters), and providing coordinated resources that can be accessed , for free for everyone , to the artificial intelligence in education.

- A team of researchers in the United States has developed a model of artificial intelligence that can better predict the extent to which students need academic assistance by assessing their performance in educational electronic games. This model is based on the concept of multitask learning and can be used to improve both teaching and learning processes. It can predict whether a student can answer the questions in different tests based on their reactions during a specific educational game. Current systems rely on evaluating the final outcome of the student after completing the electronic game, but the new system evaluates the student based on their answer to each question individually. The study team confirms that the new model can be used to alert teachers if a specific student needs more academic attention. It can also be used to develop explanation and teaching methods in classrooms.

- Microsoft has helped solve some problems related to translation for students of different languages in the same classroom or for those with hearing disabilities. They added a new service called "Translator Presentation," which is a complementary add-on to the "PowerPoint" program. It displays a translation bar in the presentation slides, showing what the teacher says through the microphone in real-time. This is done by opening the Microsoft Translator app on the students' devices and scanning the QR code of the presentation. As the teacher speaks, the words appear directly on the screen. These tools can open doors for students who may not be able to attend school due to geographical or other circumstances.

- Companies are creating integrated smart content platforms that combine content with practice exercises and assessments. One example is the Learning Netex program, which allows teachers to design digital curricula and integrate them with audiovisual media. It also enables self-assessment capabilities.

The third requirement: The importance of artificial intelligence in the development of the educational process

Artificial intelligence (AI) has emerged as a transformative force in the field of education, revolutionizing traditional teaching and learning methods. The integration of AI into educational systems offers a comprehensive range of benefits and opportunities that enhance the overall educational experience. Let's explore in detail the extensive importance of AI in education:

1. Personalized Learning: AI empowers personalized learning experiences by tailoring educational content, assessments, and feedback to the unique needs and abilities of each student. By analyzing vast amounts of data, including students' performance, learning styles, and preferences, AI systems can create customized learning pathways. This personalized approach enables students to learn at their own pace, increasing engagement, and motivation, and ultimately improving learning outcomes.

2. Intelligent Tutoring: AI-powered intelligent tutoring systems provide dynamic and interactive support to students. These systems identify areas where students are struggling, using machine learning algorithms , offer targeted explanations and additional practice, and continuously track their progress. Intelligent tutoring systems adapt to students' requirements, providing personalized guidance and fostering independent learning.[9]

3. Enhanced Administrative Tasks: AI streamlines administrative tasks, freeing educators to focus more on teaching and supporting students. AI-powered systems can automate time-consuming tasks, such as grading assignments and providing instant feedback. By eliminating manual administrative work, AI frees up educators' time, allowing them to dedicate more attention to instructional design and personalized interaction with students.

4. Data-Driven Insights: The vast amount of educational data available can be effectively analyzed by AI algorithms to generate valuable insights. By

analyzing student performance, attendance records, and engagement patterns, AI can identify trends, predict student outcomes, and provide data-informed recommendations. Educators and institutions can leverage these insights to refine teaching methodologies, identify areas for improvement, and implement targeted interventions.

5. Intelligent Content Creation: AI plays a significant role in automating content creation processes. AI algorithms can generate interactive simulations, virtual reality experiences, and multimedia resources that enhance student engagement and understanding. Additionally, AI enables educators and learners to access a diverse range of educational materials by recommending relevant and high-quality resources.

6. Accessibility and Inclusion: AI addresses accessibility challenges and promotes inclusive education. Through features such as speech recognition, natural language processing, and computer vision, Artificial intelligence (AI) is a technology that supports students with diverse learning needs. It can provide real-time captioning, language translation, and text-to-speech functionality, which enhances the accessibility of educational content for students with disabilities or those who are non-native speakers. AI-driven tools ensure that every student has equal access to educational resources and opportunities.

7. Lifelong Learning and Skill Development: AI facilitates lifelong learning by offering personalized recommendations for continuous skill development. AI-powered platforms assess individuals' existing skills, identify knowledge gaps, and suggest relevant courses or learning opportunities. This helps individuals stay updated with new developments, acquire new skills, and adapt to the changing demands of the job market. AI enables personalized and flexible learning pathways throughout a person's lifetime.[10]

8. Ethical considerations and bias mitigation: AI is becoming more common in education. This means it is important to think about how AI is used and make sure it is fair and accountable. AI should not be used in a way that is unethical or that hurts students. By thinking about how data is collected and used, how student privacy is protected, and how AI is made fair and inclusive, education systems can help people trust AI and make sure it is used responsibly.

Conclusion:

In conclusion, the results of recent research demonstrate that artificial intelligence (AI) has made a significant contribution to the quality of higher education. AI applications have shown the potential to enhance personalised learning experiences, improve student engagement and academic performance. AI-powered tools such as chatbots and virtual assistants have streamlined student support services, providing instant assistance and reducing administrative burdens. Additionally, automated systems have improved efficiency in administrative processes.

To maximize the benefits of AI in higher education, several recommendations and perspectives should be considered. Ethical considerations and transparency in AI algorithms are essential to ensure fairness and accountability. Institutions should invest in training and professional development to equip faculty and staff with AI literacy and skills. It is important to strike a balance between AI automation and human expertise to maintain the human touch in education. Ongoing research and evaluation are crucial to assess the impact of AI on the quality of higher education and address emerging challenges.

 The integration of AI in higher education has the potential to transform the learning experience, improve efficiency, and enhance academic outcomes. By fostering AI responsibly and strategically, institutions can harness its potential to create a more engaging, personalised, and impactful educational environment.

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Footnotes:

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