ARTIFICIAL INTELLIGENCE (AI) IN EDUCATION: A COMPREHENSIVE REVIEW

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Abstract
This paper examines the impact of AI in the education sector, focusing on its potential to improve learning outcomes, student engagement,and overall educational experience.The research highlights various applications of AI in education,such as personalized learning,intelligent tutoring systems,and educational data mining, and discusses the benefits and challenges associated with its implementation.Additionally, the paper explores the ethical and a privacy concern related to AI use in education and provides recommendations for future research and policy development in this field.The research is descriptive in nature. The sources of data used in this research are secondary in nature.

Key words: AI, Education,AI and Education, Exploring AI and education, Privacy, Ethics, Personalized learning,

1.Introduction:

One of the most significant aspects of civilization is education.It has a significant impact on all other industries and is interconnected with them.Because of this importance, education is beyond all barriers essential for every social group in society.

Over the last decade every area of life is being transformed by artificial intelligence,and the education sector is no exception.Numerous nations have been forced by technology to adopt technology consumption in the field of education.One may argue that technological developments and education are intertwined.

More sophisticated machinery will better meet the emerging difficulties and present new opportunities for the education sector.

Economists, political analysts, military advisors, security specialists, and educators have all been paying attention to the AI industry.

Artificial intelligence (AI) is a widespread concept that we use on a daily basis, even if we may not give it a lot of consideration. We use artificial intelligence (AI) and its help on a daily basis, whether it be for driving directions, email reading, booking a doctor's appointment, or finding recommendations for movies and music[1].Simultaneously AI is currently used in police, cancer, investigations, lowering the risk of aviation crashes, creating driverless cars, and other related fields. When it comes to suturing wounds, conducting search and rescue operations, caring for children, the elderly, and hospital patients, and helping credit card companies identify fraudulent activity, AI-enabled robots have excelled human doctors[1].

What is AI?Artificial intelligence (AI) is the area of computer science concerned with simulating intelligent behavior in computers and their potential to emulate—and hopefully surpass—human behavior[1].Science that creates and studies computers intended to enhance human intelligence processes is known as artificial intelligence.Artificial intelligence (AI) is the intelligence displayed by robots as opposed to humans[1].Intelligence shown by humans or animals possesses consciousness and emotions while the other has no such attributes. The term Al was first used by John MsCarthy in 1955 and he defined it as "making a machine behave in ways that would be called intelligent if a human were so behaving". In 1950, Alan Turing popularized that computing machines may be thinking like humans someday[3]. He thought that automated machines might eventually perform these kinds of computations that people would find irrational. Computing is used to speed up and improve the efficiency of everyday procedures.

AI is a machine that thinks, understands languages, solves problems, diagnoses medical conditions, keeps cars on the highways, plays chess, and paints impressionistic imitations of van Gogh paintings.

AI is often defined as a computer system with the ability to perform tasks commonly associated with intelligent beings.

Yann LeCun Professor, New York University rightly said **"Our intelligence is what makes us human, and AI is an extension of that quality[4]."**

Some Notable Industries Using AI

Artificial intelligence is predicted to be the primary source of competitive advantage for businesses and has the potential to add significant value to a wide range of sectors worldwide.Various industrial sectors are witnessing the crazy impact of Artificial Intelligence (AI) as a powerful technology.

Some of the most significant industries[5] using AI are:

A) Healthcare: The use of AI in healthcare can assist resolve problems with high access barriers to medical facilities, especially in remote areas with inadequate connectivity and a shortage of medical experts.

B) Agriculture: AI has the potential to spark a food revolution and satisfy the world's growing food demand, which is expected to rise to 50% by 2050 and support an additional 2 billion people. It may also help with issues like incorrect demand forecasting, unreliable irrigation, and excessive or improper use of fertilizers and pesticides. Enhanced agricultural productivity by real-time advice, sophisticated insect attack detection, and crop price forecast to guide planting techniques are a few use scenarios.

C) Intelligent Mobility, encompassing Transportation and Logistics: This field may find applications for self-governing vehicles for ride-sharing, partially self-governing functions like driver support, and anticipatory engine upkeep and monitoring. AI can also have an impact on better traffic management and driverless trucking and delivery.

D) Retail:One of the first industries to embrace AI technologies was the retail sector. Applications include enhancing customer experience through preference-based browsing, image-based product search, and personalized suggestions. Anticipating client demand, enhancing inventory control, and streamlining delivery are some more use cases.

E) Manufacturing: One of the biggest industries to benefit from AI-based solutions is expected to be the manufacturing sector. This will allow for the creation of the "Factory of the Future," which will be made possible by technological systems that are flexible and adaptable and can automate processes and machinery to react intelligently to unexpected or unfamiliar situations.Impact areas include engineering,supply chain management,production,maintenance, quality assurance and in-plant logistics and warehousing.

F) Energy: AI can be used in renewable energy systems to enable energy storage through intelligent grids enabled by smart meters, as well as to increase the affordability and reliability of photovoltaic energy. Other potential use cases in the energy sector include energy system modeling and forecasting to reduce unpredictability and increase efficiency in power balancing and usage.

G) Smart Cities: AI integration into recently constructed infrastructure and smart cities may also be able to help meet the needs of a population that is quickly moving into urban areas and improve their quality of life. Enhanced security via better crowd control and traffic control to lessen congestion are two possible use cases.

H) Banking and Financial Services sector: Banking and Financial Services sector has been one of the leading sectors globally when it comes to AI adoption. Improved processes through the deployment of intelligent automation in rule-based back-office operations; the development of credit scores through the analysis of bank history or social media data; and fraud analytics for proactive monitoring and prevention of various instances of fraud, money laundering, malpractice, and the prediction of potential risks are some examples of the current and potential uses of artificial intelligence in this sector. In this industry, artificial intelligence has also been used in wealth management through automated transactions, algorithmic trading, and robo-advisory services.

I) Education and Skilling: AI can potentially solve quality and access issues observed in the education sector. Potential use cases include augmenting and enhancing the learning experience through personalized learning, automating and expediting administrative tasks, and predicting the need for student intervention to reduce dropouts or recommend vocational training.

2.Artificial Intelligence in Education

2.1 Role of AI in Education

With the development of human resources and higher productivity, an efficient education system can change a nation. The population's literacy and education levels are crucial for overall development and the shift to an advanced economy, especially in the context of rising nations.Since childhood, people have been educating and learning.As times have changed,there have always been changes in the education process.Many of these variations lead to periodic changes in the teaching and learning models used by teachers and students. In the current context, students are expected to be mentors in addition to needing a straightforward learning method.This changed the structure of teaching and teaching materials.The widespread use of technology in education is changing how we impart knowledge and acquire it. One innovative method for personalizing the experiences of various learning groups, instructors, and tutors is artificial intelligence.

Artificial Intelligence (AI) is a powerful technology that is having a crazy impact on a number of industrial industries. This holds true for the global education system as well.Artificial Intelligence is being used by various educational institutions worldwide for a variety of purposes. Because of artificial intelligence, education is now seen entirely differently by parents, teachers, students, and educational institutions themselves. As a result, unique eLearning solutions created by using AI are becoming more and more popular.

To better understand how artificial intelligence is applied in the field of education, let's look at some numbers:

1)According to a report by Global Market Insights, AI in the education market is predicted to exceed $80 billion by 2030.

2)The Markets And Markets report suggests that global use of AI in the education market could grow up to $3,683.5 million in 2023.

AI technology has transformed education, among other things by enabling teachers to leverage real-world examples to help pupils learn more efficiently and rapidly. Artificial Intelligence has the potential to revolutionize education if applied appropriately.

2.2.Some amazing applications[4] of AI in the field of education are:

1. Automated Assessment And Grading Tasks: Grading homework and assignments takes up a lot of time that could be used for teaching students or setting up the classroom. Artificial intelligence can be used to grade assignments and evaluate student performance on multiple-choice or fill-in-the-blank assessments, but it is evident that technology cannot completely replace a teacher.

2.AI-Based Intelligent Assistants:AI-powered assistants have made it possible for students to access instructional resources without having to get in touch with teachers. For instance, Amazon Alexa is used by Arizona State University to help students with everyday assignments and tasks. When students ask Alexa a question, she answers and points them in the direction of other resources.

3.Smart content:To collect the knowledge students need, an AI-based custom eLearning system can efficiently handle and analyze large amounts of data (such as various online learning resources). Organizations like Byju's, Netex Learning, Jaro Education, etc assist students by providing unique lectures, holding conferences, virtual training sessions, and other educational activities using their bespoke cloud platforms.

4.Personalized Education: AI can help educators customize their instruction to each student's needs so they can progress at their own pace. Artificial intelligence is currently being used by a few well-known

educational platforms, such as Carnegie Learning, to create personalized courses. Personalized instruction delivery can also be facilitated by the application of AI technologies.

5.AI-Powered Tools For Constructive Feedback:Artificial Intelligence (AI)-based solutions are used by colleges, schools, and other educational institutions that currently provide online programs to track student progress and inform teachers about student performance.

6.Keeping Track Of Student's Performance:
With AI-based teaching tools, educators can keep an eye on student performance and assess where and how much more work needs to be done.

7.Creating Courses: Custom eLearning solutions, which help professors close the knowledge gap between their lectures and the study materials, are also powered by artificial intelligence. With the use of such software, they can design customized courses and determine how to improve them in order to deliver better instruction. For example, this technology is already being used by well-known online course provider Coursera to alert teachers when students submit the incorrect answer to a question.

8.AI-Based Tutors:While having an AI tutor is currently a pipe dream, considering how swiftly this technology is evolving, it might not be long before it does. At the moment, there are a few AI-based tutoring programs on the market that may help students study arithmetic,English language proficiency, and other disciplines.

9.Greater Involvement:On many AI-based platforms, students may now talk about the challenges they are facing when learning a certain subject or comprehending a topic. These platforms offer a good technological means of engaging in peer interaction and knowledge exchange, which in turn increases student engagement.

10. Enhanced Teaching And Learning:Teachers can use a range of AI-powered technology to assist pupils in better grasping a concept. They can use examples from real life and show the pupils how they work to clarify concepts.

In the end, artificial intelligence (AI) will support educators in addressing the wide range of cognitive, academic, social, emotional, and physical factors that can affect students' learning. It will also guarantee that all students, regardless of social class, race, gender, sexual orientation, ethnic background, or physical or mental disabilities, have equal opportunities in education.
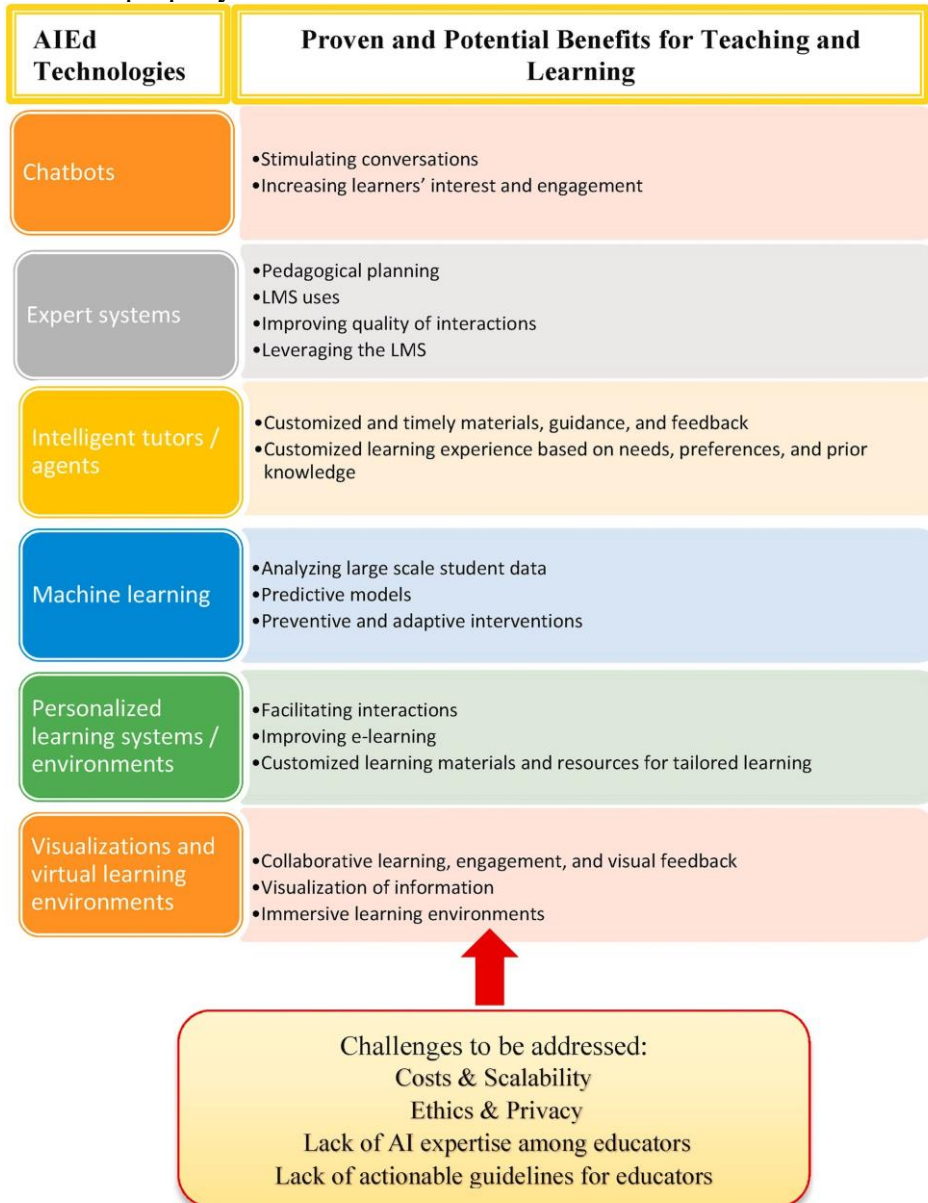
2.3 Some products of AI and Education
The products that would stand out or might hold a prominent place in education with artificial intelligence can be listed as follows:
- Advanced technology software
- Robot assistants and robot teachers
- Smart classes in schools
- Individualized education (pertains to individualization of instruction)
- Simulations for education and lessons
- Scenario and case study-producing systems
- Interest, ability, and needs analysis systems
- Vocational guidance system (for career choice)
- Programs or tools for taking attendance
- Unmanned systems of all sorts
- Learning outcome detection system (for levels of students)
- Personal teaching tools
- Attention and distraction analysis system
- Academic success detection and suggestion system for improvement
- Learning systems in cloud environments and virtual learning environments
- Curriculum editing system
- Systems that perceive and report students' learning pattern

2.4.Benefits of AI in Education

AI benefits education in many ways.For example, learning how to fly an airplane cannot only be obtained from books and teachers. One needs to acquire practical experience of how it feels and works.It gives the necessary circumstances and the experience of how it operates, among other things, through its virtual environment. Numerous issues, such as phonological abnormalities and health and safety concerns that put inexperienced persons at risk when they enter the actual world, can be addressed through virtual learning environments.It's dangerous to conduct research at other labs, and it's quite challenging to do it yourself. Such trials can be conducted by AI systems in a variety of forms without endangering human lives.In physics and chemistry, these kinds of experiments are typical.In the field of medicine, artificial intelligence (AI) systems are used to create a variety of animations and virtual representations that make it easier for students to learn about the architecture and function of the human body and its organs than they could using a book.Thanks to sophisticated technology, medical students can now learn how to operate an organ of interest. It is clear that AI and its applications benefit education and learning in other ways as well. For example, social robots, ITS, and SL are just a few of the ways that AI is being used to deliver education.Additionally, it helps with academic and administrative duties and chores and transports the learner to a virtual reality classroom where the skills can be properly mastered without risk.

AIEd Technologies	Proven and Potential Benefits for Teaching and Learning
Chatbots	• Stimulating conversations • Increasing learners' interest and engagement
Expert systems	• Pedagogical planning • LMS uses • Improving quality of interactions • Leveraging the LMS
Intelligent tutors / agents	• Customized and timely materials, guidance, and feedback • Customized learning experience based on needs, preferences, and prior knowledge
Machine learning	• Analyzing large scale student data • Predictive models • Preventive and adaptive interventions
Personalized learning systems / environments	• Facilitating interactions • Improving e-learning • Customized learning materials and resources for tailored learning
Visualizations and virtual learning environments	• Collaborative learning, engagement, and visual feedback • Visualization of information • Immersive learning environments

Challenges to be addressed:
Costs & Scalability
Ethics & Privacy
Lack of AI expertise among educators
Lack of actionable guidelines for educators

[3]Some benefits of using Artificial Intelligence in Education are :

- Helping individual at learning at their own speed
- Correct determination of the individual's need
- Practical solutions to chronic problems
- No more paperwork in schools
- Prevention of waste of time
- Increase in education quality
- Providing ease of work
- Helping the right decisions with fast data analysis
- Planning teaching according to student capacity and speed
- Using or choosing effective learning methods using a learning analysis
- Ability to train in smaller groups with effective planning
- More effective individual learning process
- Helping policymakers, for example, population prediction simulations for making the right education investments in the right places

Artificial Intelligence (AI) has promise for transforming teaching and learning methods and tackling some of the major issues facing education today.Rapid technological advancements do, however, necessarily carry with them a number of risks and difficulties that have thus far surpassed regulatory structures and policy discussions.

2.5. Limitations and challenges of AI in Education

While AI offers benefits across many industries, it also has certain drawbacks,as Stephen Hawking has mentioned,"Success in creating AI would be the biggest event in human history. Unfortunately, it might also be the last, unless we learn how to avoid the risks[1]."
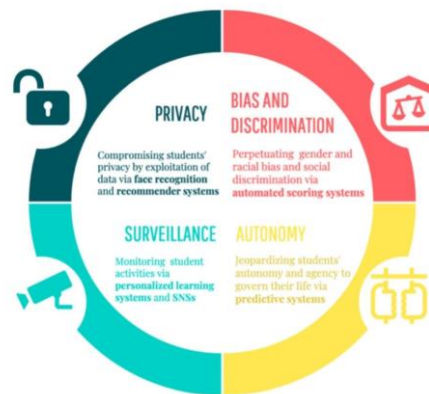
There is a growing consensus that the extraordinary range of present and future benefits will prevail, despite the fact there is still much discussion about the pros and cons of implementing AI technology in the field of education, including the ethical and depersonalization concerns.

Even though AI has a lot of potential to improve education, there are still several issues and restrictions that need to be resolved.

The limitations and challenges that come with using AI in education are :

- The ethical ramifications of utilizing AI in education are one of the major obstacles. The use of chatbots and generative AI in particular raises questions about data privacy, algorithmic bias, and the possibility of automation displacing human teachers.
- AI creates special privacy problems since it gathers and analyzes vast volumes of student data, which raises worries about data security and confidentiality.
- Language and cultural barriers make it difficult to create AI systems that can successfully serve a variety of student demographics.

- Careful consideration of the duties and responsibilities of educators as well as any potential effects on instruction are also necessary when integrating AI in education.
- Concerns about using AI in education have been voiced by educators, parents, and legislators. Some fear that implementing AI could result in a loss of human contact in the learning process and a devaluation of human expertise.
- Concerns have been raised regarding the lack of accountability and transparency in AI systems, as well as the possibility of bias and discrimination in AI algorithms.
- Due to the possibility that some students may not have equal access to AI-powered tools and resources, the use of AI technology in education raises concerns regarding equity and access.

3.Recommendations for future research and policy development

1.As previously said, the study's purpose was to provide answers to the questions it posed by conducting a theoretical evaluation of the literature. This study did not address all of the numerous additional AI applications in education, including virtual reality, trial and error, assessment, grading, and more. The remaining aspects might be covered by future research.

2.To learn more about this field, future research on each AI application in education and learning can be carried out.

3.The long-term implications and impacts of AI technology on student learning outcomes and engagement require more investigation. Large-scale empirical research and longitudinal studies can offer insightful information on the possible hazards and efficacy of AI applications in education.

4.To guarantee AI's ethical and responsible application in education, policymakers should create rules and laws. These rules ought to cover algorithmic bias, data privacy, and AI system openness.

5.The goal of professional development programs should be to provide educators with the theoretical and practical knowledge of artificial intelligence (AI) as well as the skills and competencies they need to successfully use AI technology into their teaching methods.

6.To promote innovation and develop the field of artificial intelligence in education, collaboration between researchers, educators, and business people should be encouraged.

7.Joint conferences, cooperative research projects, and knowledge-sharing websites can help to promote the sharing of concepts and best practices.

4.Conclusion

Artificial Intelligence (AI) is the ability of machines to carry out cognitive functions such as perception, thinking, learning, problem solving, and decision making. Artificial Intelligence has come a long way since it was first imagined as a system that could simulate human intelligence. Thanks to remarkable developments in data gathering, processing, and computing power, intelligent systems can now be used to handle a range of jobs, facilitate connectivity, and boost output. AI is becoming more and more useful in a wider range of fields as its capabilities have grown significantly.

AI brings educational opportunities as well as obstacles. Learning efficiency can be increased, individualized educational help can be given, administrative duties can be automated, and chatbots, analytics, and generative AI can all be applied. However, ethical standards and a thorough analysis of the advantages and disadvantages must govern the use of AI in education. To guarantee AI's ethical and responsible application in education, educators, parents, and legislators must all actively participate in the discussion and decision-making processes. Subsequent studies ought to tackle the moral dilemmas, societal implications, and confidentiality concerns related to artificial intelligence in the classroom. Programs for professional development should also be created to help teachers become more knowledgeable about AI in theory and practice and to build confidence in AI-based teaching tools.

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