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**A Comprehensive Study on The Growing Role of Artificial Intelligence
in Modern Education Systems**

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ABSTRACT

AI has changed the game in education by making lessons more engaging, enhancing how they are taught, and making schools more efficient overall. This study examines the increasing integration of AI in education, focusing on its impact on adaptive learning, intelligent tutoring systems, automated evaluation, administrative automation, enhanced accessibility, and skill development. AI-powered adaptive learning solutions provide tailored learning paths that help students comprehend, remember, and do well in school by looking at their performance data. Artificial intelligence powers both virtual and augmented reality, which enable immersive learning experiences that transcend beyond the four walls of a normal classroom. The study also looks at the positives of using AI, such making things more efficient, improving curriculum, giving feedback in real time, and keeping an eye on performance all the time.

Keywords: *Artificial Intelligence, Education, Data Privacy, Learning, Technology.*

I. INTRODUCTION

The world is changing because of artificial intelligence (AI), and so is the schooling system. AI has become a useful way to solve problems in education and speed up progress toward SDG 4. AI can tell teachers how engaged, learning, and healthy their kids are by gathering and analysing data. It also includes digital applications and tools built in that let teachers talk to each other and keep track of each student's development.

AI might change education by using personalised learning algorithms to make teaching and learning more efficient. AI can customise educational materials to better meet the needs of each student by figuring out what they are good at and what they need to work on. Virtual reality experiences could be made without leaving the classroom to connect with students from faraway places or show historical sites that could have caused environmental harm if used a long time ago. This gives students an interactive learning environment that helps them remember what they learn.

Using AI to add augmented reality to learning would make education more interesting for students by letting them engage with virtual things in ways that were not possible before. Putting real-time information on what people see around them via gadgets or cellphones on smart boards or screens in classrooms creates new immersive experiences that change how people communicate knowledge successfully.



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While the advantages of AI in education are significant, governments must recognise the hazards linked to the comprehensive use of these technologies. Using sensitive data raises questions about privacy and fairness. This means that there need to be clear rules about how this data is collected, stored, secured, and shared among stakeholders. These rules should also make sure that they are not just adding to existing biases and habits in the curriculum and school methods that limit creativity, critical thinking, and diversity, among other things, when they start making small improvements based on machine-generated insights or conclusions.

More and more schools are using education technology (edtech). AI, a technology that lets robots do things that usually need human intelligence, is also becoming increasingly common in everyday life. Putting the two together is a natural move that will help students, teachers, staff, and administrators. AI may be used in many different ways in education. There is a lot of interest in generative AI (GenAI) systems that can make things and do tasks when people ask them questions in a natural way. These systems may customise information, give feedback almost in real time, and help with coaching and skill development. Adding smart AI technology to schools may also aid teachers, staff, and administrators by taking care of chores that are boring or take a lot of time, which gives them more time to help students succeed.

The expansion of AI in the education business is huge and has several effects. AI technology might revolutionise the way we teach and make learning more personalised, welcoming, and flexible for students. One of the most important ways that AI is changing education is by giving students personalised learning routes based on their requirements, learning styles, and talents. This makes sure that all students, no matter where they come from or how skilled they are, have the aid and tools they need to do well.

AI in education lets teachers find out what students don't know and provide them specific comments to help them study better. AI-powered chatbots and virtual assistants may let teachers provide students rapid aid and support outside of class, which keeps them interested and motivated. With AI, teachers may find kids who are having trouble earlier and provide them the aid they need to do well.

One of the most intriguing things about AI in education is that it might revolutionise the way we learn by moving away from traditional classroom models and toward more interactive and dynamic ones. For example, AI-powered virtual and augmented reality technologies may help students learn by letting them explore complicated ideas in new and immersive ways. This makes learning more fun and interesting.

II. REVIEW OF LITERATURE

Wang, Shan et al., (2024) A large amount of material with varying viewpoints on artificial intelligence (AI) in education (AIED) has developed. What are the most common types of artificial intelligence (AI) applications studied in the realm of education? (1) We want to shed light on this and two other important topics in this review study. As for question two, what are the most popular areas of study and the most important results? (3) How are the theory frameworks, methodology, and



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research settings that are important to the study design doing? The current literature is comprehensively organised based on bibliometric data from 2,223 research publications and content analysis from 125 papers. Existing AIED research covers a broad range of topics, including adaptive learning, intelligent evaluation and management, prediction and profiling, and new product development. Topics for research include AIED's acceptance, effects, and difficulties as well as the technological design of educational systems. This study also draws attention to the varied theoretical frameworks used in AIED publications, the interdisciplinary character of the publishing platforms, and the existence of uncharted territory in the field.

Imran, Muhammad et al., (2024) the growing influence of AI in universities and how it could change the face of education are the topics explored in this research. We take a qualitative look at the ways in which cutting-edge AI-driven pedagogical resources might improve educational institutions by way of personalised learning paths, adaptive tutoring platforms driven by AI, digital learning spaces that transport students to another world, and systems that aid in evaluation and feedback. Theoretically, we describe the function of technology in AI-facilitated personalised and collaborative knowledge production by using the constructivist theory of learning as a research framework. There were three phases to the execution of this investigation. We start with a quick introduction of AI before moving on to discuss its recent effects on schools, including some of the ethical concerns and implementation challenges that have arisen. Stage two involves proposing constructivist implications for learning environments, cognitive growth with AI help, and the use of AI tools to optimise educational processes, paradigm shifts in education, and research.

Bit, Dipanwita et al., (2024) with the potential to make learning and teaching more efficient, personalised, and engaging, artificial intelligence (AI) has the potential to radically alter our current practices. In order to enhance the educational process, artificial intelligence (AI) is being used in the form of technologies such as machine learning and natural language processing. By analysing data, identifying patterns, and generating predictions, algorithms allow instructors to personalise learning for every student. Thanks to Catgut's remarkable results on standardised tests, artificial intelligence (AI) and its possible effects on education have attracted a lot of interest. Understanding the impact on the existing educational system is crucial for the long-term viability of AI-driven technology in K-12 and higher education. Many benefits may result from using AI in the classroom.

Akinwalere, Susan & Ivanov, Ventsislav (2022) AI in Education, or Aired, is a relatively new area of study within the field of educational technology, according to a number of global studies. Although AI has been available for over 30 years, many educators still don't understand how to fully use it for pedagogical purposes and how it may really influence higher education teaching and learning. The purpose of this research is to assess the use of AI in academic settings by looking at the pros and cons of this technology. The article delves into the ways new technology are changing education by looking at how they affect both students' and institutions' pedagogical practices. This document compiles many instances of AI being used in the classroom in an effort to provide all students with a high-quality education. The study begins by discussing the potential of AI to enhance learning



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outcomes, specifically looking at how AI technology might assist educational institutions in making better use of data to increase both equality and the quality of higher education. Along with the possible concerns, the article discusses the pros and cons of using AI in classrooms. Lastly, we provide some suggestions for AI in the classroom, with an eye on starting conversations about the benefits, drawbacks, and overall impact of AI on education in the context of long-term sustainability.

Göçen, Ahmet & Aydemir, Fatih (2020) many academics in the area of artificial intelligence (AI) in education are of the opinion that school administrators, instructors, and students will all face new challenges as a result of this growing body of research. Accordingly, this research aims to investigate potential outcomes associated with the introduction of AI into the classroom and the consequences this development may have for the educational landscape going forward. This study aimed to analyse the viewpoints of participants from various sectors via the use of phenomenology, a qualitative research approach. According to the findings, the introduction of AI into the classroom will bring both new goods and advantages to schools and instructors, as well as some negatives. Some recommendations for AI adoption and potential issue avoidance are highlighted by the results. While most people have a favourable impression of AI, educators and researchers have pointed out several negative aspects, particularly as they relate to the field's potential impact on the classroom in the future. While jurists and lawyers are more concerned with the potential legal implications of artificial intelligence (AI) in the classroom, engineers see AI as a means to improve teaching and learning for all students.

III. ADVANTAGES OF ARTIFICIAL INTELLIGENCE IN EDUCATION

The field of education is not immune to the widespread impact of artificial intelligence. Changes that improve learning experiences, simplify administrative duties, and help instructors and students in many ways have been brought about by the integration of AI in education.

Personalized Learning

By adapting course materials to each student's specific requirements, AI makes personalised learning a reality. Artificial intelligence can assess a student's aptitude, learning speed, learning style, and areas of weakness using adaptive learning technology. With this information, AI systems may create individualised lesson plans and materials, making sure that each student gets help that works for them. Students benefit from increased comprehension and memory retention since they are able to work at their own speed.

Immersive Learning Experiences

Artificial intelligence can make learning more interesting and engaging in ways that traditional approaches can't. AI-powered technologies like virtual reality (VR) and augmented reality (AR) can make learning more fun and participatory by simulating real-world situations and difficult ideas. For example, students may use AI-driven avatars to visit historical locations, do virtual science experiments, or practise their language abilities. This hands-on learning experience helps them understand and remember what they study.



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Improved Student Engagement and Motivation

AI may also make learning more dynamic and personalised, which can make students more interested and motivated. AI-powered gamified learning platforms use game features like prizes, challenges, and leaderboards to make learning interesting and competitive. AI can also provide students rapid feedback and guidance, which helps keep them engaged and on track with their learning goals. AI keeps students interested and motivates them to participate by meeting their needs and giving them aid in real time.

Cost-Effective Learning

By delivering scalable learning solutions and automating administrative duties, AI has the potential to reduce the financial burden on education. For instance, AI may take care of mundane chores like grading assignments, creating schedules, and maintaining student records, allowing educators to concentrate on really teaching. In addition, educational systems driven by AI can reach a huge number of students at little extra expense, allowing more people to have access to high-quality education. Because of its scalability, more students can have access to high-quality educational experiences at a lower cost.

Integrated Learning and Intelligent Tutoring System

Intelligent teaching systems powered by artificial intelligence provide pupils with tailored assistance and direction, much like a private tutor. These programs analyse student data to determine where they are in their learning and then make specific comments and suggestions based on that information. They are able to pinpoint areas of weakness, provide useful resources, and modify assignment levels based on the student's progress. Artificial intelligence improves students' ability to reach their learning goals via providing personalised assistance and ongoing evaluation.

Continuous Evaluation and Improvement in The Long Run

By giving real-time insights into student learning performance and learning outcomes, AI enables continuous review and improvement. Artificial intelligence (AI) can monitor student development, spot patterns, and pinpoint problem areas using data analytics. Teachers may utilise this data to make their lessons better, provide more targeted interventions, and check if their students are learning what they should be. A proactive approach to education is made possible by continuous evaluation, which allows for fast modifications to be made in order to better the learning experience and outcomes.

Raising Academic Standards and Educational Quality

Academic standards and the quality of education might be enhanced by the use of AI in the classroom. With the aid of AI, we can make sure that grades are always accurate, that students have access to high-quality materials, and that teachers have the tools they need to teach effectively. Using AI, schools may provide a more thorough and challenging curriculum that adapts to students' changing requirements. With the help of AI, classrooms may become more collaborative spaces where teachers and students can pool their expertise and resources to promote a growth mindset.



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Personalised and immersive learning experiences, as well as affordable and high-quality education, are just a few of the many benefits of artificial intelligence (AI) in the classroom. The impact of AI on the future of education is certain to grow, opening up exciting new possibilities for both students and teachers.

IV. DISADVANTAGES OF ARTIFICIAL INTELLIGENCE IN EDUCATION

Artificial intelligence (AI) is being both praised and criticised for its use in the classroom as it spreads to more and more industries. While artificial intelligence (AI) has the ability to revolutionise education, it also comes with a number of drawbacks that must be carefully considered and addressed in order to provide a fair and productive classroom setting.

Data Privacy Concerns

Concerns over personal information being compromised are among the main drawbacks using AI in the classroom. Academic records, behavioural data, and biometric information are just a few examples of the mountains of personal data needed by AI systems. Many questions concerning the storage, usage, and protection of this data have been raised by this massive data gathering. Data breaches, caused by insufficient security measures, might make students' personal information vulnerable to identity theft and other types of exploitation. Protecting students' information requires strong data privacy protections and regulatory compliance.

Dependence on Technology

A other key worry is the increased reliance on technology that AI in the classroom encourages. Some worry that schools may become too reliant on AI-powered systems for grading, class management, and other administrative duties. In the case of technological malfunctions or cyberattacks, this reliance might cause substantial interruptions. Plus, if kids get used to AI systems giving them answers and solutions, it might stunt their ability to think critically and solve problems on their own.

Lack of Human Touch/Dehumanized Learning Experience

One major drawback of AI in education is that it dehumanises the learning process due to its lack of human interaction. Human connection is crucial in traditional education, where instructors offer more than just academic knowledge; they also serve as role models and emotional supports for their students. Even while they work well, AI systems just can't compare to the human teachers' capacity for empathy, understanding, and connection. Students' emotional and social development, as well as their interest in and drive for learning, might be impacted by this lack of human aspects.

Risk of Cheating

Cheating is another issue that AI in the classroom might cause. Students may uncover strategies to circumvent academic integrity standards by utilising advanced AI techniques. One example is the possibility that AI-powered plagiarism detection systems may be fooled by highly intelligent AI-generated content that looks much like real student work. Furthermore, the validity and reliability of



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academic tests might be compromised if automated assessments and AI-based tutoring systems were programmed to provide students unfair advantages. To keep these threats at bay, educational institutions must regularly upgrade and modify their AI technologies.

Teacher Job Displacement

Finally, the potential loss of teaching positions due to the proliferation of AI in the classroom is a major worry. The potential obsolescence of educators is being discussed in light of the increasing responsibilities that AI systems are assuming. With the rise of AI-driven tutoring, automated grading, and other administrative duties, the demand for human instructors may decrease, which might result in job losses and a devaluation of the teaching profession. Although AI has the potential to greatly improve teaching methods, it is crucial to use it in a balanced way so that instructors still play a crucial role in the classroom and offer students the personal attention that computers just can't replicate.

V. IMPROVING ACCESSIBILITY WITH AI-POWERED TOOLS: USE CASES AND APPLICATIONS

The many applications of AI in the field of education are changing the game for everyone involved: educators, students, and educational institutions themselves. Here are a few examples of how AI is changing the face of education: AI is changing the way students learn, how teachers educate, and how educational institutions function. Among the most well-known uses of AI in the classroom are:

Intelligent Tutoring Systems

In order to provide students with immediate and tailored feedback, AI-powered tutoring systems use complex algorithms. The AI monitors the students' interactions with the learning materials, finds out where they're having trouble, and then adjusts the explanations to make sure they understand. By tailoring the learning rate to each student's specific needs, this method is able to close knowledge gaps.

These technologies help students better understand complicated ideas by responding instantly to their questions and adjusting to their individual learning methods. Students' self-esteem and academic achievement are both lifted by the stimulating learning environment made possible by the constant engagement with AI.

Automated Grading and Assessment

By quickly and consistently evaluating student work, AI simplifies the grading system. It relieves teachers of some tasks, which frees them up to focus on individual instruction. Recognising patterns in student performance helps in identifying students who are struggling and providing them with targeted support. At the same time, the effectiveness of AI guarantees timely feedback, which improves the learning cycle. Improving teaching quality, promoting equitable assessment, and cultivating successful student-teacher cooperation are all goals of the automated grading and assessment systems.



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Chatbots and Virtual Assistants

Enhancing students' learning experiences is greatly facilitated by AI-driven chatbots and virtual assistants. Smart solutions like these are there to help students right away by walking them through their schoolwork, answering their questions, and providing insightful criticism. These resources are available at all times, allowing teachers to meet their students' needs outside of traditional school hours. Students are encouraged to learn independently and actively participate in class with the personalized guidance, which helps them succeed academically.

Curriculum Planning

By examining educational data to spot patterns and deficiencies in learning outcomes, AI aids in the process of curriculum building. In light of current knowledge and changing educational standards, it might propose revisions to existing curriculum. A further benefit of AI is its ability to automate the process of aligning curricula with particular learning objectives. This helps to keep educational content current and relevant. Better data-driven decisions and resource allocation lead to higher-quality, more relevant education as a result of this streamlined curriculum development process.

Interactive and Learning Games

Artificial intelligence may improve educational games by creating more interesting ways to learn. It can come up with interesting plots, change stories depending on how the user interacts with them, and provide personalised insights by using AI algorithms, NLP, and ML. Students are motivated to study more actively, creatively, and reflectively with this method. To encourage active learning, problem-solving abilities, and teamwork, learning systems powered by generative AI for games incorporate simulations, virtual worlds, challenges, and more.

Personalized Learning

There is a wide range of student talents and preferences when it comes to studying in a conventional classroom setting. Nevertheless, in order to address these variations more efficiently, the traditional method is frequently required. Here is where the practical use of AI in distance learning courses really shines. Educational systems may now provide each student with a unique learning experience by utilising AI. Incorporating technology such as machine learning further lessens the cognitive burden on students by allowing the system to adapt to their unique methods of understanding things.

By providing AI-enhanced learning activities, personalised educational programs, and other characteristics that are specific to each student, AI in education seeks to meet their unique needs. Students are more likely to be engaged and achieve better learning outcomes when they get materials that are tailored to their individual learning styles. To take this personalised approach to the next level, academic support platforms that offer dissertation aid online may be accessed by graduate students and researchers. These platforms provide professional assistance that is specifically customised to each student's study goals and research concerns.



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Task Automation

Automation of educational tasks is made possible by AI-enhanced virtual classrooms. In addition to individualized instruction, AI can grade tests, compose research papers, manage reports, and even create presentations and notes. Through this connectivity, Edtech firms are able to optimize their operations, leading to increased productivity on a daily basis. Through the automation of mundane chores, AI creates an atmosphere that promotes learning efficiency and the acquisition of new information.

Smart Content Creation

Educators and academics rely on AI and ML to help them create innovative material that facilitates learning and teaching. Intelligent content generation driven by AI may be shown in the following examples:

- **Information Visualization:** Visual aspects, in addition to hands-on experiments, are necessary for conventional instruction. Online learning environments are being upgraded to more realistic ones with the help of AI-powered content development. Students are provided with a range of viewpoints to better their knowledge through the use of this technology, which allows for immersive 2D-3D visualizations.
- **Digital Lesson Generation:** Artificial intelligence (AI) in the classroom makes it easier to make digital lectures and study materials that are small and easy to save. Without causing the system to use up too much storage space, this guarantees that the curriculum is fully accessible. Additionally, these resources are compatible with any device, so remote learning is made easy.
- **Frequent Content Updates:** The usage of AI allows users to effortlessly update and maintain lesson content, guaranteeing that it remains relevant as time goes on. Users are also notified when new information is added, which helps them get ready for future tasks.

Proctoring

Oversight of online tests is greatly enhanced by AI, which substantially reduces instances of cheating and promotes impartiality. Educators are free to concentrate on the quality of assessments since it uses sophisticated monitoring and authentication methods to reduce their workload. Students benefit from a safe and fair testing environment, and the evaluation process is strengthened as a result. By cultivating an atmosphere of trust and academic honesty, this not only protects the validity of examinations but also improves educational results generally.

Language Learning

Artificial intelligence (AI) improves language acquisition by providing immediate, real-time comments on articulation, syntax, and vocabulary. Students are able to improve their language abilities through this interactive component because they receive fast feedback and suggestions,



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which enhances their learning experience. Artificial intelligence (AI) makes learning a new language more interesting and useful by mimicking natural conversational situations. It learns each student's unique learning style and adjusts its help accordingly. In general, AI completely transforms the way languages are taught, making it more engaging and approachable for students of all abilities.

Closing the Skill Gap

Businesses have a technological shortage, and one critical answer is to upskill students. Individuals and businesses alike may reap the benefits of AI and ML-powered software's ability to make skill acquisition more accessible and affordable for students. Taking this tack isn't just for the benefit of kids; it can also help businesses enhance their current workforce, increase employee motivation, and cultivate an innovation and improvement culture. Learning and Development (L&D) is also affected by AI in the classroom since the technology determines how humans learn best, tailors lessons to individual tastes, and automates repetitive tasks to make skill acquisition faster and easier.

Dyslexia Detection

Advanced technology is a useful tool for finding dyslexia in kids who have trouble reading and writing early on. These kids typically have trouble focusing and their eyes move in ways that aren't normal, including not following the normal left-to-right, top-to-bottom reading rhythm. Sensors included inside the display unit may be used to measure eye movements and gather and analyse data. You may then compare this data to huge datasets kept in a big data repository to quickly find out how much attention is lacking. This simplified method speeds up the diagnosis process, making it easier to get medical and therapeutic help faster. In comparison, manual observation might take months or even years.

Edutainment and Gamification

Edutainment and gamification are new ways to educate and learn that leverage AI to make engaging and interactive games and simulations that students love. Ai makes it easier for pupils to learn by adding game-like elements, such incentives and competition, to lessons. This makes students want to participate in their learning. These gamified teaching tools not only get students interested, but they also help them recall and understand hard information better. Gamification and AI-driven edutainment create a more interesting and useful learning environment by using interactive challenges and immersive games. This is in keeping with current educational trends that emphasise learning that is both fun and instructive.

Administrative Support

AI is changing the way administrative assistance works by making important duties easier for schools and other organisations. AI uses powerful algorithms to efficiently manage scheduling, optimise resource allocation, and make it easier for students to sign up for classes. Adding chatbots and virtual assistants to the mix makes the administrative effort much lighter by automatically handling common questions. This not only makes operations run more smoothly, but it also lets



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teachers and administrators focus on the more creative and strategic parts of their jobs. AI helps make schools more efficient and responsive by automating certain administrative tasks. This makes schools more effective overall.

VI. FUTURE OF AI IN EDUCATION

The future of AI in education seems good since technology is becoming better and people are starting to understand how AI can help people learn. Personalised learning is an important issue. It employs intelligent tutoring systems and adaptive learning systems to make each student's learning experience unique. These systems are made to meet the specific learning demands of each student, which improves their education.

AI will also change a lot about administrative jobs in education. Automated grading systems might be a huge help for instructors, especially in subjects that take a lot of time, like algebra and computer science. AI might make administrative tasks like enrolment, scheduling, and record-keeping easier, giving instructors more time to educate. Artificial intelligence (AI) might potentially make learning more interesting by employing gamified teaching tools and interactive materials to get students more involved.

AI can help teachers make sure that everyone is treated fairly and included. AI-powered professional development systems can help teachers keep learning by giving them personalised suggestions for training and resources. Teachers may utilise classroom management tools to keep track of how much students are participating and get helpful information. Assistive technology, such text-to-speech for students who can't see, speech-to-text programs for students who can't hear, and real-time language translation services, can help more diverse groups of students get an education. Even though AI has a lot of potential benefits, there are moral issues and problems that need to be dealt with right away before it can be used in the classroom. It's really important to make sure that AI systems don't treat people differently and provide every child an equal chance to accomplish well.

VII. CONCLUSION

Using AI in the classroom is changing the way teachers teach and students learn. It is automating chores that help teachers, getting students more involved, and making "smart" classrooms. More and more Indian classes are using AI. Platforms, schools, and the government are all taking part in this. Researchers have looked into its benefits, such as being able to customize it and having it available all the time. We also know that there are problems, such worries about privacy and a lack of emotional support. To move forward, there must be harmony. Machine learning should not replace human instruction, but it should help it. AI might change education in India for the better if it is used fairly and with good access.

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