

Artificial intelligent based teaching and learning approaches: A comprehensive review

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ABSTRACT

The goal of this study is to investigate the potential effects that artificial intelligence (AI) could have on education. The narrative and framework for investigating AI that emerged from the preliminary research served as the basis for the study's emphasis, which was narrowed down to the use of AI and its effects on administration, instruction, and student learning. According to the findings, artificial intelligence has seen widespread adoption and use in education, particularly by educational institutions and in various contexts and applications. The development of AI began with computers and technologies related to computers; it then progressed to web-based and online intelligent education systems; and finally, it applied embedded computer systems in conjunction with other technologies, humanoid robots, and web-based chatbots to execute instructor tasks and functions either independently or in partnership with instructors. By utilizing these platforms, educators have been able to accomplish a variety of administrative tasks. In addition, because the systems rely on machine learning and flexibility, the curriculum and content have been modified to match the needs of students. This has led to improved learning outcomes in the form of higher uptake and retention rates.

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1. INTRODUCTION

Because of advancements in technology, many industries are transforming to meet the needs of a diverse array of professions, including both civilian and military applications [1]. The internet and mobile phones are related technologies that considerably impact our daily lives [2]. There is a vigorous argument among psychologists, educators, and parents regarding the appropriate amount of screen time children should have. Another fast-spreading innovation can profoundly revolutionize the educational system.

The term "artificial intelligence" (AI) refers to a well-known technology or field of study. Some science fiction authors and novelists predicted the meteoric rise to fame that it would one day achieve in the past. Technology is here to stay and is causing changes all over the place, although things have not yet gone exactly as planned. It is not very often that a piece of technology is developed that can be applied across a wide range of fields, including education [3], [4].

Between 2017 and 2021, there will be a 47.5% growth in the use of artificial intelligence in education in the United States [5]. Current projections indicate that this growth will take place. A survey conducted on the market for artificial intelligence within the education sector of the United States found this

to be accurate. Even though many professionals in the field of education believe that technology will not eliminate the need for teachers, they acknowledge that it will impact how teachers carry out their responsibilities and the educational methods that are advised. It is more than just modifying how teachers carry out their responsibilities. In addition to this, it is altering how pupils are educated. This expansion is taking place in countries other merely the United States. According to the market research engine [6], the application of AI in educational settings is expected to increase on a global scale at a rate of 45% yearly, reaching \$5.80 billion by 2025.

This study aimed to evaluate the applications of artificial intelligence (AI) and investigate how AI has influenced the administrative, instructional, and learning aspects of educational settings. AI in education first manifested itself in computers and other computer-related systems, but it has since progressed into web-based and online learning platforms. Due to the development of embedded systems, it is now feasible to employ robots or humanoid robots as teacher coworkers or independent instructors. Additionally, chatbots may now be programmed to assume teacher- or instructor-like tasks. The utilization of various platforms and technologies has increased educators' efficacy and efficiency, resulting in a more robust or superior level of instructional quality. AI has improved students' learning experiences by making it possible to customize and personalize educational materials based on the requirements of individual students and their unique talents. The field of education has been significantly influenced by AI, particularly in administration, instruction, and learning within the educational system as a whole or inside specialized educational institutions.

The educational system is highly reliant on methods that have now become obsolete. Even if there are knowledge gaps in the existing grading systems, an injection of AI techniques and technologies can usher in a new era of automation. The application of AI in educational settings is anticipated to generate revenue of \$3.68 billion by 2023, as reported by *marketsandmarkets.com*, representing a compound annual growth rate (CAGR) of 47% between the years 2018 and 2023 [7]. Educators should consider building a digital transformation for their field that incorporates the appropriate AI technologies and produces the desired results. Let's look at some of the most critical applications of AI in the educational sector [8].

It can be challenging to ensure that all children, regardless of their geography or race, receive an education of the same high quality. On the other hand, technology powered by AI has the potential to drastically reduce the distance that separates students from their teachers, peers, and other educators. AI technology enables the collection of intelligent data, the creation of individualized schedules, the creation of one-of-a-kind jobs, and access to educational resources around the clock. They can also develop language translations, subtitles, and many plug-and-play apps that may be spread throughout different locations to foster universal learning and tear down barriers between outmoded and ineffective educational techniques [9]. With the capacity to incorporate the cloud, AI-powered systems can analyze large volumes of data in real-time. This enables any firm with branches worldwide to carry out swift administrative, testing, and instructional duties in a standardized manner across all of their locations.

To eliminate the need for manual administrative tasks in educational institutions such as scheduling, rescheduling classes, marking attendance, grading papers, finance and accounting, and record-keeping [10]. This frees the employee from having to complete the monotonous, routine tasks that had been required of them. Artificial intelligent systems can assist with a wide variety of tasks, including the following: i) Eliminating truancy warnings; ii) Automatically send report cards and other correspondence to parents; iii) Schedule and plan meetings; iv) Send normal student forms, enrollments, and other documentation to the appropriate department via automation; v) Reduce the amount of time spent on progress reports; and vi) Make any other record-keeping chores more efficient. This may free up professors and teachers to focus on enhancing the quality of education rather than reducing the burden of laborious paperwork and easing the stress of their jobs.

After gathering essential data on metrics for scoring assignments from papers that teachers or professors have graded, AI-powered grading software will employ machine learning to construct calculating systems [11]. These metrics will be derived from the papers themselves. These technologies are designed to comprehend and simulate the human process of grading students that teachers carry out. Essays, papers, and tests can be promptly assessed in various languages using the input of professors and artificial intelligence. It is possible for them to swiftly incorporate them into an already existing cloud-based platform or virtual environment. They are helpful in situations where there are many papers to grade, allowing teachers to focus on other vital duties rather than spending time grading the papers.

Voice assistants are an engaging and helpful tool that may benefit users in various ways while bringing education into the home. The use of voice assistants in educational settings has several benefits, including the following [12]: i) Efficient time saving for students and teachers; ii) Community learning opportunities; iii) Personalized instruction in seconds. Voice assistants powered by artificial intelligence can be utilized within mobile applications even if the user does not own a smart speaker.

AI systems play a critical part in the educational process by creating individualized study plans and adjusting course content to meet the requirements of each student. They identify areas in which students' knowledge could be improved and provide educational materials, evaluation tools, and feedback systems for students of all ages, from preschool to college. Students can study at their own pace if they use software powered by AI, games, and tools that can design a strategy for people to learn at their own pace, time, and requirements for repetitive repetition. This machine-assisted classroom setting can considerably enhance diversified and adaptive learning, offering all students a firm foundation [13]. It can also help teachers create unique lesson plans based on the needs of individual students.

The term "smart content" can refer to a wide variety of mediums, such as digital textbooks, manuals, instructional snippets, and films, as well as AI systems that construct personalized settings for educational institutions based on the strategies and goals of those institutions. Finding areas in which artificial intelligence tools might be helpful is one way to actualize education's personalization, which is currently a global trend. For example, educational institutions can develop augmented reality (AR)/virtual reality (VR)-based learning environments that are complemented by web-based instruction [14]. Technologies for AI Monitoring and Evaluation can simplify content for various learning styles and mix up learning curves and speed. AI and machine learning algorithms can identify areas of the curriculum that can be improved to close the gaps in inaccurate or ineffective knowledge and support teachers in resolving them when a substantial percentage of students provide incorrect responses. This helps teachers close the gaps in inaccurate or ineffective knowledge more quickly.

Tutoring programs based on artificial intelligence, often known as intelligent tutoring systems (ITS), can manage tailored feedback and instructions for one-on-one education [15]. However, because they need more intelligence to learn in the same way humans can, they will never be able to take the position of teachers. They are helpful when human instructors are not accessible to teach and evaluate short lessons that may be done online and can be taught by the computer. In e-learning environments, it may be utilized to instruct various courses, including linguistics, geography, circuitry, medical diagnostics, computer programming, mathematics, physics, genetics, and chemistry, amongst others. They are developed with engagement, grading standards, and comprehension in mind while they are being made.

Students can connect directly to their mobile devices or laptops using virtual reality technologies, allowing them to interact with content. An immersive learning experience can be enhanced with the use of virtual learning environments, which can also provide educational experiences for groups of students and student counseling services. Virtual reality headsets can help kids who have attention deficit hyperactivity disorder (ADHD) by eliminating distractions and increasing their ability to focus [16]. Learners can also benefit from interactive virtual simulations concerning the coaching of soft skills, the development of life skills, and personal growth.

The remaining parts of this work are structured as described. The background of AI and its technical applications in education are discussed in section 3, which demonstrates the various technical components that can be utilized in teaching. The many applications of AI in educational settings, such as teaching, learning, and administrative tasks, and discussions of their effects, are presented in sections 3, 4, and 5, respectively. In section 6, conclusions and further research are discussed.

2. AI BACKGROUNDS AND TECHNICAL ASPECTS IN EDUCATION

2.1. The background of AI and approaches in education

The term "artificial intelligence" (AI) is widely used in connection with computers. A comparison of the numerous articles reveals a tendency away from the computer alone, the hardware and software, or the equipment, as artificial intelligence. This is true even though computers may have served as the foundation for the development of artificial intelligence. It is now much simpler to include artificial intelligence in machines and other things, such as robots and buildings, due to the proliferation of embedded computers, sensors, and other developing technologies [17]. The research presents two distinct definitions and accounts of AI. They distinguish between AI as a theory and a field when defining it. According to their definition, AI is a subfield of computer science that aims to solve various cognitive difficulties commonly associated with human intellect. These tasks include learning, comprehending problems, identifying patterns, and adapting [18]. In the article, AI was defined as a theoretical framework for directing the creation and application of computer systems with intelligence and the capacity to carry out activities that demand human intellect, such as speech recognition, visual perception, language translation, and decision-making.

The definitions of AI proposed by numerous experts and in other studies highlight nearly comparable characteristics or qualities of AI. Other studies have also looked at this topic. AI is defined by Verma *et al.* as "machines that can resemble human reasoning" [19]. In a manner parallel to this, it was mentioned that the creation of AI required several decades of research and development. System designers, data scientists, product designers, statisticians, linguists, cognitive scientists, psychologists, education

experts, and many other professionals worked together to develop education systems that possessed some level of intelligence and could carry out a variety of tasks, such as supporting teachers and students [20]. According to the author, artificial intelligence is founded on enhanced software and programming skills, such as algorithmic machine learning, which enables computers to carry out a variety of jobs that need intelligence equivalent to that of humans and environmental adaptability [21]. A similar set of observations was made about artificial intelligence, which may be described as the ability of a machine or computer to imitate human intellect and conduct [22].

According to these requirements and descriptions, artificial intelligence is imbuing computers with intelligence and the potential to engage in human-like behaviors, such as cognition, learning, decision-making, and environment adaptation. As a result, some features and principles are vital for AI. This definition and analysis of AI lead to the conclusion that intelligence, or the potential of a machine to demonstrate some level of intellect and perform a variety of activities that need human-like abilities, is a crucial component of AI.

Artificial intelligence and machine learning have recently received much attention for mobile devices to improve computing quality and enable new applications like face unlocking, speech recognition, natural language translation, and virtual reality. However, machine learning needs a lot of computer power to do complex training and learning. Some systems that are effective at computation have been created to solve this issue. Qualcomm introduced the Snapdragon Neural Processing Engine in 2016 to aid GPU processors in accelerating the execution of neural networks. HiSilicon suggested the HiAI platform for running neural networks. To efficiently execute machine learning models on portable devices, the Android Neural Networks application programming interface (API) was developed [23]. This API offers mobile consumers much value by reducing network complexity and latency. Mobile learning networks for AI are well-developed and include SqueezeNet, MobileNet, and ShuffleNet [24]. Thanks to the advancement of AI technology in mobile devices, mobile education has reached a new level. This technology provides ease by rapidly assisting students and enabling interactive and personalized learning. Because AI can link students to the virtual classroom, virtual reality, for example, enables the learning process to extend outside of the learning environment to establish a global classroom. Additionally, AI-powered chatbots deliver individualized online education and translate teacher interactions into chat conversations. With this technology's aid, students' comprehension levels can be assessed.

2.2. Technical aspects in education

Table 1 demonstrates numerous scenarios in which AI methods might help the educational industry. Intelligent teaching, cutting-edge virtual learning, and data analysis and prediction are a few examples of AI-assisted education. Table 1 lists the most important uses of AI in education and supporting technologies. It is crucial to remember that AI-enabled education is becoming more crucial as learning requirements increase [25]. Teachers and students receive timely, tailored training and feedback from intelligent educational systems. To boost the value and efficacy of learning, they mostly use machine learning-related technologies [26], closely tied to statistical models and cognitive learning theory.

Table 1. AI techniques with scenarios in teaching and learning

No	AI education scenarios	AI possible techniques
1	Intelligent schools	Virtual labs; A/R; V/R; hearing and sensing technologies;
2	Online and mobility of remote education	Virtual personalized assistants; Edge computing; Real-time analysis;
3	Personalized intelligent teaching	Intelligent teaching systems; Data mining or Bayesian knowledge interference; Learning analytics;
4	Grading and evaluation	Computer vision; Image recognition; Prediction systems;
5	Students and Schools assessment	Academic analytics; Adaptive learning methods; Personalized learning approaches;
6	Building curriculums	Big data analysis; Clustering algorithms; Machine Learning or Deep Learning technology;

In AI systems, several strategies for learning analysis, recommendation, knowledge understanding, and acquisition are included [27]. These strategies are based on machine learning, data mining, and knowledge models. An AI education system comprises teaching content, data, and intelligent algorithms. This system is divided into two parts: the system model (which includes the learner model, teaching model, and knowledge model) and intelligent technology [28]. As shown in Figure 1, a model's contribution to creating a data map, which builds structures and association rules for the acquired education data [29], is essential for enhancing the amount of learning that occurs. The model operates as the AI system's central processing unit (CPU), while several technologies provide the system with its driving force.

Improving the learner model utilized in AI learning systems is necessary to expand autonomous learning capabilities. The information gathered regarding the conduct of students while they were engaged in the learning process is used to determine it. The ideas and capabilities of the learners are evaluated so that their learning capacities can be determined. Following this, the knowledge analysis findings are mapped to determine the level of knowledge mastery possessed by the learners. Learner modeling establishes linkages between learning goals and various components, such as instructional styles, learning resources, and technologies [30]. The knowledge model generates a knowledge structure map with specific learning components. These learning components usually include technical information and guidance to avoid common errors and misunderstandings [31]. The teaching model is responsible for determining the rules of the knowledge field. This model, a combination of the learner and the knowledge field models, allows instructors to customize their lessons.

Students are more likely to exhibit positive behaviors, take action, or seek support as they go through their schooling. Artificial intelligence systems can always rely on the built-in teaching ideas provided by the tutoring model. The user interface provides feedback and explanations regarding the learners' performance using various input mediums, including speech, typing, and clicking (texts, figures, cartoons, and agencies). The enhanced human-machine interface will be able to do AI-related activities such as natural language interaction, speech recognition, and emotion detection in the future.

2.2.1. Machine learning

The basis of machine learning is the process of parsing, which generates meaningful patterns and ordered data based on a sample of data called "training data". By generating recommendations, machine learning can assist students in selecting classes and universities, for instance. Using data on student accomplishments, aspirations, and preferences, it "matches" students to institutions where they can flourish the greatest. Moreover, this technology can assist teachers in comprehending how students assimilate each concept [32]. In response to cumulative student performance data, teachers might change their teaching tactics to assist students in the better comprehending course material. For example, picture recognition and machine learning predictions can be used to grade student examinations and homework more quickly and accurately than humans. Deep learning, a machine learning subfield, has recently attracted much media interest. The most common techniques are decision tree learning, inductive logic programming, clustering, reinforcement learning, and Bayesian networks. Deep learning emphasizes the learning of successive layers that create progressively meaningful representations from a technological standpoint. These layer features are extracted using neural networks, which are arranged in literal layers piled on top of one another.

2.2.2. Learning analytics

Learning analytics focuses on data obtained from student attributes and knowledge objects derived from the learner model and the knowledge field model. Learning analytics is a concept that applies newly developed technology, specifically machine learning, to a field traditionally considered non-technical, such as education. The objective is to modify educational practices so that they are better suited to the capabilities and requirements of particular students. This may involve intervening with students who are at risk or providing feedback and instructional content [33]. Machine learning, data visualization, learning sciences, and semantics are implemented here. For instance, AI-based competency learning can successfully detect insights about students and foresee the critical competencies they can pursue, enabling institutions to take preventative action. The field of learning analytics uses the varied learning capabilities of AI and competency-based education. If students drop out of school, AI might consider many aspects before labeling prospective students as likely to drop out. This would provide schools with early warning systems and data that they could use. The next stage for learning analytics is to widen its reach to encompass, among other things, interpersonal skills, the arts, and literature. This will bring an entirely new degree of complexity to measuring and analyzing learning outcomes and competencies. Learning analytics are in a catch-22 situation because they need to be specialized enough to be used in specific learning contexts while still being general enough to be used in various educational settings and classes. The application of learning analytics, which uses innovative methods to assist students, teachers, administrators, and institutions in their respective learning processes, will become increasingly widespread.

2.2.3. Data mining

Educational data mining aims to give students automated, organized answers. AI-based educational data mining aims to make rules of natural association and give students knowledge that fits their needs. For example, a small number of writing assignments can be used to evaluate students' grades and demographic information [34]. This can be done with machine learning regression, which can also be used to predict how a student will do in the future. Data mining is also becoming a meaningful way to improve how we learn and how much we know. It helps us learn more about learning settings and students.

The technique of retrieving hidden knowledge by pattern recognition and predictive modeling, or to put it another way, is known as data mining. It enables educators to modify curriculum creation in educational institutions. The ability of data mining-based AI to achieve individualized learning from knowledge field data, allowing students to learn at their own pace and choose their preferred learning style with the help of AI, is one of the essential uses. With personalized learning, students choose the subjects that interest them, and teachers modify their pedagogical approaches to reflect the students' preferences [35]. AI can create its intelligence more precisely and with more dependable outcomes using data mining (e.g., via machine learning). Figure 1 shows the structure of the technology used in AI education. This structure creates a data map that shows the structures and rules for how educational data is linked.

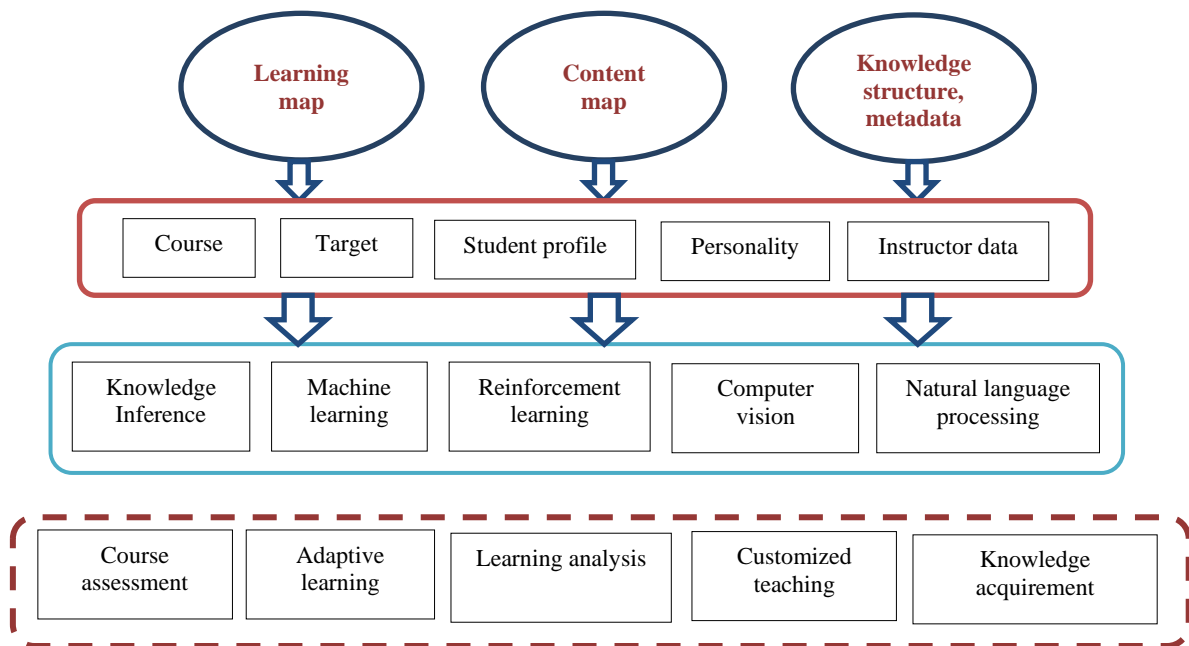


Figure 1. An illustration of the AI education technological structure

3. AI BASED TEACHING APPROACH

According to the research of the articles obtained and included in the analysis, teaching or instruction is one of the essential domains where AI systems have invaded. AI has contributed to the development and implementation of systems that are demonstrably effective educational tools [36]. As depicted in Figure 2, these technologies have led to an improvement in education quality. The image depicts several AI applications utilized by educators to perform their responsibilities. Numerous papers were examined to examine and highlight the many platforms and applications of AI as a teaching tool. This article explores various technologies, such as virtual reality, to communicate concepts to pupils or show information effectively. Various AI uses as pedagogical tools or instructional platforms, such as simulation-based instruction, are also explored. Other researchers have studied a similar concept of using virtual reality elements as an AI component in education. Several studies, for instance, highlight virtual reality, 3-D technology, and highly interactive simulation as teaching tools that facilitate student comprehension of the subject matter [37]. Similarly, the results suggest that AI is utilized in medical education through virtual reality and simulation, which educate medical students through practical aspects of their education, such as procedures and human anatomy, among other topics.

Other research has been done on how to put AI into machines or robots, as well as how to make powerful educational tools and improve the quality of teaching methods. Some research says that putting AI in education principles into robots and using robots as teacher assistants and colleagues, called cobots, is another important use of AI in education as a teaching tool. Cobots can be used to do basic and even advanced teaching tasks, like teaching students how to read and say words [38]. The study found that using AI in education, mainly as a teaching tool and in combination with other technologies, has led to the developing and using better teaching tools [39]. On the other hand, Pokrivcakova emphasizes making and using chatbots, which are online robots that can talk and have conversations, as well as putting AI into

computer programs. Chatbots can answer common questions from students and, in some cases, send out learning materials [40]. AI makes it possible for humanoids and other robots to think, make decisions, talk, and have conversations. This makes them useful as teaching and learning tools.

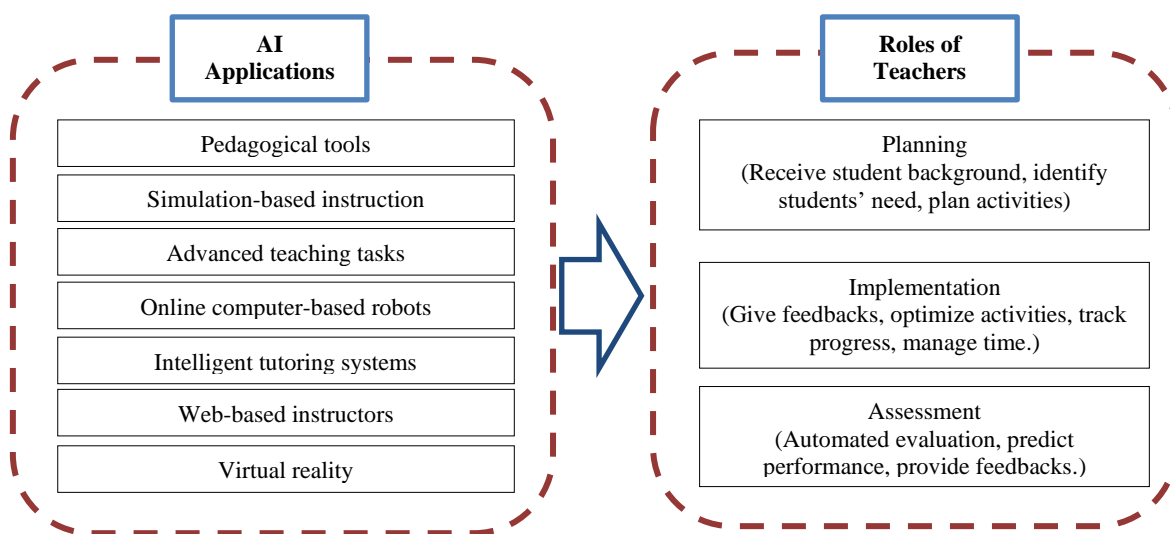


Figure 2. Contents of AI technologies to support teaching roles in educational areas

As a result of the article study, other ways AI can be used in education have been found. Intelligent tutoring systems, for example, are talked about in different ways in another research. For example, animated conversational agents like chatbots or robots, as well as intelligent tutoring systems (ITS) that can talk and have conversations, have helped make teaching more effective [41], [42]. Pokrivcakova's AI applications for education, such as computer-assisted language learning (CALL), which gives students or learners individualized instructions, and language learning writing and translation tools [42], all focus on the same topics. There are also talks about other ways AI can be used in education, especially when giving instructions on how to do a teacher or instructor's job. With the use of AI in web-based education, especially the use of AIWBES in teaching and the addition of teacher-like functions, the platform has become a powerful tool for helping teachers. This is looked at, especially the use of AIWBES in teaching and the addition of teacher-like functions, which makes the platform a powerful tool for helping teachers [43].

It is likely that discussions on IWBE, also known as intelligent and adaptive web-based systems, will take place to ensure that the technology used in education, web-based education, is an effective and methodical way to enhance the learner experience. In these discussions, teachers will be studied and presented as social agents in this system. After that, the system attempts to comprehend teachers and provide them with help so that they can fulfill their mandates and give students instructions and guidance [44]. It has been utilized either on its own as an independent educational tool or to assist teachers in the performance of their duties. Several different technologies and methods have been adapted to make use of AI.

3.1. Discussion of the impacts

Figure 2 depicts an additional component of education examined in this study: the usage of AI by teachers or in instruction. An examination of multiple studies indicates that educators are rapidly adopting and employing AI in various ways as a teaching tool or for educational purposes. The use of artificial intelligence (AI) in instruction or as a pedagogical aid has considerably impacted this facet of education. Numerous examined and studied investigations demonstrated that it had increased teachers' job effectiveness, efficiency, and caliber. In this context, effectiveness is measured by delivering relevant content following the curriculum and the learner's specific needs and abilities. Simultaneously, students evaluate the effectiveness and quality of the knowledge assimilation and retention of the pupils. Considering these operational definitions and descriptions of efficiency, quality, and effectiveness, the study's findings suggest that AI has contributed to achieving quality, effectiveness, and efficiency in education.

Thanks to AI, teaching has become more effective. Previous researchers [41] stated that using evidence-based or empirically supported methods, like the wide use of cognition and learning models [45], has ensured that students learn the most from the content and remember it best. Learner-centered systems like DeepTutor and AutoTutor encourage customization and personalized information based on the learner's skills

and needs. This makes the learning experience better for the learner and helps them reach their learning goals. Some more arguments show that AI has improved the quality and effectiveness of teaching because modern systems are technology-based adaptive systems. This means that the materials or information offered are based on the learners' needs, making for the best learning experience [46]. AI ensures that course content is delivered better, especially in online and web-based learning platforms. This starts with the planning of the curriculum and ends with the actual delivery of information or instructions.

The development and usage of AI, particularly its incorporation in online and web-based learning platforms, has improved education because AI has made it possible to construct and utilize better teaching tools for these platforms [47]. Other researched research lists the same benefits or boosts to learning. A study [48] addressed the significance of adaptive IWEBS and instructions based on observed and learned learner behavior. Due to the capacity to personalize the pedagogical strategies employed, these capabilities enable the platforms to improve the quality of learning and instructional efficacy. It has been demonstrated that computer-aided learning (CAL) and computer-based training (CBT) utilize a “put everything on the web” strategy. Unlike intelligent tutoring systems (ITS), which customizes, individualizes, and personalizes learning [49], they may not align with the student's learning objectives. It was noticed that AI significantly impacts education, notably enhancing instructional efficacy and efficiency. AI systems, particularly tutoring or instructional systems, were created to address the challenges inherent in one-on-one teacher-student tutoring, improving the overall quality of instructors' work [50].

Because of the analysis, more essential themes or ways that AI has changed the quality of teachers' work were found. Several studies [51]–[53] have shown that technology, especially artificial intelligence (AI), can help maintain academic integrity through tools like Grammarly, Turnitin, and White Smoke that check for plagiarism, proctor students, and keep an eye on how they act online. Other studies [54], [55] talked about gamification, which uses AI for educational purposes and significantly impacts instruction quality. Gamification is also a part of or uses virtual reality and 3-D technologies differently. These studies also talked about the benefits of simulation, team-viewer applications, and gamification, which are all closely related to VR and 3-D or even used to improve the effectiveness and efficiency of instruction. Other studies [56]–[59] have looked at how expressive humanoid robots with dialogue and conversational skills can improve the quality of instruction by getting students to interact with each other. This is because these robots have more human-like abilities and look like people.

4. AI BASED LEARNING APPROACH

Learning, an integral part of education, is another aspect of education that is included in the research. Artificial intelligence may help students learn more quickly and efficiently when combined with top-notch learning materials and instruction. Artificial intelligence (AI) technology can also help students get back on track more quickly by alerting teachers to problems that a human eye cannot see. Figure 3 illustrates the different ways that AI has been adopted, utilized, or exploited to help students' learning after reviewing and analyzing the numerous articles included in the study. There have also been discoveries of software or programs that employ AI to help student learning. Customizing and personalizing lessons and materials following students' needs, abilities, and talents is one of the most significant ways AI has been used to improve student learning [60]. An individual student's learning route is “adapted” in real-time by adaptive learning software using AI or machine learning techniques. There are various strategies to increase students' knowledge intake and retention, which is the cornerstone of learning [61], [62]. For instance, AI in education has removed national and international borders, allowing global access to learning through online and web-based platforms [63], [64].

The writings led to the discovery of numerous platforms and apps. Some platforms will promote content personalization and customization, enhancing learners' learning experiences by promoting information intake and retention. For instance, a program like Knewton gives students real-time suggestions based on learning styles identified by machine learning algorithms. Then it adapts the course materials or content to their requirements [65]. Other platforms with comparable features, such as Cerego, Immersive Reader, and CALL, can improve students' educational experiences at all levels, from kindergarten through undergraduate and graduate programs at universities [65], [66]. According to the authors, using chatbots and integrating AI enhances students' learning experiences since they use machine learning algorithms to deliver content customized to their unique learning needs and abilities [67]. The author also looks at how machine translation tools, adaptive educational systems, and intelligent tutoring systems are being used in education to help students. AI ensures that material is tailored and personalized to learners' needs and skills in various ways.

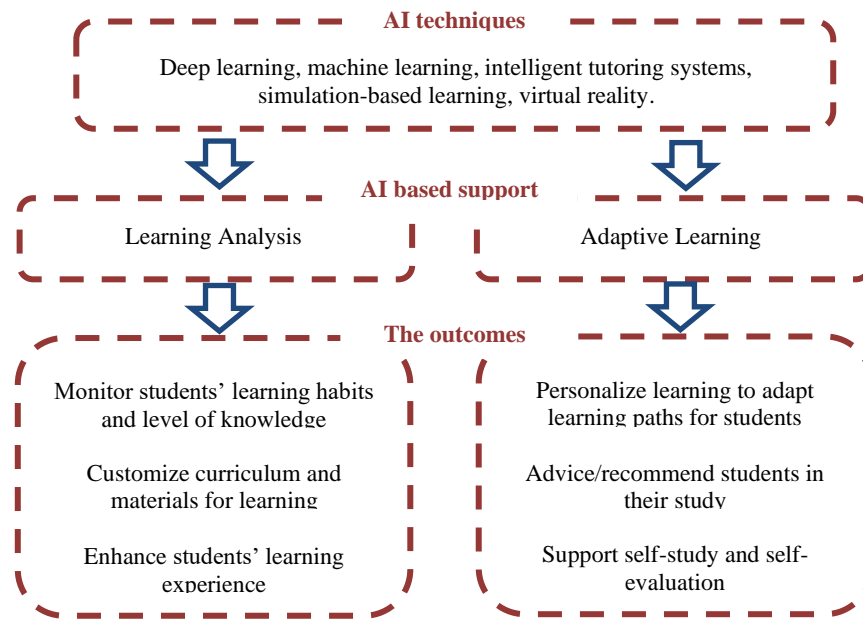


Figure 3. Contents of AI techniques to support learners

On the other hand, as earlier papers have shown, AI applications have been found to affect how learners learn significantly. Deep learning is a way to improve how students learn, and it has been shown that intelligent tutoring systems (ITS) and simulation-based learning can help with it [68]. Mitropoulos brings up the same idea when he says that simulation and virtual reality make learning better for students [69]. Using simulation, virtual reality, and other AI-based learning tools helps students prepare for the future and keep up with how AI is used in the business world [70]. AIWBES is another way that AI could help students learn more. AIWBES is more flexible and can make content that fits the learner's needs [71]. Interactive problem-solving, a part of AIWBES, will help students do these tasks by giving them help from people who know what they are doing at every step [72]. Online learning acknowledges and talks about the same AI skills. In IWBE or intelligent and adaptive web-based systems, especially multi-agent systems (MAS), the learner is included as a social agent. The system tries to figure out how the learner acts and responds by giving them information that meets their needs [73], [74]. AI has had a significant impact on other parts of education. However, the main goal of integrating, adopting, and using it in education has been to improve the learning experience for students.

4.1. Discussion of the impacts

The student's educational experiences are yet another aspect of education that is covered by the scope of this research and has been dramatically impacted by the incorporation and application of AI in educational settings. When discussing the influence that AI has on education, it facilitates deep learning because the conversational agents that are an essential part of the system will question and challenge students until they can successfully explain themselves in detail, including the reasoning that lies behind their stance [75]. This improves the amount of information the learner takes in and retains.

Several research shed light on the myriad ways that AI can assist students in their educational pursuits. With the assistance of AI, learning progress can be monitored, including knowledge and understanding, and the results are used to enhance the system's capacity to tailor information to the requirements and talents of the students, motivating them and making use of their unique skills to increase retention [76], [77]. For instance, Pokrivcakova asserts that artificial intelligence has made it possible to design and implement intelligent learning systems and adaptable content tailored to each student's learning needs and capabilities. One example of this would be intelligent virtual reality and its use in simulation teaching and learning, which has been shown to improve learning [78]. The pedagogical benefits of simulation and other technologies in a similar vein are also discussed in this article. It has been observed that simulation and other related technologies provide students with practical exposure and experiential learning, improving learning quality. The researchers in this article reviewed studies that highlighted the key benefits of virtual reality and three-dimensional technology in learning, such as usability, enjoyment, learner enthusiasm, motivation, and increased student interests [79].

Subsequent research focusing on web-based systems uncovered additional AI benefits and their impact on the quality of learning. Kahraman noticed, for instance, that crucial AIWBES concepts or aspects, such as adaptive hypermedia, information filtering, class monitoring, and collaborative learning, promote student engagement, interactions, and learning [80]. Previous research who highlighted the link between AIWBE and improved learning quality, emphasized the benefits of web-based platforms because the system adapts and customizes instructions and information to detect and assess learner behaviors. StudentTracker middleware, for example, will utilize online data about the learner, such as completed activities, learning tracking, time, and other factors, to design pedagogical tactics for the AIWBE [81]. Two further benefits of web-based platforms that have been found to facilitate learning are their affordability and their capacity to expand worldwide access to education [82]. These platforms have enhanced the learning experience overall.

Another study has emphasized the advantages of AI for learning and how it affects learning [83]. For instance, AI has been applied to improve learning through writing and revision tools like Turnitin and Pearson's Write-to-Learn tools [84], [85]. On the other side, many studies have highlighted AI's potential harm or negative consequences on learning. A study discovered that AI might promote dishonesty and compromise academic integrity by making it easier for students to use paper mills and paper-churning websites or platforms [86]. However, as shown by several earlier studies, the benefits of AI for learning generally outweigh the disadvantages [87].

5. AI BASED EDUCATIONAL MANAGEMENT

This section presents an overview of the study on the use of artificial intelligence in education, focusing on administrative chores. Completing multiple administrative duties in the educational process, such as evaluating student assignments and papers, grading them, and providing students with feedback, is one of the main areas of education that AI is projected to impact. According to a study [88], the application of AI in education has enhanced productivity in institutional and administrative operations, particularly for online learning at a distance. Specific tools, such as Knewton, enable teachers to provide feedback to students based on how they utilize the program. Other studies and publications that analyze administrative support systems follow similar perspectives.

For example, intelligent tutoring systems (ITSs) have been proposed to perform diverse functions, such as grading and providing students with feedback on their work [89]. In addition to their significant responsibilities, which include directing and instructing students to ensure their academic success, instructors who collaborate with ITS are more efficient in various administrative activities. The research by Mikropoulos and Natsis validates the findings and conclusions of these investigations; the utilization and application of AI in education have boosted the efficacy and efficiency of administrative duties such as grading student work [89]. A study of the current online learning environment reveals systems such as Turnitin and Ecree, which provide suggestive grading, verify student work for plagiarism, and enable instructors to carry out other administrative tasks. Several administrative tasks that would have taken considerable time to complete without AI are now performed more efficiently.

5.1. Discussion of the impacts

The utilization of artificial intelligence (AI) in different forms and for diverse purposes has had a considerable impact on how administrative and management activities are implemented in education. It has made administrative tasks easier, such as grading assignments and giving students comments to lecturers or instructors. The grading aid elements in the AIWBE applications make it easier for instructors to assess and remark on students' work [90]. On websites like Knewton, which enable teachers to assess student work, grade it, and provide feedback on enhancing learning progress, similar tools and capabilities are accessible. AI has improved administrative procedures and enhanced teachers' and instructors' ability to instruct and guide students. Teachers can use the many features of intelligent tutoring systems to perform administrative duties, such as grading and giving feedback [91].

Other AI-powered apps give teachers the tools they need to do various administrative tasks, like finding plagiarism, grading papers, and giving students feedback on where they can improve. Apps like Grammarly, Ecree, PaperRater, and Turnitin are examples of these apps. AI has made a big difference in how much paperwork and work teachers have to do, especially when it comes to administrative tasks. This lets them focus on their primary job, which is to teach and spread information in line with the institution's or country's curriculum [92]. Even though this area of education wasn't the main focus of many of the articles that were looked at, the ones that were looked at showed signs of improvement in the quality of administrative tasks and processes as well as the instructors' or educators' efficiency and productivity in doing different administrative tasks.

6. CONCLUSION

This study aimed to determine how artificial intelligence will impact schooling. A literature review served as a qualitative investigation's research plan and method. To accomplish the purpose of the study, journal papers, professional publications, and conference reports from experts were selected and analyzed. Due to the invention and extensive usage of computers and computer-related technology, artificial intelligence (AI) was developed and is now utilized in numerous industries. It has been demonstrated that the use of artificial intelligence, which has been shown to have a significant impact on the industries in which it is employed, was made possible in part by the development of personal computers and subsequent advancements that have increased processing and computing capabilities. AI has been widely embraced and utilized in the education sector, notably in the educational institutions examined in this study. There are numerous possible applications of AI in education technology domains. Curriculum development in certain subjects necessitates AI analysis of comprehension challenges, teacher backgrounds, and school teaching infrastructures. AI approaches also assist teachers, students, and administrators with their study and teaching strategies. Field researchers may encounter several difficulties due to the emergence of new problems.

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