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Artificial Intelligence on Education

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ABSTRACT :

This study's objective was to evaluate how artificial intelligence (AI) is affecting schooling. The study's focus was on the use of AI and its impacts in administration, instruction, and learning. It was built around a narrative and framework for evaluating AI that were discovered during early investigation. The study goal was successfully realised through the employment of a qualitative research approach that made use of the literature review as a research design and methodology. Computers, machines, and other artefacts now exhibit human-like intelligence that is characterised by cognitive capacities, learning, adaptability, and decision-making capabilities thanks to the field of research known as artificial intelligence and the inventions and developments that have followed. According to the study, AI has been widely adopted and employed in education, especially by educational institutions, in a variety of ways. In the beginning, artificial intelligence (AI) was represented by computers and computer-related technologies. It then evolved into web-based and online intelligent education systems, and finally, with the use of embedded computer systems and other technologies, humanoid robots and web-based chatbots were used to perform the duties and functions of instructors either alone or in collaboration with instructors. These platforms have helped teachers improve the quality of their instructional activities and carry out other administrative tasks, such as reviewing and grading students' assignments, more quickly and effectively.

Keywords: Education, Technological innovation, Learning (artificial intelligence), Microcomputers, Robots.

1. Introduction

Henry Ford used an analogy to show that innovation does not entail sticking to the status quo and finding new uses for established technologies, like speeding up horses. There are instances when it's vital to look outside the box and create novel approaches. Build a car instead of horses; it will move a person from point A to point B more quickly and be quicker than a horse. The tremendous advancements in technology throughout the years, especially in the field of education, have been propelled by these ideas and methods.

It is 1950. Dr. Potter, a tenured professor at a nearby institution, walks clumsily to a class while carrying a large stack of papers. After reading and evaluating the grammar and substance of every paper submitted by the forty students in his class, he has just finished marking all of the assignments. After reviewing a few of the papers, Dr. Potter believed that some of the text had been taken verbatim from other sources, but he was unable to determine where the student had done so. 2019 has come, and Dr. Potter scarcely has any papers with her when she enters a classroom. Nevertheless, she has reviewed, reported instances of plagiarism for disciplinary action, and graded papers for a much greater number of students.

Before the invention of computers and other associated technology, teachers and pupils either used mechanical means of education and learning, or they applied human labour alone. According to Flamm, the 1970s saw the debut of microcomputers and, subsequently, personal computers, which increased processing capability and signalled a significant shift to electronic computers for the general public [1]. Campbell-Kelly concurred, stating that the advancement of personal computers in the 1970s was a major factor in the growth of electronic computers in particular and their availability for use by many organisations in various economic sectors [2]. Utilising earlier studies on programmed instructions from the middle of the 20th century, advancements in computers and associated computing technologies led to the use of computers in various departments within educational institutions and in the education sector as well. One example of this is the creation of computer aided instruction and learning (CAI/L) in classroom interactions [3].

The education sector has seen an increase in the use of computers in various ways due to later developments in computers and computer-related technologies, such as networking, the internet, the world wide web, and increased processing, computing, and other capabilities, including task-oriented software packages and various programmes.

According to Coppin, artificial intelligence is the capacity of robots to cope with novel circumstances, solve issues, respond to inquiries, devise strategies, and carry out a variety of other tasks requiring a degree of intellect usually exhibited by people [4]. Whitby gave artificial intelligence

still another definition, defining it as the study of intelligent behaviour in humans, animals, and machines with the goal of engineering such behaviour into an artefact, like computers and computer-related technology [5].

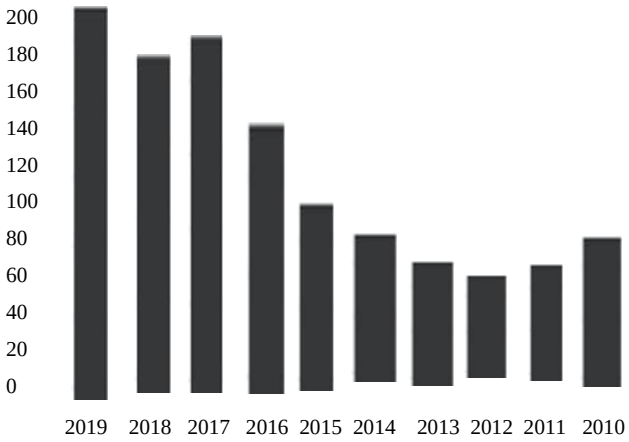
1.1 Artificial Intelligence in Current Education

When artificial intelligence is mentioned, a supercomputer comes to mind. These machines have enormous processing power and can exhibit adaptive behaviour by adding sensors and other features that give them cognitive and functional abilities similar to those of humans. In fact, these features even help supercomputers interact better with people. In fact, a number of films have been produced to demonstrate the potential of artificial intelligence. One such example is the management of temperature, air quality, and music in smart buildings based on the perceived moods of the building's residents. Artificial intelligence has found greater use in the field of education, extending beyond the traditional notion of AI as a supercomputer to encompass embedded computer systems.

For instance, artificial intelligence (AI), computers, and related hardware integrated with robots make it possible to develop robots that enhance student learning, starting with the most fundamental educational program—early childhood education. In fact, Timms proposed that cobots, or the use of robots in conjunction with instructors or colleague robots, are being used to teach kids basic skills like spelling and pronunciation while also adapting to the needs of the individual pupils [7]–[9]. Similar to this, web-based and online education has evolved, as reported in various studies, from simply providing students with online resources to download, study, and complete assignments in order to pass, to include intelligent and adaptive web-based systems that recognise learner and instructor behaviour and make appropriate adjustments to enhance the educational experience [6,], [11], [18], and [19]. Chassignol et al. claim that artificial intelligence has been integrated into teaching, learning, and administration in the field of education [11]. The focus of this study will be these domains, which Chassignol et al. describe as the framework for analysing and comprehending artificial intelligence in education.
Papers in Web of Science and Google Scholar in the last ten year with key words ‘‘AI’’ and ‘‘Education’’.

1.2 Purpose of the Study

It is certain that as long as information technology is applied or used, it will have an impact on education in various ways. This study aims to evaluate how various forms of AI use in education have affected or had an impact on various aspects of education. The study will specifically look at how AI has impacted the fields of education administration and management, teaching, and learning. The study's goal is to determine whether artificial intelligence (AI) has increased instructional and learning effectiveness in general and has made administrative duties in education more effective and efficient.



Numerous stakeholders in the education system will gain from this study. It will add to the expanding body of research on the various ways that artificial intelligence (AI) has impacted education, as well as the theory, knowledge, and empirical data that support these claims. By encouraging evidence-based decision-making and management and leadership practises in the sector, it will help academics, professionals, and policy makers, including administrators, management, and leadership of educational institutions and the education sector.

The results will complement those of other studies and guide government policies and initiatives meant to promote the beneficial application of information technology, especially artificial intelligence (AI), in the field of education. For instance, the government, working with educational institutions, can develop a policy, strategy, and initiatives that promote the positive impact or effects and mitigate the possible negative effects of

AI on education if it has a thorough understanding of the impact of AI on the education sector and has evaluated the precise nature of such impact, including improved instructional and learning effectiveness.

2.Literature Clustering

2.1 Materials and Methods

The goal of the study is to evaluate how AI will affect education. More specifically, it looks at several facets of education, such as administration, instruction, and learning, in order to determine how AI has impacted education. As a result, the study adopts a retrogressive methodology, which involves evaluating previously conducted studies and secondary data. In fact, Snyder proposed that a review of secondary data, or a systematic or semi-systematic literature review, offers a greater comprehension of the phenomenon under research [8].

Because only studies, including meta-analyses, that have been done on the subject matter support the identification, analysis, understanding, and synthesis of the ways in which AI has affected and impacted education, this approach guarantees that the study is premised on empirical or is evidence backed. To evaluate the various approaches, a qualitative study design that includes topic analysis and qualitative content is typically employed. The process of doing a comprehensive examination of every text and recognizing recurrent themes from a review of several texts is known as thematic and content analysis. These themes are then used to inform inferences and findings for descriptive research[10].

3.Search Strategy

EBSCOhost, ProQuest, and Web of Science are just a few of the databases that will be searched using key terms and search strings. Additionally, publications from various journals that have concentrated on examining the impact of AI on education are found by searching Google Scholar using the key terms and search strings. Following a search on Scimago for the journals containing the papers, the study includes the journals with an H-Index of 20 or higher. The more renowned a journal and its writers are, the higher the H-Index, which is a measure of scientific output at the author level based on publications and citations and, consequently, contribution to science and scholarly endeavors.

4.Sampling: Exclusion and Inclusion Criteria

Based on the previously indicated criteria—matching the search terms and search strings and publication in a journal with an H-Index of 20 or higher—a total of 250 articles published after 2009 were initially chosen. After a more thorough examination and analysis of these papers, which included the H-Index to help identify articles that addressed the nature of artificial intelligence and its effects on education, thetotal number of articles for analysis was reduced to thirty. This was deemed to be a sufficient sample size to support conclusions and inferences about the effects of AI on education that were drawn retroactively. Additionally, research that identified and evaluated the effects of artificial intelligence on education using a quantitative method while simultaneously being given preference and fulfilling the previously mentioned criteria.

4.1Artificial Intelligence in Education

Based on an analysis of the convergence of AI and education as covered by Chassignol et al., this study's focus will be on how AI affects the management and administration, instruction or teaching, and learning areas within the education sector. This report's section gives a summary of the study's findings and a brief discussion of them based on a review of numerous articles that have evaluated the nature and potential applications of artificial intelligence in the field of education.

4.2Nature of Artificial Intelligence

The term artificial intelligence (AI) is typically closely linked to computers. A review of the various articles, especially those pertaining to the education sector, makes it clear that while computers may have served as the foundation for the development of artificial intelligence, the concept of artificial intelligence is moving away from the computer itself and toward the hardware and software that make up the device. Artificial intelligence has been made easier to integrate into machines and other objects, like robots and buildings, thanks to embedded computers, sensors, and other cutting-edge technologies . In fact, Chassignol et al. give a dual definition and overview of artificial intelligence.

AI is described as both a theory and a field. According to their definition, artificial intelligence (AI) is a branch of computer science whose goals are to solve various cognitive issues that are frequently connected to human intelligence, like learning, problem-solving, and pattern recognition, and then adapting [11]. According to Chassignol et al., artificial intelligence (AI) is a theoretical framework that directs the creation and application of computer systems with human-like capabilities, particularly intelligence and the capacity to carry out tasks requiring human intelligence, such as speech recognition, visual perception, decision-making, and language translation.

The definition of AI given by other researchers and in other studies highlights a number of closely related aspects or features of AI. Artificial intelligence (AI) was defined by Sharma et al. as machines that can mimic human reasoning [13] (p.1). In a similar vein, Pokrivcakova defined and described artificial intelligence (AI) with reference to the field of education. She noted that AI is the outcome of decades of research and development involving the collaboration of system designers, data scientists, product designers, statisticians, linguists, cognitive scientists, psychologists, education experts, and many others to create educational systems with a certain degree of intelligence and functionality.

including to support educators and students in expanding their knowledge and adaptable skills for a world that is changing all the time [14] (p. 138). According to the author, artificial intelligence (AI) makes use of enhanced software and program capabilities, such as algorithmic machine learning, to enable machines to carry out a variety of tasks that call for human-like intelligence and the capacity to adjust to their immediate surroundings [14]. Similar findings are reported by Wartman et al., who described artificial intelligence as computers and other machines' capacity to mimic human thought processes and behavior. Generally speaking, artificial intelligence refers to the creation of machines with a certain degree of intelligence and the capacity to carry out humanlike tasks like cognition, learning, decision-making, and environmental adaptation. As a result, certain traits and principles emerge as crucial for artificial intelligence. From this definition and discussion, intelligence—the machine's capacity to exhibit some degree of intelligence and carry out a variety of tasks requiring human-like abilities—emerges as a crucial aspect of artificial intelligence (AI).

These days, a lot of research is being done on applying artificial intelligence (AI) and machine learning to mobile devices. The goal is to improve the quality of computation and open up new application possibilities, like virtual reality, speech recognition, face unlocking, and natural language translation.

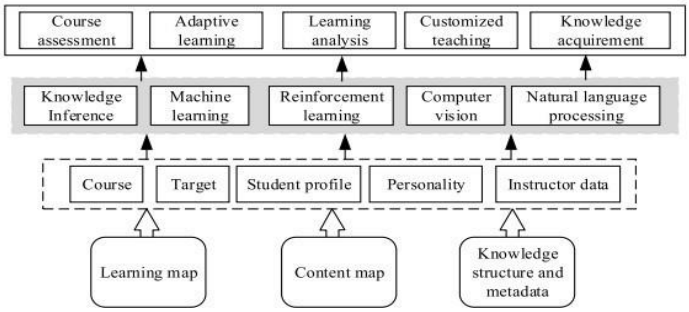
However, complex training and learning in machine learning require enormous computational power. A few platforms for effective computational operation were suggested as a solution to this problem. With their GPU processors, Qualcomm accelerated the execution of neural networks in 2016 with the release of the Snapdragon Neural Processing Engine. The HiAI neural network operating platform was proposed by HiSilicon. It should be emphasized that the Android Neural Networks API was created with speedy mobile machine learning model execution in mind.

This API reduces network latency and complexity, which is very useful for mobile devices. SqueezeNet, MobileNet, and Shufflenet are well-developed learning networks related to artificial intelligence for mobile devices [38]. The advancement of artificial intelligence in mobile devices has raised the bar for mobile education, enabling more interactive and personalized learning while saving students time and effort. For example, since AI can connect students to the virtual classroom, virtual reality makes learning easier to do outside of the classroom, creating a global classroom. AI-based chatbots also offer individualized online instruction and convert lecturers into chat hosts. The level of understanding of the pupils can be evaluated by this technology.

4.3 Technical Aspects of Ai in Education

Intelligent education, creative virtual learning, and data analysis and prediction are all examples of AI- aided education. Table 1 lists the main uses of AI in education along with the essential technologies that enable them. Keep in mind that as learning requirements increase, AI-enabled education is becoming more and more important [12]. Both teachers and students can receive timely, individualized instruction and feedback from intelligent education systems. They are made to increase the effectiveness and value of learning through a variety of computing technologies, particularly those connected to machine learning [18], which are intimately associated with the statistical model and cognitive learning theory.

Scenarios of AI education	AI-related techniques
Assessment of students and schools	Adaptive learning method and personalized learning approach, academic analytics
Grading and evaluation of paper and exams	Image recognition, computer-vision, prediction system
Personalized intelligent teaching	Data mining or Bayesin knowledge interference, intelligent teaching systems, learning analytics
Smart school	Face recognition, speech recognition, virtual labs, A/R, V/R, hearing and sensing technologies
Online and mobile remote education	Edge computing, virtual personalized assistants, real-time analysis



Technological structure of AI education

AI systems use a variety of approaches based on machine learning, data mining, and knowledge models for learning analysis, recommendation, and knowledge acquisition [39]. The components of an AI education system typically include intelligent algorithms, data, and teaching materials. These can be further subdivided into two categories: intelligent technologies and system models, which include learner, teaching, and knowledge models [43]. Model assistance in creating a data map, as illustrated in Fig. 2, is essential for enhancing learning since it creates associations and structures for the educational data that is gathered [44]. AI systems use models as their central component, with technologies supplying the system's power.

4.2.1AI Education Model

The learner model in an AI learning system is essential to enhancing autonomous learning capacities. It is developed using learner behavior data that is produced during the learning process. To evaluate students' learning capacities, analysis of their thinking and abilities is done. To ascertain learners' mastery of the material, knowledge analysis is then mapped. Learner modeling creates links between learning outcomes and a range of elements, such as resources, learning materials, and instructional strategies [39]. A knowledge model creates a knowledge structure map that includes comprehensive learning contents, typically consisting of expert knowledge, guidelines for common mistakes made by students, and misunderstandings.

By fusing the learner and knowledge field models, the teaching model establishes the conditions for accessing the knowledge field, allowing teachers to customize their lesson plans and methods. As learning progresses, students are more likely to act, behave well, or ask for assistance. The integrated teaching theories of the tutoring model enable the AI system to be ready to assist at all times. The user interface produces output (texts, figures, cartoons, and agencies) and explains the performance of the learners using a variety of input media (voice, typing, and click). AI-related features such as speech recognition, natural language interaction, and emotion detection for learners are provided by the sophisticated human-machine interface.

5 Intelligent Education Technologies

Technologies for education that are closely related are machine learning, learning analytics, and data mining. Currently, learning analytics and educational data mining have given rise to two distinct communities. They benefit from a multitude of disciplines, including machine learning, data mining, statistical psychometrics, and data modeling, and they overlap in their goals and methods [41]. The domain of learning analytics is primarily concerned with large-scale test results and learning content management systems. The field of data mining emerged from the intelligent tutoring systems community, which focuses on very small-scale cognitive processes.

6 Machine Learning

Knowledge discovery, or the process of parsing based on a sample data set called "training data," is the fundamental component of machine learning. It produces meaningful patterns and organized knowledge. For instance, machine learning can assist in developing suggestions for students as they

pick courses and even universities. It uses student preferences, aspirations, and accomplishment data to "match-make" them with institutions where they can grow to their full potential. Additionally, teachers can use this technology to better understand how each concept is being absorbed by their students [42]. By using students' cumulative records, instructors can modify their teaching strategies to better suit their needs and potentially improve the way that students understand the material.

Particularly for student assessment, machine learning's image recognition and prediction capabilities can be used to grade assignments and tests more quickly and accurately than a human could. It should be mentioned that the machine learning subfield of deep learning is very popular. Among the frequently employed methods are Bayesian networks, decision tree learning, inductive logic programming, clustering, and reinforcement learning. Deep learning, as seen through the lens of technique, places emphasis on learning successive layers to produce increasingly meaningful representations. Neural networks, which are structured as literal layers stacked on top of one another, are the models used to extract these layer features.

6.2 Learning Analytics

The focus of learning analytics is on data derived from learner and knowledge field models, as
well as attributes of the students. The idea behind learning analytics is the application of new technology, specifically machine learning, to non-technical fields like education. The goal is to modify teaching strategies to fit the needs and aptitude of each individual student, such as helping at-risk students or offering feedback and course materials [40]. It employs methods from the fields of semantics, learning sciences, data visualization, and machine learning. Institutions can take proactive measures by using AI- based competency learning, for example, which produces vital data from students and can efficiently gain insights into them as well as forecast the critical competencies they can pursue.
Apart from competency-based learning, learning analytics leverage AI's versatile learning capabilities. In order to classify incoming students in terms of their likelihood of dropping out, AI can take into account a variety of factors, producing early warning systems and useful data for the institutions. The next challenge for learning analytics is to step outside of its comfort zone and pursue a wider range of subjects, such as literature, the arts, and interpersonal skills. These subjects add a whole new layer of complexity to the measurement and evaluation of competencies or learning outcomes. Applying learning analytics in particular learning contexts while keeping them universal enough to be used in a variety of courses and educational settings presents a challenge.

6.3 Data Mining

The goal of educational data mining is to provide learners with automated and methodical responses. The goal of AI-based educational data mining is to create natural association rules and provide students with knowledge objects tailored to their individual needs. For instance, from a limited number of written assignments, data on students' demographic characteristics and grading can be analyzed [44]. A machine learning regression technique that also forecasts a student's performance in the future can be used to accomplish it. Additionally, data mining is developing into a potent tool for enhancing knowledge acquisition and the learning process, which will enhance our comprehension of both learners and educational environments. Put differently, data mining can be understood as the application of predictive modeling and pattern recognition to uncover hidden information. which enables educators to modify their curricula to enhance the quality of education. One of the most significant uses of data mining-based AI is the achievement of personalized learning from knowledge field data, allowing students to learn at their own pace and choose their own AI-assisted learning strategy. With personalized learning, instructors should ideally allow students to select the subjects that interest them and then modify the course material and delivery style accordingly [43]. With data mining, AI can more accurately build its intelligence and produce results that are more dependable.

7. The Role of AI in Education

Timms raises an intriguing point: artificial intelligence (AI) is extremely potent and has the capacity to deeply influence many facets of society, including education. One area of society where AI is most likely to have a significant impact is education. In fact, it is clear from the various publications we have examined that artificial intelligence (AI) has found a home in the education sector, where it has facilitated advancements across the board. More precisely, it is clear that AI has been used in education, particularly in administration and teaching, and as a result has
affected or impacted students' learning within the framework and storyline put forth by Chassignol et al., which also serves as the study's scope.
AI has been used in educational institutions in a variety of ways, including the automation of administrative tasks and processes, curriculum and content development, instruction, and student learning processes, according to an analysis of the academic sources chosen for the study. Through automation using web-based platforms or computer programs, artificial intelligence (AI) has increased efficiency in the performance of administrative tasks, such as reviewing student work, grading, and providing feedback on assignments. Additional areas in which artificial intelligence (AI) has been used in the education sector include curriculum and content development, as well as instructions that make use of technologies that improve student learning, including virtual reality, web-based platforms, robotics, video conferencing, audiovisual files, and 3-D technology.

Students receive a more individualized and comprehensive education, and teachers are more productive and efficient.
Additional significant conclusions from a more thorough examination of the various sources show that, because learning materials are now housed on the Internet and the World Wide Web, the analysis of AI in education offers a chance to overcome the physical barriers posed by national and international borders. By utilizing web-based learning platforms or online learning, students can access the materials from any location in the world. Additionally, by utilizing AI capabilities like language translation tools, students can customize their learning to best fit their unique learning styles. As will be shown in the section on the discussion of the findings on the study, the results do, in fact, show that administration, instruction, and learning are more efficient and effective.

Numerous studies covered and illustrated the use of AI in education. An overview and the transitions that have defined the use of AI in education are given by Chassignol et al. According to Chassignol et al., artificial intelligence (AI) was incorporated into education through the use of computers and computer- related technologies like the Internet and the World Wide Web [11]. There has been evidence of a gradual shift away from computers toward online and web-based technologies and intelligent, or AI, systems, which has coincided with changes in the macro operating environment's technological landscape [11]. In the field of education, artificial intelligence (AI) is moving beyond simple computers and toward embedded systems, like robots or colleague robots (cobots), which can function as teachers or collaborate with educators on their own.

Timms agreed that artificial intelligence in education (AIED0) is assuming various forms, but there is evidence that separates AI from computers or that the emphasis is on utilizing AI as computers exclusively, including the use of computer embedded systems like cobots and smart classrooms [7]. Artificial Intelligence has expanded beyond just computers, desktops, and other traditional computer applications. As the presentation of results from other studies has already shown, it has continued to include other elements.The various publications under review demonstrate the various ways in which artificial intelligence is being applied in education. The broad use of AI in a variety of contexts, such as content creation, instructional strategies, student evaluation, and teacher-student communication, was highlighted by Chassignol et al. [11] (p. 22). For instance, the study by Chassignol et al. claims that AI has been widely used in teaching and pedagogical approaches, assessment, curriculum development and content personalization, and teacher-student communication. Examples of various AI platforms and applications given by Chassignol et al. include Interactive Learning Environments (ILEs), which are used to monitor student performance and facilitate teacher-student feedback and interactions; Intelligent tutoring programs like MATHia, Comet, Why2Atlas, ACTIVE Math, and Viper have been widely used in learning assessments to monitor student progress and enhance the pedagogical resources that are currently available. These programs have been used by educators and instructors at various educational levels for a variety of subjects [11]. Analogous applications can be observed in additional research.

Similar findings and conclusions were made by Sharma et al., who noted that AI is now used in education to enhance administrative procedures, instruction, and learning through the use of intelligent tutoring systems, adaptive learning systems, and other systems [13]. Pokrivcakova agreed, observing that intelligent systems with adaptive capabilities are how AI manifests itself in education [14]. These principles and features of the systems allow AI in education to carry out a variety of tasks that are typically or conventionally carried out by instructors, all the while enhancing the educational experiences of students by providing them with coaching and adjusting the curriculum to meet their needs and expectations.
As the United Nations Educational, Scientific, and Cultural Organization (UNESCO) noted, it is clear that artificial intelligence (AI) has impacted many facets of society, especially education. Examples of this include tools, methods, and instructions for teaching. Changes in the general environment have prompted other areas or methods of implementing AI in education, such as learning and administration. In fact, Wartman and Combs claim that changes in the workforce or professional world are causing changes in education as well, making the integration of AI into teaching and learning necessary. The use of AI in the medical field, for instance, necessitates exposing students to the technology in medical education in order to prepare them for the experiences in the real world

Furthermore, web-based education is another trend or application of AI in education, according to the analysis of the chosen articles. In their study, Kahraman, Sagiroglu, and Colak, for instance, covered the development and application of artificial intelligence (AI) in education through the creation of adaptive and intelligent Web-based educational systems (AIWBES), which are quickly displacing the rudimentary use of the Internet and the World Wide Web—what they refer to as the "just put it on the Web" approach [18]. The application of artificial intelligence (AI) concepts and technology to web-based learning systems (WBES) enhances the learning process for students. In fact, Peredo et al. also cover the incorporation of AI into online platforms. They proposed that the rise in popularity of online learning has made intelligent webbased education (IWBE) even more significant. This is because the platform can be used as a powerful pedagogical tool to integrate AI into WBE and other intelligent approaches, tools, and theories for modeling engineering agent-based systems and technologies [19] . As per the study's findings, integrated work-based education (IWBE) takes into account various aspects such as learners' knowledge and skills, learning, performance capabilities, and compatibilities. These factors are then utilized in the creation and utilization of a platform that enhances teachinglearning experiences. Peredo et al. deduced from their research that learning about and comprehending various social agents, such as teachers and students, is a crucial component of the IWBE. This guarantees the creation and application of resilient, clever, interactive, learning, and adaptable AI systems in education, especially on the web, which is accessible from any location in the world [19]. It appears that AI will potentially promote improved access to learning by removing obstacles to learning, automating management and administrative functions in academic institutions, and optimizing instructions and learning, as

well as by fostering empirical or evidence-based decisions and initiatives in education, as demonstrated by the evaluation of the nature of application of AI in education and as listed in the UNESCO report.
It can improve the professional environment for teachers and students as a virtual platform. AI can be used as an assessment tool to help teachers save time by grading papers and exams. Additionally, it aids students in navigating various content pathways and customizing their education based on their areas of strength and weakness. The various ways AI can be used in administration, instruction, and learning scenarios in education are illustrated in Tab. 2. The following subsections provide a summary of the in- depth research results regarding the use of AI in education.

7.1 AI in Education Administration

An overview of the research on AI's use in education is provided in this section, with an emphasis on administrative tasks. One of the main areas of education that AI is predicted to have an impact on is the administration of various tasks related to teaching, including reviewing student papers and assignments, grading, and giving feedback to students. Sharma et al. claim that artificial intelligence (AI) has improved institutional and administrative service efficiencies, especially in distance and online learning [13]. In fact, certain programs—like Knewton—reduce the workload for teachers by giving them a platform to give feedback to students based on their interactions on the platforms. Similar viewpoints can be seen in additional research and writings.

For instance, Rus et al. proposed that intelligent tutoring systems (ITSs) carry out a variety of tasks, such as assigning grades and giving students feedback on their assignments [12]. By collaborating with ITS, instructors can more efficiently complete a variety of administrative duties in addition to their primary duties of advising and directing students to succeed academically. The conclusions and arguments made by Mikropoulos and Natsis support those made in these studies; utilizing AI in education has increased productivity and efficacy when it comes to performing administrative duties like assigning grades to students [15]. In fact, a close examination of the current online learning landscape reveals tools that enable teachers to carry out a variety of administrative duties, like TurnItIn and Ecree, which check for plagiarism in student assignments and offer suggestive grading. With artificial intelligence (AI), instructors can now complete various administrative tasks more quickly and efficiently. These tasks would have taken a lot of time to complete without AI.

7.2 AI in Instruction

~One of the main areas that has seen an influx of AI systems is instruction or teaching, according to the analysis of the articles that were found and included in the analysis. Artificial Intelligence has enabled the development and implementation of systems that are clearly very effective teaching instruments. The quality of instruction has improved thanks to these resources. The different articles that have been evaluated discuss and highlight various platforms and applications of artificial intelligence as a teaching tool. Timms talks about the different ways that artificial intelligence (AI) can be used as a teaching tool or platform; simulation-based instruction, which uses various technologies, like virtual reality, to show students concepts or practically demonstrate materials, providing students with an experiential or practical learning experience
Other studies address the same idea or the use of virtual reality components as an AI component in education. For instance, Mikropoulos and Natsis emphasize the use of highly interactive simulation, 3-D technology, and virtual reality as pedagogical tools that aid in improving students' comprehension of concepts that are being demonstrated [15]. Parallel to this, Wartman and Combs draw attention to the application of AI in medical education through simulation and virtual reality, which guides students through real-world medical experiences like performing procedures and comprehending human anatomy, among other topics.

	The work AI can do in education
Administration	● Perform the administrative tasks faster that consume much of instructors' time, such as grading exams and providing feedback. ● Identify the learning styles and preferences of each of their students, helping them build personalized learning plan. ● Assist instructors in decision support and data-driven work. ● Give feedback and work with student timely and directly.
Instruction	● Anticipate how well a student exceed expectations in projects and exercises and the odds of dropping out of school. ● Analyze the syllabus and course material to propose customized content. ● Allow instruction beyond the classroom and into the higher-level education, supporting collaboration. ● Tailor teaching method for each student based on their personal data. ● Help instructors create personalized learning plans for each student.
Learning	● Uncover learning shortcomings of student and address them early in education. ● Customize the university course selection for students. ● Predict the career path for each student by gathering studying data ● Detect learning state and apply intelligent adaptive intervention to students.

The functions AI provides in educational scenarios

The incorporation of AI into robots or machines, the development of effective teaching tools, and the enhancement of the caliber of applied pedagogical approaches have all been emphasized in other studies. In fact, Timms points out that integrating AI principles into robots—the creation and deployment of these artificial intelligence (AI) aides and colleagues, or cobots—as a means of carrying out fundamental and even sophisticated teaching tasks, like teaching pupils to read and pronounce words, is another important way that AI in education is being used as a tool for instruction. In fact, Sharma et al. noted that the development and application of better teaching practices has resulted from the integration or use of AI in education, more specifically, integration with other technologies and use as instructional tools. However, Pokrivcakova also draws attention to the incorporation of AI into computer programs and the creation and application of chatbots, or online computer-based robots with dialogue and conversational skills, to respond to common questions from students and, in certain cases, distribute educational resources [14].

The use of humanoids and other robots as teaching and pedagogical tools is made possible by artificial intelligence (AI), which endows these machines with cognitive and decision-making abilities as well as dialogue and conversational capabilities.
Moreover, additional applications of AI in education were found through the examination of the articles. For instance, various studies address various forms of intelligent tutoring systems. For instance, Rus et al. note that the realization of effectiveness in teaching has been facilitated by intelligent tutoring systems, or ITS, that are outfitted with conversational and dialogue abilities as well as animated conversational agents, such as chatbots or cobots [12]. The same ideas are also emphasized in the AI applications in education that Pokrivcakova discusses, such as writing and translation assistants in language learning, computer-assisted language learning (CALL), which gives students or learners personalized instructions. Additional applications of AI in education are also highlighted, specifically in instructions to carry out teacher or instructor functions. In their various papers, Kahraman et al. and Peredo et al. address web- based learning platforms that combine AI with teacher capabilities.

In order to make the platform a potent and helpful pedagogical tool, Kahraman et al. address the incorporation of AI in web-based education, specifically the use of AIWBES in teaching and incorporating teacher-like functions [18]. Peredo et al. also talk about intelligent and adaptive web-based systems, or IWBEs. In these systems, teachers are viewed as social agents who must be understood and assisted by the system as they carry out their assigned duties. to give students guidance and instructions with the goal of making sure that the technology—web-based education—used in education is an effective and methodical approach to enhance the learning experience [19]. Artificial Intelligence has been incorporated into various technologies and methodologies, serving as a solitary educational instrument or assisting educators in carrying out their assigned duties.

8. AI in Learning

Another facet of education that falls under the purview of the study is learning, which is a necessary component of education. The study's evaluation and analysis of the various articles revealed various applications of artificial intelligence (AI) that have been adopted, used, or leveraged to support students' learning. Additionally, particular applications or programs that use AI to enhance student learning were found. The customization and personalization of curriculum and content in accordance with the needs, abilities, and capabilities of the learners is a significant way that AI has been applied to improve students' learning [15]. Alternative methods offer students a more enjoyable, engaging, or hands-on learning experience, which enhances their assimilation and retention of knowledge—the cornerstone of learning.

Numerous platforms and applications were recognized from the articles. Certain platforms facilitate the personalization and customization of content, which enhances the learner's experience by encouraging the assimilation and retention of knowledge. For instance, Knewton is an application that uses machine learning algorithms to determine a student's learning style and then uses that information to tailor course materials or content to the individual student's needs in real-time . Together with other platforms, Cerego, Immersive Reader, and CALL have the potential to enhance students' educational experiences at all levels of the educational system, from early childhood education to undergraduate and graduate study at universities. Pokrivcakova also noted that the usage of chatbots and the integration of AI enhance students' educational experiences since they make use of machine learning algorithms and provide content that is tailored to each student's learning requirements and aptitudes [14]. Additionally, the author emphasizes how AI is being incorporated into education to enhance the learning experience for students through intelligent tutoring systems, adaptive education systems, and machine translation tools. AI can be used in a variety of ways to guarantee that content is individualized and tailored to the needs and abilities of learners.

However, as can be seen from other articles, some uses of AI were discovered to significantly affect the experiences of the learners. For instance, it has been shown that applying and utilizing intelligent tutoring systems (ITS) and simulation-based learning can promote deep learning, which enhances the educational experience for students [13]. The same idea is also highlighted by Mikropoulos, who notes that simulation and virtual reality help students have better learning experiences . It has been demonstrated that integrating simulation, virtual reality, and other AIrelated learning tools into the classroom helps students get ready for future trends and gradually catch up with the industry's adoption of AI.

For instance, when students are working on such problems, interactive problem solving, a feature of AIWBES, will collaborate with them to provide intelligent assistance in each stage of the problem- solving process [18] (p.159). Peredo et al. discuss and highlight the same capabilities of AI in

web-based education. They note that IWBE, or intelligent and adaptive web-based systems, have a learner component, with the learner integrated as a social agent. The system focuses on understanding learner behavior and making adjustments by producing content that is relevant to the learners' needs [19]. It appears that the goal of AI adoption, use, and integration in education has been to enhance the learning experiences for students.

9. Impact of AI in Education

A synopsis of the study's goal is to evaluate the effects of artificial intelligence in education. The implied research question is only partially addressed by the assessment of the various ways that artificial intelligence has been incorporated into education, with an emphasis on administrative duties, instruction, and learning. According to Sharma et al., the application of AI in education offers a chance to fundamentally transform a number of educational facets [13]. An examination of AI's applications demonstrates some of its effects on education. Based on the conclusions from the articles that were examined, a more in-depth examination of the real impacts of AI on management, instruction, and learning is presented in this section.

9.1 Education Administration

The use of AI in education, in all of its forms and for all kinds of purposes, has significantly impacted how well administrative and management tasks are carried out in the field. It has made it possible for educators to carry out their administrative duties, like grading assignments and giving students feedback, more successfully. Programs offered by AIWBEs have features that give teachers access to grading guidelines, which facilitates the process of assigning grades and providing feedback to students [14].

Similar features and functionalities can be found in programs like Knewton, which give teachers built-in tools to assess performance, assign grades, and give students feedback to guarantee learning progresses continuously. AI has improved teacher and instructor efficiency and effectiveness in giving students instructions and guidance, as well as made administrative tasks easier to complete. With the help of intelligent tutoring systems, instructors can carry out a variety of administrative duties, such as marking assignments and giving feedback [12]. Other AI-powered programs, like Grammarly, Ecree, PaperRater, and TurnItIn, among others, give instructors the ability to carry out various administrative tasks, like grading and rating assignments, checking for plagiarism, and giving students feedback on areas for improvement. AI has greatly decreased the amount of paperwork and workload that instructors have, especially when it comes to performing different administrative tasks.

10. Literature Review

1. K. Flamm [1] Historical account of the development of computers and their significance in education.
2. M. Campbell-Kelly [2] Historical perspective on the evolution of computers and their impact on the educational landscape.
3. M. M. L. Cairns [3] Discusses the impact of computers in educational settings and their role in transforming schools and classrooms.
4. B. Coppin [4] Provides foundational understanding of AI concepts relevant to education.
5. B. Whitby [5] Explores fundamentals of AI and its relevance to education.
6. V. Devedžic [6] Explores the intersection of web intelligence and AI in education, highlighting their potential to enhance learning experiences.
7. M. J. Timms [7] Discusses the concept of educational cobots and smart classrooms, envisioning a future where AI seamlessly integrates into educational environments.
8. H. Snyder [8] Provides an overview of literature review as a research methodology, offering guidelines for conducting comprehensive literature reviews in education and AI.
9. M. Chassignol et al. [11] Presents a narrative overview of AI trends in education, highlighting key developments and emerging technologies shaping the educational landscape.
10. V. Rus et al. [12] Discusses recent advances in conversational intelligent tutoring systems, showcasing innovative approaches to personalized learning.
11. R. C. Sharma et al. [13] Discusses promises and concerns associated with integrating AI in open, online, and distance education, addressing issues such as privacy, equity, and algorithmic bias.
12. S. Pokrivcakova [14] Explores preparation of teachers for application of AI-powered technologies in foreign language education, emphasizing the importance of pedagogical training.
13. T. A. Mikropoulos et al. [15] Provides a ten-year review of empirical research on educational virtual environments, highlighting evolution of technology- enhanced learning environments.
14. United Nations Education Scientific and Cultural Organization (UNESCO) [16] Discusses how AI can enhance education on a global scale, exploring initiatives and strategies aimed at leveraging AI to address educational challenges.

15. R. Peredo et al. [19] Development of an intelligent web-based education system for adaptive learning.
16. P. Phobun and V. J. [20] Exploration of adaptive intelligent tutoring systems for elearning.
I. Roll and R. Wylie [21] Discussion on the evolution and revolution in AI in education.
17. S. Pokrivcakova [14] Preparation of teachers for the application of AI- powered technologies in foreign language education.
18. T. A. Mikropoulos et al. [15] A review of empirical research on educational virtual environments.
19. (2019). United Nations Education Scientific and Cultural Organization (UNESCO) [16] Exploration of how AI can enhance education on a global scale.
20. S. A. Wartman and C. D. Combs [17] Discussion on the need for medical education to
21. transition to the age of artificial intelligence.
22. H. T. Kahraman et al. [18] Development of adaptive and intelligent web-based educational systems.
23. J. P. Rowe et al. [35] Integration of learning, problem-solving, and engagement in narrative-centered learning environments.
24. S. D'Mello et al. [36] Exploration of the effectiveness of affect-sensitivity in promoting deep learning.
A. Ignatov et al. [37] Discussion on running deep neural networks on Android smartphones.
25. J. Hu et al. [38] Introduction of squeeze- and-excitation networks.
26. S. Nunn et al. [39] Discussion on learning analytics methods, benefits, and challenges in higher education.
27. T. Yi-Shan and D. Gasevic [40] Exploration of challenges and policies related to learning analytics in higher education.
28. J. Estevez et al. [41] Introduction of artificial intelligence to high school students using Scratch.
29. D. Kučak et al. [42] Exploration of machine learning in education and a survey of current research trends.
30. Y. Kim et al. [43] Discussion on the engineering and educational directions for emotionally aware AI smart classrooms.
31. Deloitte Res. [44] Exploration of the global development of AI-based education.
32. P.-H. Lin et al. [45] Discussion on the potential of artificial intelligence in online education.

11. Instruction

The use of AI by instructors or in instructions was another facet of education that this analysis focused on. A review of several articles revealed that instructors were quickly adopting artificial intelligence (AI) in various forms for teaching or as a pedagogical tool. This area of education has been significantly impacted by the use of AI as a pedagogical tool or for instructional purposes. The effectiveness, efficiency, and caliber of the work produced by instructors have all increased, as demonstrated by the various publications that have been examined and analyzed. In this context, the delivery of pertinent content in accordance with the curriculum and the unique needs and capabilities of the learner serves as a gauge of efficiency and quality. Effectiveness, on the other hand, is judged by the learners' or students' implied uptake, retention, and learning achievement. The study's findings therefore suggest that AI has facilitated the realization of quality, effectiveness, and efficiency in instruction or teaching, taking into account these operational definitions and descriptions of efficiency, effectiveness, and quality.

AI has improved instruction effectiveness. According to Rus et al., ITS have guaranteed students' best retention and uptake of the materials or best possible learning because they make use of empirically supported or evidence-based practices, such as the broad application of learning models and cognition [12]. According to Rus et al., learner-centered programs like DeepTutor and AutoTutor support customization and personalized content based on the needs and capabilities of the learner. This enhances the learner experience and promotes the accomplishment of the established learning objectives.

Pokrivcakova's arguments also show how AI has improved educational quality and effectiveness because modern systems are technology-based adaptive systems.
Several studies have emphasized the role of technology, specifically AI, in promoting academic integrity through the use of plagiarism checkers, proctoring, and online supervision of students' activities on platforms like Grammarly, TurnItIn, and White Smoke, among others [23]–[25]. Other studies have discussed gamification, which is the use of AI for instructional purposes and has a significant positive impact on the quality of instruction. Gamification is also an element of or integrates virtual reality and 3- D technologies, in their various forms.

Which emphasized the advantages of gamification, team viewer apps, and simulation, all of which are closely related to virtual reality and three dimensions, or even the use of these technologies to enhance the efficacy and efficiency of instruction [26], [27]. Because of their enhanced capabilities and human-like appearance, other studies have explored the advantages of expressive humanoid robots with dialogue and conversational capabilities in fostering instructional quality by fostering engagement with learners.

11.1 Learning

Students' learning experiences are another area of education that falls under the purview of this study and has been significantly impacted by the introduction and application of AI. In fact, Rus et al.'s summary of the impact of AI on education noted that ITS promotes deep learning because, when students interact with the conversational agents that are an essential component of the system, they will be prompted to explain themselves fully and rationally, which will enhance their ability to assimilate and retain the knowledge
[12] (p. 43). The many advantages of AI for students' learning experiences are illustrated in various ways by this and other studies.
Pokrivcakova, for instance, noted that artificial intelligence (AI) has made it possible to create and employ intelligent learning systems and adaptive content that is tailored to each student's learning requirements and skills. This includes the use of intelligent virtual reality in simulation teaching and learning, which has been demonstrated to improve learning [14] (p.143). Mikropoulos and Natsis discuss the same advantages of simulation and related technologies for learning. They note that these tools give students hands-on experience and experiential learning, which enhances the quality of learning. The studies the researchers reviewed in their article highlight the main advantages of VR and 3-D technology for learning, such as usability, enjoyment, learner enthusiasm, motivation, and increased.

Additional benefits of artificial intelligence and how it affects learning quality are emphasized in other research that concentrated on web-based platforms. For instance, Kahraman noted that they promote student collaboration, interactions, and learning in his discussion of the key principles or elements of AIWBES, such as adaptive hypermedia, information filtering, class monitoring, and collaborative learning, among others. Because the system adjusts and customizes instructions and content to identified and assessed learner behaviors, discussion of the relationship between AIWBE and improved learning quality highlights the same advantages of web-based platforms. To modify the pedagogical approaches for the AIWBE, for instance, StudentTracker middleware will interact with online learner data, such as completed tasks, learning tracking, time, and other elements [19]. Web-based platforms have been shown to enhance learning in other ways, such as by promoting worldwide access to education and lowering costs. In general, the learning experience provided by these platforms has been superior.

12 Performance of Instructor and Student

It would be interesting to examine how AI will impact teacher and student performance as intelligent systems. AI systems will be effective in relieving the strain on instructors as the number of students in educational institutions rises. AI tools assist teachers in proposing individualized content by analyzing the syllabus and course materials [11]. After analysis, these systems can also create and grade exams.
Eventually, this would free up teachers to concentrate on more urgent matters, like student performance. Artificial intelligence (AI) solutions can analyze study data more effectively in individualized teaching and autonomous learning, which helps teachers design unique lesson plans for each student.Another developing problem with AI in education is human bias. In order to eliminate bias, AI solutions can grade exams and papers using predefined benchmarks and rubrics . AI systems based on computer vision that can read and recognize images of handwritten documents can accomplish this. These kinds of systems not only lessen bias but also stop students from plagiarizing and cheating.

Therefore, the best teaching performance cannot be achieved by using the same teaching method with every student. AI would assist in figuring out the best teaching strategy for each student based on their learning style, areas of strength, and complimentary abilities. All students can benefit from and enjoy their learning experience in this way. Along with expanding students' knowledge, it also aids in the development of a knowledge system that fosters better study habits, creativity, and learning capabilities. Additionally, by analyzing data, AI systems forecast each student's career path, which helps students choose their courses at university. Students can achieve higher grades and acquire practical skills by taking into account their individual abilities and career path.

The conversation above suggests that AI has a lot of potential for automating and streamlining administrative work for schools and teachers. AI is already capable of automating the grading of homework assignments and essay evaluations, freeing up teachers' time to work one-on-one with students. New approaches to grading written assignments and tests are being developed by AI developers. Artificial intelligence (AI) produces digital learning interfaces that are adaptable to students across all grade levels and age groups when it comes to educational resources.
Additionally, according to Nick Oddson, the creator of Brightspace, AI allows instructors to gain student insight "based on the entire ecosystem of learning tools" during the learning process.

13. Discussion of the Results

The various articles and studies that have been reviewed make it clear that technological advancements, computer technology, and other innovations have aided in the development of artificial intelligence. This technology has become ingrained in various societal sectors and has the potential to have a significant impact on a variety of industries. The education sector is one of these areas where AI has been applied and is having a significant

impact. A definition and description of AI was considered necessary as a starting point and basis for comprehending the ways in which it has affected education.
Various definitions of artificial intelligence derived from the evaluated studies revealed different tenets, characteristics, and nature of AI. As the name suggests, having some degree of intelligence is a fundamental aspect of artificial intelligence (AI), something that was previously exclusive to humans. Artificial intelligence (AI), computers, and consequently embedded systems like robots and buildings are endowed with human-like cognitive, learning, adaptive, and decision-making abilities by virtue of intelligence.

Indeed, the adoption and application of AI in education has taken many different forms, as evidenced by the various sources that have been examined and analyzed. Initially, artificial intelligence (AI) in education took the form of computers and computer-related technologies, which were used for a variety of administrative tasks, instruction, and student learning. The scope of these applications was established based on the description of AI application in technology.
Continuous advancements and innovations, in particular, have heralded the development and application of artificial intelligence (AI) in web-based platforms and robotics. This is demonstrated by the creation and use of humanoid robots, such as chatbots and cobots, which carry out educational tasks on their own or in conjunction with human teachers, such as distributing course materials to students at different educational levels. Additionally, it is clear from the analysis and platform descriptions given in the various reviewed articles that the use of AI in education in its various forms has given students a richer and more fulfilling educational experience.

Therefore, it is implied—and this is supported by the analysis—that artificial intelligence (AI) has had a significant impact on the education sector overall, and specifically on its application in specific educational institutions. Educators who utilize artificial intelligence (AI) can accomplish increased productivity and efficiency when carrying out various tasks, including reviewing, grading, and giving feedback to students on their turned in assignments.
Additionally, teachers can improve the quality of their instruction by utilizing AI, or the various forms of AI, such as chatbots, cobots, and web-based and online intelligent systems. Contrarily, students benefit from a better and more comprehensive learning experience thanks to AI's use of machine learning, as demonstrated by various studies. AI uses machine learning to evaluate students' abilities and needs, and then uses the results of that analysis to create and distribute individualized or customized content that increases learning through higher uptake and retention.

Additionally, AI enhances students' learning experiences by giving them hands-on or experiential learning opportunities, especially when combined with other technologies like virtual reality, 3-D, gaming, and simulation. One study covered or emphasized the negative effects of AI, the erosion of academic integrity, and the use of AI-facilitated paper mill and paper churning services to commit cheating. The majority of the examined studies illustrated and clarified the various applications of AI in education, as well as its advantages and effects on management, instruction, and learning. The advantages, or good effects, exceed the drawbacks, or bad effects.
AI-enabled education will become more significant as learning requirements change, but for now, AI learning is thought of as an early education assistant. It has not yet attained the highest level of intelligence in intelligent education and instead offers courses with varying degrees of difficulty based on basic rule judgment. Studies on AI system education that use probability models and knowledge maps exist. AI systems will produce more data as the educational process interacts more frequently, giving a clearer picture of the teaching and learning process and facilitating more precise information recommendations.

AI systems will help teachers and students by offering high-quality contents that will support both teaching and learning and make the entire process measurable. These systems will be aided by learner analytics, machine learning, and data mining. At this point, users can choose from several methods to get the right response to any question. The ideal AI system of the future would mold students' imaginations and creative energies by examining their emotional states, learning preferences, and level of initiative.
This would enhance learning capacities, foster creativity, and encourage subjective initiative. More widespread use of AI systems is anticipated, and it is anticipated that these systems will flourish on all fronts for students—personal skill, knowledge mastery, learning capacity, and career development— rather than just helping students comprehend particular subject matter.

CONCLUSION

This study's goal was to evaluate how artificial intelligence is affecting education. Utilizing a literature review as a research design and methodology, a qualitative research study was conducted. In order to help achieve the goal of the study, professional publications, conference reports, and journal articles were found and used in an analysis. Artificial Intelligence (AI) has emerged and is being used in various sectors as a result of research and innovations sparked by the development and use of computers and computer-related technologies.

The development and application of artificial intelligence (AI), which has been demonstrated to have a significant impact on the sectors it permeates, have been aided in particular by the advancement of personal computers and later innovations that have increased processing and computing capabilities as well as the ability to integrate or embed computer technologies in various machines, equipment, and platforms. The education sector has widely adopted and utilized AI, especially in the educational institutions that were the subject of this study. The analysis's main objective was to determine how artificial intelligence (AI) has affected the administrative, instructional, and learning aspects of education. It also sought to determine the effects of AI's application.

Computers and computer-related systems were the first forms of artificial intelligence (AI) in education. Later, web-based and online learning platforms emerged. Robots can now be used as independent instructors or cobots, or humanoid robots, to assist teachers. Moreover, chatbots can be programmed to mimic teaching roles. This is made possible by embedded systems. Richer or higher-quality instruction has resulted from the use of these platforms and tools, which have enabled or improved teacher effectiveness and efficiency. In a similar vein, AI has enhanced the educational experiences of students by making it possible to tailor and customize course materials to each student's needs and skills. AI has, all things considered, had a significant impact on education, especially on areas of learning that are specific to individual learning institutions or the administration, instruction, and learning areas of the education sector.

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