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Artificial Intelligence in Teaching Mathematics

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Abstract:
The goal of today's higher education is to significantly raise the standard of instruction. Artificial intelligence advancements in technology give instructors and students the chance to solve problems and enhance their teaching and learning processes. By providing a thorough review of artificial intelligence in mathematics teaching and learning for students at all levels of education, this paper hopes to contribute to the discourse. These days, one of the disciplines with the greatest educational impact in mathematics, which has several applications in social interaction, research, and the comprehension of various scientific ideas and rules. Therefore, enhancing the caliber of mathematics instruction in colleges becomes a crucial issue in contemporary college teaching. The teaching strategies used in higher education have been improved and diversified by artificial intelligence.

Keywords: Artificial intelligence, Mathematics education, Teaching and learning.

Introduction:

A nation can be revived through research and education, and the competition of the twenty-first century is between economic power and science and technology. In the end, it all comes down to a skills competition, and education is the key to developing those skills. The primary element in maintaining a nation's overall strength and competitiveness is high tech. Hightech is fundamentally a mathematical technology, and the successful application of mathematics characterizes the knowledge-based economy. In order to apply science and education and revitalize a nation, it is crucial to develop mathematical education. Currently, mathematics expands into other subjects and merges with other disciplines to produce many fringe disciplines in addition to its own ongoing development and progress. As a result, mathematics is

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indispensable to the advancement of not only science and technology but also economic science, environmental science, social science, and even the humanities.

The Rise of Artificial Intelligence:

But the concept of artificial intelligence is not new. In reality, McCulloch and Pitts began to develop algorithmic learning methods in 1943. They did this by creating artificial neurons that are connected and stacked in layers to create artificial neural networks, which replicate the operation of the human brain. They already had a plan in mind for how artificial intelligence might be used at the time. The community did not, however, fully appreciate neural networks' potential. As a result, this initial wave of artificial intelligence failed and disappeared. Machine learning regained popularity about 1980, and numerous notable developments came out of that time period. Deep neural networks were widely used in 2010, which marked the beginning of a new era in artificial intelligence.

There are two main difficulties that stand out while evaluating the college mathematics teaching system at the moment. First of all, kids do not approach learning mathematics with a positive mindset. Students are more likely to choose major areas that are more practical because of contemporary society's profound influence. Many math students in their early years believe that it has little to do with real-world issues. As a result, it is challenging for individuals to develop a positive learning mindset. The evolution of mathematics instruction has run into certain issues because there isn't a strong foundation for learning. Second, due to the slow pace at which teaching materials and methods are updated in mathematics classes, students are more likely to become weary from the process of learning, which will further reduce their interest. Passion and curiosity are crucial components of the learning process. When fully reflected in math learning, inadequate interest and insufficient passion will provide low learning efficiency. There are mainly two problems. First of all, the classification of mathematics instruction in colleges is not sufficiently precise, and there are instances when the focus is ambiguous in particular learning and research. This is from the perspective of curriculum planning and selection of teaching materials. The mathematics curriculum at the institution is mostly based on

theoretical instruction. The practical curricular environment is definitely too tiny even for the teaching of applied mathematics, making it difficult to carry out mathematical practice effectively. The choice of instructional resources and the course's content is not updated frequently enough, which causes the teaching material to lag. Second, because the school does not take into account the teaching team's composition, there is a disparity in the teaching experience of the team's teachers. The managerial issues that plague the mathematical education system have an impact on the standard of instruction as well. The instructional order is illogical, to start. Initially, mathematics was taught in a step-by-step fashion. However, in the real teaching process, the teaching sequence is frequently muddled in order for certain teachers to finish their teaching courses, which undermines its continuity and violates the students' learning norms. Second, there are instances where the scheduling of courses and class times is illogical. There should be a certain ratio of theoretical class hours to practical class hours in the actual teaching of mathematics, and their distribution should be appropriate.

Impact on Mathematics :

The potential of artificial intelligence technology to advance several industries, including education, has recently received attention. In short, it has been demonstrated that artificial intelligence can raise educational standards by strengthening tried-and-true methods of teaching and learning. More precisely, it can provide teachers more time to interact with their students or work on duties related to professional development by automating some routine tasks like grading. Students of all skill levels can cooperate in one classroom while teachers provide support and assistance as needed by tailoring the learning experience to each student's unique needs, aptitude, or interest. Artificial intelligence in education has the potential to deliver efficient intelligent coaching that takes into account students' aptitude, emotions, and degree of achievement. Additionally, AI-enhanced systems can produce beneficial feedback, hints, and recommendations for teachers and students, enhancing their learning and teaching experiences. Given the vital responsibilities that artificial intelligence plays in education and the fact that COVID-19's spread has made its use in education increasingly important,

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Applications of artificial intelligence in education are growing in popularity and have received a lot of media attention lately. Artificial intelligence represents a quantum jump in original and creative thought across many disciplines, including mathematics instruction.

The current study shows numerous artificial intelligence studies in various contexts. Artificial intelligence can improve our capacity to live in a world where technology is getting more and more sophisticated. Artificial intelligence's fundamental contribution to mathematics education is the concepts, techniques, and tools it offers for creating adaptable and useful computer-based systems for both teaching and learning. With direct manipulation of abstract objects, individualized explanations, and intelligent microworlds that enable learning by discovery, such systems raise high expectations. The purpose of technology in higher education is to advance both the educational process and human thought. Students benefit from using artificial intelligence to find solutions more quickly and easily. Students may simply access all of the lesson's information utilizing this cutting-edge intelligence programme. Due to the generational preference for independent learning and information exploration, this potent instrument of artificial intelligence can assist students in learning more without the need for an instructor. Artificial intelligence will never in any manner "take over" the role of a teacher. The technique of creating human intelligence using technologies, particularly computer systems, is known as artificial intelligence. Artificial intelligence has specific uses in speech recognition, expert systems, machine vision, and natural language processing. With the help of an advanced system, artificial intelligence may carry out tasks or execute actions that are similar to those performed by humans. A sort of educational software called a pedagogical agent is intended to support students in online learning environments. It resembles humans in appearance or behavior. Additionally, AI-enabled robots or systems are capable of carrying out sophisticated tasks that the human brain is incapable of. Different societal attitudes exist about artificial intelligence. Because they believed that machines would eventually replace humans in certain tasks, they felt that artificial intelligence was wrong. The public perception of risk of artificial intelligence, or simply the risk perception of artificial intelligence, refers to the expectation of possible

adverse effects associated with the range of uses of artificial intelligence as a technology. The use of robotics in learning and teaching mathematics was examined in the studies that have recently come to light. They find it exceedingly difficult to learn programming and problem-solving skills at a young age. With the use of artificial intelligence, learning has become more interactive.

A Need for Mathematics:

These arguments demonstrate the critical importance of mathematics in the field of artificial intelligence. In reality, it is currently evident that many mathematicians are entering this subject and contributing their own experience. To address the multiple challenging yet fascinating difficulties in the field of artificial intelligence, practically all branches of mathematics are needed. At the nexus of mathematics and artificial intelligence, there are two distinct research areas.

Mathematical Foundations for Artificial Intelligence: This research area strives to develop a profound understanding of mathematics. Based on this, it works to eliminate current challenges like a lack of robustness or theoretically bases the entire training process.

Artificial Intelligence for Mathematical Problems: Focuses on inverse problems and partial differential equations as examples of mathematical problem settings with the intention of applying AI approaches to create better solvers.

Conclusion:

Artificial intelligence is the modeling and programming of a machine's intelligence to mimic human intelligence. In other words, artificial intelligence (AI) refers to a computer system that is capable of performing tasks that ordinarily call for human labor or intelligence. For artificial intelligence to function properly, it needs knowledge and data. Artificial intelligence (AI) learns on its own based on what it has experienced when employed by humans, even though humans do not necessarily direct the learning process. The use of AI in mathematics education has a number of benefits, including helping students develop their analytical and problem-solving skills as well as their comprehension of the basic concepts behind geometry, mathematics, and statistics. Additionally,

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students gain knowledge of and develop superior interpersonal skills and social skills, which improves learning environments that help students grasp mathematical ideas. Various strategies, including systems, teachable agents, autonomous agents, machine learning models, digital technology devices, and comprehensive methodologies, can be used to integrate artificial intelligence into mathematics teaching. However, it appears that of all of those ways, robotics was the one that math students, instructors, and educational researchers used the most.

The use of artificial intelligence in math education has become widespread across the nation. The majority of nations use artificial intelligence to enhance learning. In the previous five years, the United States has produced a disproportionately large number of articles on the application of artificial intelligence when compared to other countries like Mexico, Canada, and others. The usefulness of AI in the teaching and learning process, particularly in mathematics education, is the most widely noticed element of AI, including its benefits, drawbacks, and usage techniques. When compared to other factors, it is still noticed, although not as frequently as efficacy. Understanding how successful artificial intelligence is in teaching is essential. Therefore, if artificial intelligence proves to be effective, its use may become more widespread in the future. However, if teachers and students are able to fully explore the pedagogical potential of robots to focus and advance mathematical knowledge, we should not expect robotics to be the dominant effect on mathematical learning. As a result, by introducing "seductive details" introduced by robots, the workload for math students could worsen. In conclusion, teaching and learning are more effective with the aid of artificial intelligence since it is fun and engaging, which has made it simpler for students to comprehend a subject.

Limitations:

Every study has some limitations. Your study may have constraints resulting from restrictions on the research design or technique, which could have an impact on the study's findings. The analysis has certain limitations, even if it reveals a lot of important patterns and future research goals for artificial intelligence in mathematics education. The availability

of a small number of publications for research is the first drawback. It is challenging to draw general inferences from the data because Artificial Intelligence is a subject that is rarely explored in mathematics education. On the other hand, a tiny number of studies just skim the surface of what is known about how artificial intelligence is being employed in mathematics education in their research without giving in-depth explanations.

Implications:

One area of artificial intelligence that is flourishing is mathematics teaching. Since a long time ago, either teachers or students have used AI in mathematics instruction. According to the study, they frequently adopted the robotic technique, which had a favorable effect on their mathematical understanding. Artificial intelligence, meanwhile, faces similar challenges in terms of widespread use due to its high maintenance costs. This is thought to be the reason why a lot of research was only carried out in industrialized nations like the United States, China, and Australia, while there was none in Southeast Asia, particularly Malaysia. Furthermore, since the method employed was different from the traditional teaching and learning procedure, which uses pen and paper, the Artificial Intelligence approach in mathematics education did improve students' learning experiences. When teachers and students use artificial intelligence, such as robotics, in the classroom, their creativity will also increase. The teachers' effective methods will greatly increase their pupils' capacity to apply and comprehend what they are learning. Teachers should therefore use AI into the teaching and learning process to help pupils learn while also improving their understanding.

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