A Comprehensive Examination of Artificial Intelligence in the Field of Education

Umme Thayyiba Khatoon [1] *and Rafeef Ahmed Madkhali* [2]

Abstract

The objective of this study was to evaluate the influence of Artificial Intelligence (AI) on the field of education. Based on an initial analysis, this study focused on the use and impact of Artificial Intelligence (AI) in the domains of administration, instruction, and learning. The study was guided by a narrative and framework for evaluating AI. The study effectively employed a qualitative research approach, utilizing literature review as a research design and approach to successfully achieve the study's objectives. Artificial Intelligence (AI) encompasses a scholarly discipline focussed on the exploration and subsequent advancements in Computer Science, leading to the creation of intelligent systems, robots, and other artifacts that exhibit cognitive powers, learning capacities, adaptability, and decision-making prowess akin to human intelligence. The research determined that Artificial Intelligence (AI) has been widely embraced and implemented in the field of education, specifically by educational institutions, in many manifestations. Artificial intelligence (AI) was initially developed in the form of computer technologies and their associated applications. Over time, it has evolved to include web-based and online intelligent education systems. Furthermore, the integration of embedded computer systems, along with other technologies has facilitated the use of humanoid robots and web-based chatbots to independently or collaboratively perform instructors' duties and functions. Through the use of these platforms, educators have been able to execute various administrative tasks with greater effectiveness and efficiency. These tasks include the review and evaluation of students' assignments, resulting in an enhanced quality of their instructional endeavours. However, due to the utilization of Machine Learning and adaptability, the educational systems have been able to adjust and personalize curriculum and content according to the specific needs of students. This has resulted in increased adoption and retention rates, thus enhancing the entire learning experience and quality for learners.

Keywords : Artificial Intelligence, education

I. INTRODUCTION

Innovation does not entail that society should stick to the status quo (existing state of affairs), as Henry Ford's analogy demonstrates. For example, innovation does not imply developing faster horses. Occasionally, it becomes imperative to venture beyond conventional practices and cultivate innovative approaches. Rather than focusing on enhancing the speed of horses, the development of the vehicle emerged as a means of transportation that surpasses equine capabilities, enabling individuals to travel more swiftly between two designated locations. The tremendous advancements in technology, particularly within the education sector, has been propelled by these underlying concepts and techniques.

The current year is 1950. Dr. Potter, a tenured professor at a nearby university, briskly walks towards a classroom, carrying a substantial stack of papers in his arm. The individual in question has recently completed the task of evaluating and grading all of the submitted papers from the 40 students enrolled in his class. This involved carefully examining and rating both the grammatical aspects and the substance of each piece. Upon reviewing many papers, Dr. Potter observed that the content inside appeared to have been plagiarized from external sources. However, he lacked definitive means of

[1] U. T. Khatoon *(Corresponding Author), Lecturer,* College of Business Administration, Jazan University, Jazan, Kingdom of Saudi Arabia; Email : ukhatoon@jazanu.edu.sa ; ORCID iD : https://orcid.org/0000-0003-1803-4439

[2] R. A. Madkhali, *Lecturer,* College of Business Administration, Jazan University, Jazan, Kingdom of Saudi Arabia ; Email : ramadkhali@jazanu.edu.sa ; ORCID iD : https://orcid.org/0009-0000-9155-0646

determining the specific origins from which the student had obtained the materials. In the year 2019, Dr. Potter enters a classroom with minimal paperwork, having diligently reviewed and identified instances of plagiarism for further disciplinary measures. Additionally, Dr. Potter has diligently assessed a substantial volume of student papers. On certain occasions, when he is not physically present on the educational institution's premises, he has the ability to remotely connect to the class by dial-in or video conferencing methods. By utilizing technology, he is able to fulfill his obligations and carry out his responsibilities. The development, advancements, and widespread adoption of technology, including Artificial Intelligence have facilitated teachers in carrying out their responsibilities with greater effectiveness and efficiency. Technological advances have also been integrated into several sectors of academia, resulting in enhanced efficacy and efficiency.

Before the advent of computers and other associated technology, educators and learners relied on manual methods or the sheer application of human effort for instruction and learning. The advent of microcomputers, and subsequently personal computers in the 1970s was a significant milestone in the field of computing. As Nelson, argues, these technological advancements not only offered increased computational capabilities, but also facilitated the widespread adoption of electronic computers by the general public [1]. Alam concurred that the advancements in electronic computers, specifically the proliferation of personal computers in the 1970s, had facilitated their accessibility to many entities in diverse sectors of the economy [2]. The advent of personal computers has facilitated the acquisition and utilization of computing devices by individuals and non-governmental entities, enabling them to fulfil many purposes. These shifts signalled the widespread adoption of computers across various areas of the economy and society.

Drawing upon previous research on programmed instructions during the mid 1900s, advancements in computer technology and related computing technologies have facilitated the integration of computers in various domains of the education sector. This includes the implementation of Computer Aided Instruction and Learning (CAI/L) within different departments of educational institutions, thereby enhancing classroom interactions [3]. Subsequent advancements in computers and computer-related technologies, such as networking, the internet, the world wide web, and enhanced processing, computing, and other functionalities alongside the availability of task-oriented programs and software packages, have led to the expanded utilization of computers within the education sector. To be more precise, within several academic departments of educational institutions.

The progression of computer and information communication technologies has witnessed ongoing advancements, culminating in the emergence of Artificial Intelligence. According to researchers [4], Artificial Intelligence refers to the capacity of machines to adapt to novel circumstances, handle emerging situations, resolve problems, respond to inquiries, formulate strategies, and execute a range of other tasks that typically necessitate a certain degree of intelligence commonly observed in humans. In an alternative definition, Chen and Chen et al. conceptualized Artificial Intelligence as the examination of intelligent behaviour in humans, animals, and machines, with the objective of replicating such behaviour in artifacts, specifically computers and computer-related technologies [5]. Based on the aforementioned definitions, it becomes apparent that Artificial Intelligence represents the convergence of computers, computer-related technologies, machines, and advancements in information communication technology. This convergence empowers computers with the capacity to execute tasks that closely resemble or mimic human capabilities. In accordance with the integration and utilization of emerging technologies in the field of education, Artificial Intelligence has been widely employed within the educational domain.

Yigitcanlar et al. (2020) noted that the research and development efforts in the field of Web Intelligence (WI) and Artificial Intelligence (AI) encompass various aspects [6]. These include the utilization of Machine Learning techniques to establish distributed intelligence, achieving a harmonious integration of Web technology and intelligent agent technology, facilitating agent self-organization, and enabling learning and adaptation. These features of WI and AI enable them to effectively adapt to their environment and carry out intelligent functions. Leveraging these capabilities in the education sector has the potential to drive advancements and enhancements [6]. Artificial Intelligence has been widely embraced and integrated into diverse domains within the education industry, including numerous divisions within

educational institutions. The integration of Artificial Intelligence in the field of education has yielded significant outcomes, such as enhanced efficiency, expanded opportunities for global learning, tailored and individualized instruction, intelligent material delivery, and better efficacy and effectiveness in educational administration, among other notable benefits. The user has provided a numerical reference. The field of Artificial Intelligence is undergoing ongoing advancements, leading to the emergence of novel applications within the realm of education.

The Integration of Artificial Intelligence in Contemporary Education

The concept of Artificial Intelligence evokes the image of a highly advanced computer system possessing exceptional computational power. This includes the ability to adapt its behaviour through the incorporation of sensors and other functionalities, resulting in cognitive and functional capabilities resembling those of humans. Furthermore, these enhancements facilitate improved interactions between supercomputers and human beings. Various motion movies have been produced to demonstrate the capabilities of Artificial Intelligence (AI) in the context of smart buildings. These capabilities include the management of air quality, temperature control, and the capacity to play music based on the occupants' detected mood. The education industry has witnessed a growing utilization of Artificial Intelligence (AI), surpassing the traditional perception of AI as solely a supercomputer to encompass the integration of embedded computer systems.

For instance, the integration of Artificial Intelligence (AI) and computer systems into robots and associated equipment facilitates the development of educational robots that enhance the learning process for students, starting from the foundational stage of education, such as early childhood education. According to Niankara, there is a growing utilization of cobots, which refers to robots functioning in collaboration with teachers or other robots for the purpose of instructing children in everyday chores such as spelling, pronunciation, and adapting to individual student capabilities [7], [8], [9]. In accordance with various studies, web-based, and online education has evolved beyond the provision of downloadable materials for students to passively engage with. Instead, it now encompasses intelligent and adaptive web-based systems that analyze instructor and learner behaviour in order to tailor the educational experience and enhance its quality [6], [11], [18], [19]. According to scientists, Artificial Intelligence has been integrated into various aspects of education, including administration, instruction, and learning. The scope of this study will encompass the topics identified by them as the framework for studying and comprehending Artificial Intelligence in education.

The utilization of Artificial Intelligence (AI) algorithms and systems in the field of education has been garnering growing attention over the years. Fig. 1 depicts the increasing quantity of scholarly articles published in the domains of "Artificial Intelligence" and "Education"
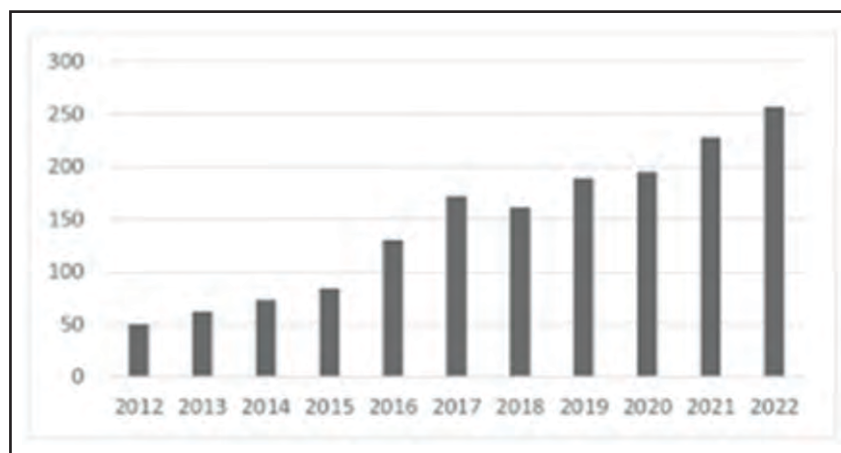

Fig. 1. Papers in Web of Science and Google Scholar from 2012 to 2022 with the keywords *AI* and *Education.*
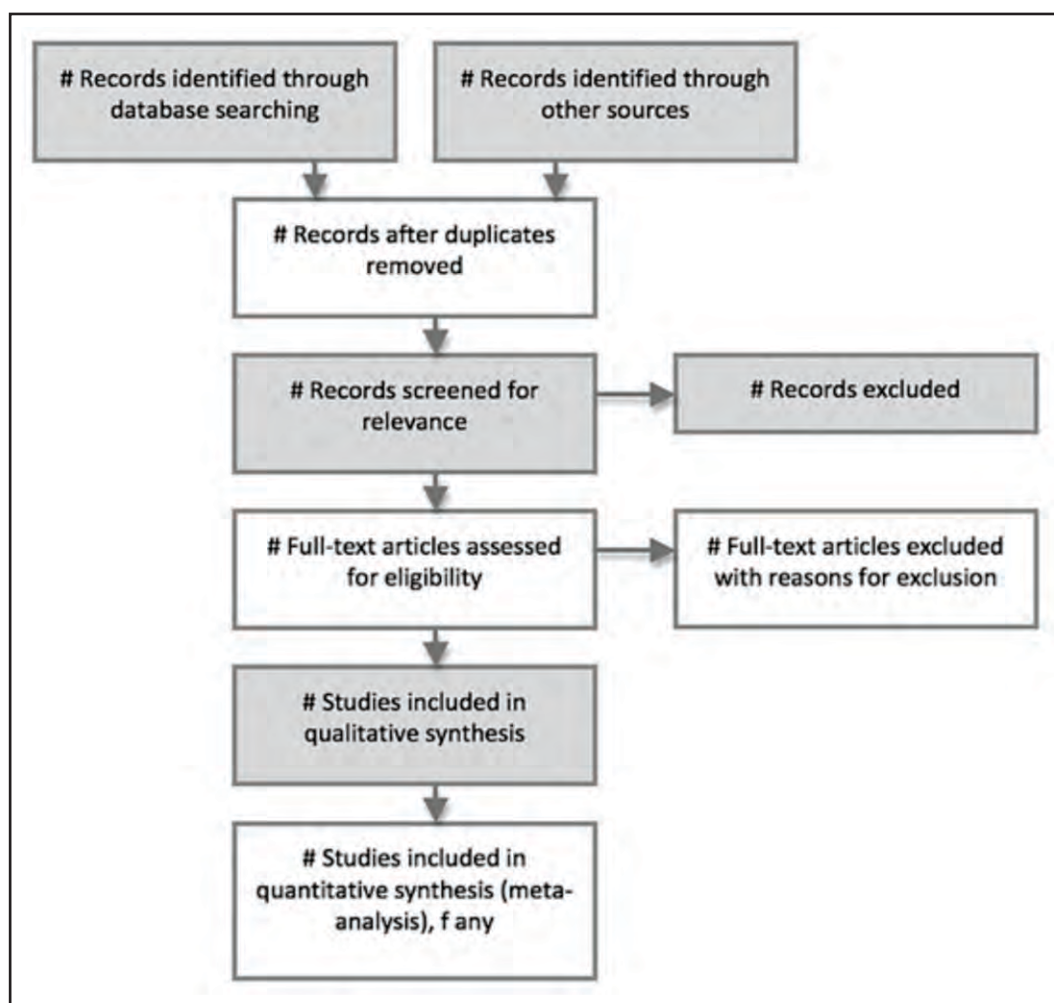
Fig. 2. Flowchart according to preferred reporting items for systematic reviews and meta-analyses.

as obtained from the Web of Science and Google Scholar databases, commencing in 2012. It is important to acknowledge that a significant number, specifically 70% of the indexed papers were published between the years 2016 and 2022. As the field of education continues to progress, scholars are actively exploring the integration of sophisticated Artificial Intelligence (AI) techniques, such as deep learning and data mining to address intricate challenges and tailor instructional approaches to the unique needs of individual learners.

II. OBJECTIVE OF THE STUDY

The utilization and integration of Information Technology in education has undeniably resulted in various impacts. The objective of this study is to evaluate the effects and impacts of various forms of Artificial Intelligence (AI) implementation in the field of education. The primary objective of this study is to evaluate the impact of Artificial Intelligence (AI) on the domains of teaching, learning, administration, and management within the field of education. The study is expected to determine that Artificial Intelligence (AI) has enhanced the efficacy and efficiency of administrative duties in the field of education. Additionally, it is anticipated that AI has contributed to general improvements in instructional and learning effectiveness within the education sector.

This research will provide advantages to multiple stakeholders within the education system. The aforementioned contribution will advance the on-going scholarly inquiry and progress in comprehending the impact of Artificial Intelligence on education, encompassing the acquisition of knowledge, formulation

of theories, and empirical discoveries that elucidate the diverse modalities through which AI has influenced this domain. This initiative has the potential to provide valuable advantages to various stakeholders, including researchers, professionals, and policy makers. Specifically, it can support evidence based decision making and enhance management and leadership practices within the education sector, benefiting administrators and individuals in positions of authority within educational institutions. The results will additionally enhance the findings of previous studies and provide valuable insights for government policy and initiatives targeted at promoting the effective utilization of information technology, namely Artificial Intelligence within the education industry. With a comprehensive comprehension of the influence of Artificial Intelligence (AI) on the education sector, and a thorough assessment of its specific implications such as enhanced instructional and learning efficacy, the government, in collaboration with educational institutions can formulate a policy, strategy, and set of initiatives aimed at fostering the advantageous consequences of AI on education while mitigating any potential negative effects.

III. REVIEW OF THE STRATEGY, MATERIALS, AND METHODS

This study aims to evaluate the influence of Artificial Intelligence (AI) on the field of education. Specifically, this study aims to examine the impact of Artificial Intelligence (AI) on the field of education, exploring its influence on several facets such as educational administration, instructional methods, and the learning process. The study adopts a retrospective methodology, involving the evaluation of existing secondary data, resources, and previous investigations. Snyder argued that conducting a systematic or semi-systematic literature review, which involves reviewing secondary material, might lead to a more comprehensive comprehension of the topic being studied [8]. This methodology guarantees that the research is based on empirical evidence, as it exclusively incorporates studies, including meta-analyses, that have been conducted on the topic. These studies provide support for identifying, analyzing, comprehending, and synthesizing the various ways in which Artificial Intelligence has influenced and had an impact on education. Typically, researchers employ a qualitative research design that

incorporates qualitative content and thematic analysis in order to evaluate the various approaches. Thematic and content analysis involves doing a comprehensive evaluation of each textual item and discovering reoccurring themes through the examination of several texts. These themes serve as the foundation for making inferences and drawing conclusions in descriptive investigations [10]. The selection of this research methodology and technique aligns with the objectives of the study, which aim to evaluate the influence of Artificial Intelligence (AI) on the field of education.

IV. THE DEVELOPMENT OF AN EFFECTIVE SEARCH STRATEGY

Various databases, such as EBSCOhost, ProQuest, and Web of Science will be utilized to conduct searches using key terms and search strings. Furthermore, the utilization of key terms and search queries is employed to conduct searches on Google Scholar with the objective of identifying scholarly publications from various academic journals that have specifically investigated the effects of Artificial Intelligence (AI) on the field of education. The publications are subsequently searched for in Scimago's database, and only those published in journals with an H-Index of 20 or higher were considered for inclusion in the study. The H-Index is a metric used to assess the scientific productivity of an author, taking into account the researcher's publications and citations. It serves as an indicator of the researcher's contribution to the field of science and scholarly endeavours. A higher H-Index is typically associated with journals and writers of greater reputation. After employing a rigorous elimination procedure, a comprehensive collection of over 40 papers was curated, encompassing various sources such as journal articles, professional periodicals, and reports from governmental and institutional entities.

Sampling : Criteria for Exclusion and Inclusion

In the beginning, a selection of 250 articles was made based on specific criteria. These criteria included the use of search keywords and search strings, as well as the requirement for the papers to be published after 2009. Additionally, the selected articles had to be published in a journal with an H-Index of 20 or above. A comprehensive examination and evaluation of the aforementioned articles was conducted, specifically identifying those that

centered on the essence of Artificial Intelligence (AI) and its influence on the field of education. Additionally, the H-Index was utilized to refine the selection of articles for analysis, resulting in a final sample size of 30 articles. This sample size was deemed adequate for drawing meaningful conclusions and making inferences regarding the impact of AI on education, employing a retrospective methodology. Moreover, preference was given to research that employed a quantitative methodology to identify and evaluate the influence of Artificial Intelligence on education, while also matching the aforementioned requirements.

V. THE INTEGRATION OF ARTIFICIAL INTELLIGENCE (AI) IN THE FIELD OF EDUCATION

According to analysis on the integration of Artificial Intelligence (AI) in education, the focus of this study will encompass the effects of AI on several aspects of the education sector, including administration and management, instructional practices, and learning processes. This portion of the report presents a comprehensive summary and concise analysis of the findings derived from a literature review encompassing multiple studies that have evaluated the characteristics and consequences of Artificial Intelligence within the realm of education.

A. The Nature of Artificial Intelligence

Artificial intelligence (AI) is commonly and predominantly linked with computer systems in conventional understanding. Nevertheless, upon examining multiple articles, particularly within the realm of the education sector, it becomes apparent that although computers have played a fundamental role in the advancement of Artificial Intelligence, there is a noticeable shift away from perceiving Artificial Intelligence solely as the computer itself, its hardware and software, or the equipment involved. The integration of embedded computers, sensors, and other developing technologies has enabled the implementation of Artificial Intelligence in various entities, including machines, buildings, and robots [11]. Scientists offer a comprehensive and nuanced definition and description of Artificial Intelligence (AI). AI is commonly

understood and classified as both an area of study and a theoretical framework. AI is a designated discipline within the realm of computer science that focuses on addressing certain cognitive challenges typically associated with human intelligence. These challenges encompass learning, problem solving, pattern recognition, and subsequent adaptation [11]. In their study, they provided a theoretical definition of Artificial Intelligence (AI) as a framework that directs the design and implementation of computer systems capable of emulating human intelligence. This encompasses various cognitive abilities such as visual perception, speech recognition, decision-making, and language translation [11].

In many scholarly works and research investigations, the definition of Artificial Intelligence (AI) presented highlights comparable features or characteristics of AI. According to researchers, the concept of AI encompasses machines that possess the capacity to resemble human reasoning. In a similar vein, few posited that AI in the education sector is the culmination of extensive research and development efforts involving various professionals such as system designers, data scientists, product designers, statisticians, linguists, cognitive scientists, psychologists, education experts, and others. The aim of these collaborative endeavours is to create intelligent education systems capable of performing diverse functions, including assisting teachers and facilitating learners in the acquisition of knowledge and adaptable skills necessary for an ever evolving world. The author proposed that AI utilizes enhanced functionalities of programs and software, such as algorithmic Machine Learning. This enables machines to execute various activities that necessitate human like intelligence and the capacity to adapt to their immediate surroundings [14]. Also, they provided comparable findings, wherein they define Artificial Intelligence as the capacity of computers and machines to replicate human cognition and behaviours.

Artificial Intelligence, as per the provided definitions and descriptions, pertains to the advancement of machines possessing a certain degree of intelligence, enabling them to execute tasks resembling human capabilities. These tasks cover cognitive processes, learning abilities, decision-making skills, and adaptability to varying environmental conditions. Therefore, there exist distinct attributes and principles that emerge as essential for Artificial Intelligence. The

essential aspect of Artificial Intelligence, as evident from this definition and debate, is the capacity of machines to exhibit a certain degree of intelligence and execute a diverse array of tasks and functionalities that necessitate human like abilities.

In recent times, there has been a significant increase in the research and exploration of Artificial Intelligence (AI) and Machine Learning techniques for integration into mobile devices. The primary objective of these endeavours is to improve the overall computational capabilities of such devices and open up new avenues for innovative applications. Examples of these applications include face unlock functionality, speech recognition capabilities, natural language translation, and virtual reality experiences. Nevertheless, the implementation of Machine Learning necessitates substantial computational power in order to effectively carry out intricate training and learning processes. In response to this matter, several computational efficiency oriented platforms were suggested. In the year 2016, Qualcomm unveiled the Snapdragon Neural Processing Engine, a technology designed to enhance the speed and efficiency of neural network execution through the utilization of its Graphics Processing Unit (GPU) processors. HiSilicon has put forth the HiAI platform as a solution for executing neural networks. It is important to acknowledge that the Android Neural Networks API was specifically developed to efficiently execute Machine Learning models on mobile devices [37]. This application programming interface (API) offers significant benefits to mobile devices by mitigating network latency and simplifying network operations. In the context of Artificial Intelligence (AI) learning networks, it is worth noting that SqueezeNet, MobileNet, and Shufflenet have been extensively developed and optimized for utilization on mobile devices [38]. The advancement of Artificial Intelligence (AI) in mobile devices has elevated the realm of mobile education, offering enhanced convenience and efficiency for students. This progress has facilitated interactive and individualized learning experiences, enabling students to fulfill their educational goals more effectively and efficiently. Virtual reality has the capacity to enhance the educational experience by extending the boundaries of traditional learning environments, thereby establishing a global classroom. This is made possible by the integration of Artificial Intelligence, which enables students to connect with virtual classrooms. Furthermore, AI-powered chatbots offer a customized online learning experience, while also transforming the role of the instructor through chat-based interactions. This device has the capability to evaluate the students' comprehension level.

B. Technical aspects of Artificial Intelligence in the field of education

AI assisted education encompasses intelligent instructional methods, cutting edge virtual learning technologies, and the utilization of data analysis and predictive models. Table I presents a comprehensive compilation of the primary scenarios in which AI is applied within the field of education, together with the essential technologies that facilitate these applications. It is worth noting the integration of AI in education is assuming a significant role, particularly as the demands for learning continue to increase [12]. Intelligent educational systems offer instructors and learners with prompt and tailored training and feedback. These technologies have been specifically developed to enhance the value and efficiency of learning. They primarily utilize various computing technologies, with a particular focus on machine learning. These Machine Learning technologies are strongly intertwined with statistical models and cognitive learning theory [18].

AI systems include a wide variety of Machine

TABLE I.
AI TRAINING SCENARIOS TECHNIQUES

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 Bayesian 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 personalised assistants, real-time analysis

Evaluating the process | Interactive Learning | Analytical Learning | Acquisition of Knowledge

Interference with Knowledge | Artificial Intelligence | Assistive Technology | Vision based

Curriculum | Target | Learner's Private Details | Characteristics | Instructor Information

Description of the Learning Process

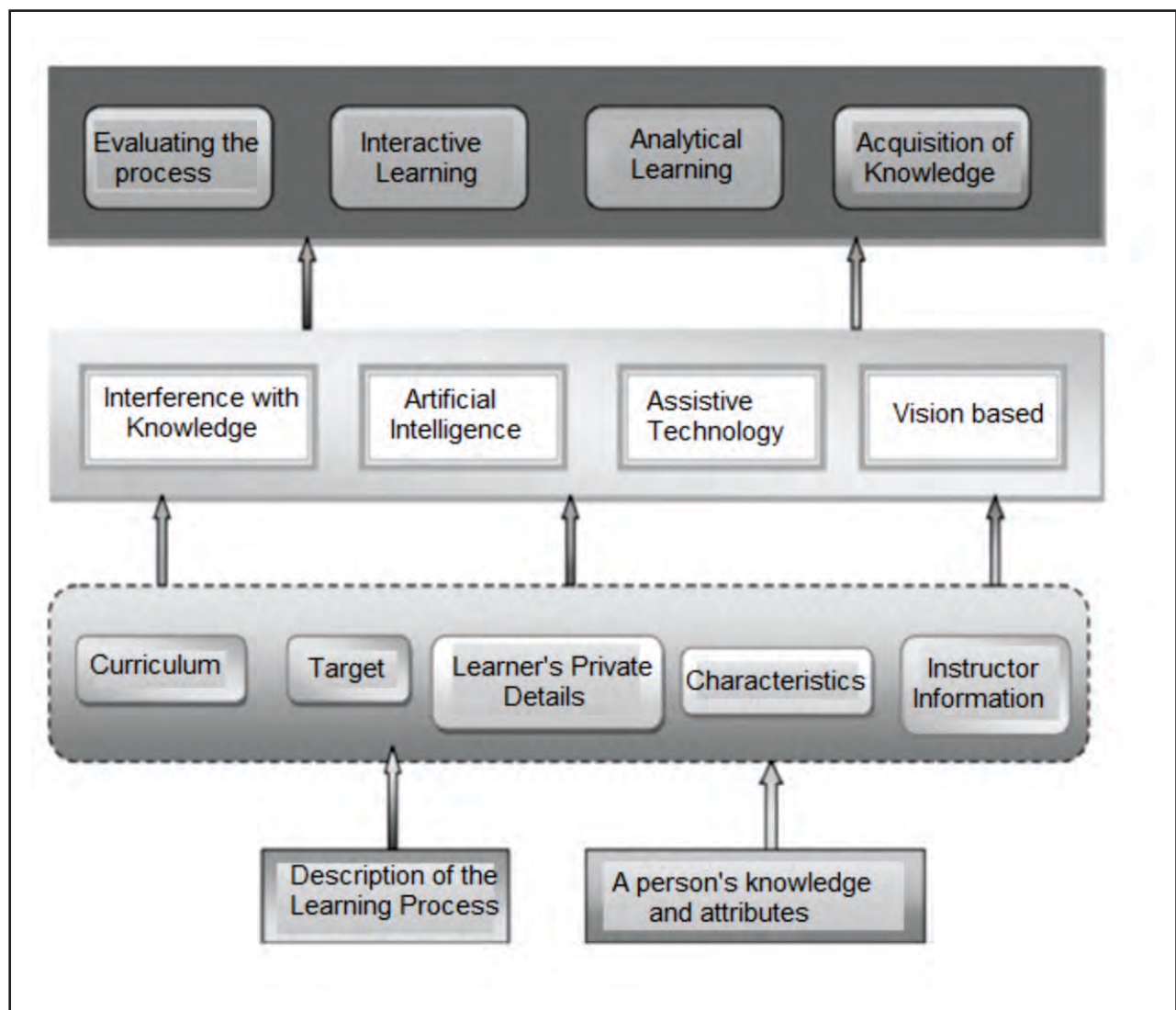A person's knowledge and attributes

Fig. 3. Instructional Technology in Artificial Intelligence

Learning, data mining, and knowledge model based techniques for the purposes of learning analysis, recommendation, knowledge understanding, and acquisition [39]. The two main components of an AI education system are the system model (which includes the learner model, the teaching model, and the knowledge model), and the intelligent technologies [43]. As can be seen in Fig. 2, having a model's assistance in building a data map is vital for enhancing learning because it creates frameworks and rules of association for the data acquired in the field of education [44]. The model serves as the brain of the AI system, while the supporting technologies supply the brain with juice.

VI. ARTIFICIAL INTELLIGENCE BASED LEARNING MODEL

Learner models are essential in AI learning systems because they enhance the system's capacity for autonomous learning. It is established using information about students' actions that is produced during the educational process. In order to evaluate students' potential to learn, their thoughts and talents are dissected. The next step is to map the learner's knowledge using the analysis results. Through the use of learner models, instructors may better understand the impact that different instructional strategies, tools, and resources have on student achievement [39]. The goal of a

knowledge model is to provide a precise map of the knowledge structure that will be used for learning [44]. This map will include expert knowledge, common learner pitfalls, and misunderstandings. By fusing the concepts of the knowledge field model and the learner model, the teaching model establishes the parameters within which students can access the knowledge field, allowing for more personalized lessons. Students are more inclined to act responsibly, show initiative, and reach out for support as educational practices progress. The AI system can provide assistance whenever it is needed using the knowledge it has gleaned from the tutoring model. Input (speech, typing, clicking) and output (texts, figures, cartoons, and organizations) are all part of the user interface, which explains the progress of learners. Natural language interaction, speech recognition, and emotion detection are only some of the AI related features made available by the sophisticated human machine interface.

VII. ADVANCED LEARNING SYSTEMS

Technology in education that utilizes machine learning, learning analytics, and data mining all share commonalities. There are now two groups working on improving education through the use of learning analytics and educational data mining. Machine Learning, data mining, psychometrics of statistics, and data modelling are only few of the fields that can help achieve their shared goals and technologies [41]. As a result, learning analytics is increasingly concerned with Learning Management System's (LMS) and massive-scale assessment data. The field of data mining was developed by specialists in intelligent tutoring systems, which focus on microcognition.

A. Mechanical Intelligence/ Machine Learning

Machine Learning relies on knowledge discovery, which is the process of analyzing a sample of data (called "training data") to identify patterns and generate structured knowledge. For instance, Machine Learning can be used to assist students in making course and even university decisions based on personalized suggestions. To "match-make" schools where kids would thrive, it takes into account students' past performance, future goals, and current interests. Technology like this also allows teachers to see how their students are processing

information [42]. Students may learn more effectively if their teachers modify their approaches to teaching based on their cumulative records. For example, Machine Learning's image recognition and prediction capabilities can be utilized to grade students' written work and performance on tests more efficiently and accurately than any human could. It is worth noting that a lot of people are interested in Deep Learning, a specific type of Machine Learning. Decision tree learning, inductive logic programming, clustering, reinforcement learning, and Bayesian networks are just a few of the popular methods. Specifically, Deep Learning places an emphasis on learning ever more nuanced representations across successive layers. Neural networks, which are models, are organized in layers, and they are used to extract these layer properties.

B. Analytics for Education

Information about students and knowledge objects from the learner model and the knowledge field model is at the heart of learning analytics. Learning analytics is an emerging field that applies cutting edge technologies like Machine Learning to traditionally non-technical domains like schooling. The goal is to personalize learning by adapting strategies and information to each student's unique situation and level of proficiency [40]. Semantics, AI, data visualization, and other branches of learning science are all incorporated. For instance, AI based competence learning, which gathers important student data, can help institutions gain insight into their students and foresee the most useful skills they can learn. Learning analytics take advantage of the adaptable learning potential of AI in addition to a competency based approach to education. AI may analyze a variety of factors to predict which prospective students are most likely to drop out, thereby providing institutions with early warning systems and useful insights. The next hurdle for learning analytics is to expand their focus to include areas such as interpersonal skills, the arts, and literature, all of which add a new layer of complexity to the measurement and assessment of competencies or learning outcomes. One difficulty for learning analytics is that it must be tailored to individual classroom settings while still being adaptable enough to be used in a variety of settings. Supporting learning for students, teachers, and administrators at all levels, learning analytics will become increasingly commonplace as cutting edge methods are integrated into their design.

C. Mining Data

Data mining in education is an attempt to provide students with predetermined and pre-programmed answers. With the use of AI, educators may mine student data to discover new patterns of association and provide relevant knowledge items. Samples of student writing can be mined for insights of student demographics and academic performance [44]. A Machine Learning regression approach can be used to do this, and it can also be used to forecast how well a student will do in the future. Additionally, data mining is developing into a potent tool to enhance the learning process and information mastering, leading to a deeper comprehension of educational contexts and students. Data mining, then, can be thought of as the application of techniques like pattern recognition and predictive modelling to the retrieval of previously concealed knowledge, thereby empowering educators to make changes to existing curricula in order to better serve their students. The ability of data mining based AI to create personalized learning from data in the knowledge sector is an essential application, as it allows students to learn independently at their own pace and determine their own learning technique with the help of AI. With the help of personalized learning, students are able to focus on topics that most interest them and teachers can tailor their lessons to each individual's needs using Machine Learning [43].

VIII. IMPACT OF AI ON THE SCHOOLING PROCESS

In an insightful remark, Timms notes that the education sector is one that is likely to be significantly impacted by AI. This is because AI is very powerful and has the capacity to permeate and heavily create changes in numerous sectors of society. The publications examined show that AI has been embraced and implemented in the education sector, resulting in benefits across a variety of subfields. Specifically, it is clear that AI has been applied in education, especially in administration and teaching, and consequently, influencing or impacting students' learning, within the narrative and framework proposed by scientists, which also forms the scope of the study.

The research's analysis of scholarly sources confirmed that AI has been used in educational institutions, particularly in the areas of administrative

process and task automation, curriculum and content development, classroom instruction, and student learning. Using web-based platforms or computer programs, AI has increased the speed with which administrative duties like assessing student work, grading it, and giving feedback on it may be completed. Curriculum and content development, as well as instructions leveraging technologies like virtual reality, web-based plat-forms, robotics, video conferencing, audio-visual files, and 3D technology are other areas where AI has been applied in the education sector to help students learn more effectively. The educational experience for both teachers and students is enhanced, becoming more productive and individualized.

An additional analysis of the various sources found that the internet and the World Wide Web have made it possible for educational resources to be accessed from anywhere in the world, making AI in education a potentially game-changing development. The accessibility of online learning or web-based learning platforms makes it feasible for students to study best within the context of their own talents, as does the usage of other components of AI, such as language translation tools. The results of the study, which will be discussed in the next part, show that the use of AI in education improves the efficiency and effectiveness of educational administration, teaching, and learning.

Many papers have examined and proved the usefulness of AI in the classroom. Castleberry and Nolen [11] gives an outline of the use of AI in education and the changes that have characterized it. According to them, the most common type of AI implementation in schools has been the use of computers and other computing-related technologies. There is mounting evidence that in step with shifts in the macro operating environment, people are moving away from desktop and laptop computers, and towards online and web-based technologies and intelligent or AI systems [11]. The use of AI in the classroom is evolving beyond desktop computers to embedded systems like robots or cobots that collaborate with educators or operate independently to carry out teacher-like tasks [11] [12][13]. The use of computer embedded systems such as those found in smart classrooms and cobots, is one example of how AI in Education (AIED) is evolving beyond the traditional conception of the term and away from a singular focus on computers. This is in agreement with a claim made by scientists, who argued that AIED is taking on a variety of forms.

According to Huang and Zou et al. [14], definition and description of AI in education provides an overview and summary of the nature of application of the same in education. Even from a review of other works, there is evidence of AI going beyond and above the conventional perception of AI as computer systems only in the context of application in the education sector. Therefore, it follows that AI in the classroom is intended to do more than the typical tasks associated with computers. According to Huang and Zou et al. [14], the traditional view of the many uses of technology in education, including web-based, online, distant, and computer-assisted instruction courses and learning, has been rendered obsolete by AI.

The evaluated publications show that there are a variety of ways in which AI can be used in the classroom. As Nolen et al.[11] pointed out, AI has several potential uses in education, some of which include creating and evaluating course materials, evaluating student progress, and facilitating dialogue between instructors and students. Case in point: research by Nolen et al. AI has been widely used in the classroom for a variety of purposes, including lesson planning, student-teacher interaction, grading, and evaluation. Examples of AI platforms and applications provided by Nolen et al. include Intelligent tutoring systems like ACTIVE Math, MATHia, Why2Atlas, Comet, and Viper, which have been used by educators or instructors for a variety of subjects across a variety of grade levels, and Interactive learning environments (ILEs), which are used to manage performance and provide feedback and exchanges between teachers and students. There are parallels to this in other research as well.

Bodily and Kay et al. [13] made similar points, noting that AI has already been implemented in the classroom in the form of adaptive learning systems, intelligent tutoring systems, and other technologies that enhance the quality of administrative operations, classroom instruction, and student learning. Huang and Zou et al. agreed noting that AI in the classroom typically takes the shape of smart systems with flexibility and adaptability [14]. These principles and features of the systems allow AI in education to take on a variety of roles that were once performed by human teachers, while also enhancing students' learning experiences through coaching and tailoring instruction to meet individuals' specific goals and preferences [14]. Another aspect of AI in instruction described in the article is virtual reality (VR) and three-dimensional (3D) technology, with scientists noting that VR presents enormous opportunities for the learning process, integration of simulation, and 3D technology.

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) has made the observation that AI has invaded many areas of life, including education [16]. This is especially true in terms of instructional or teaching methods, approaches, and technologies. As a result of environmental shifts, AI is also being applied to the fields of education and administration. Indeed, AI must be incorporated into teaching and learning because education is evolving in line with the employment or professional sector [17]. The medical field, for instance, makes extensive use of AI. Thus, it is important to familiarize future doctors with the technology early on in their training [17]. Other studies and publications back up the trend and points brought up by Okonkwo and Ade-Ibijola et al., showing how AI may be used in many contexts inside the classroom [17].

According to the analysis, another trend or use of AI in education is AI in web based education. According to Alam [18], Adaptive and Intelligent Web-based Educational Systems (AIWBES), are quickly replacing the straightforward exploitation and utilization of the internet and the World Wide Web, or the "just-put-it-on-the-Web" method. Artificial Intelligence web-based education systems (AIWBES) are those that use AI principles and technologies to enhance online education. In fact, Heradio and Torre et al. detail the incorporation of AI into web-based platforms as well. With the rise of online education, they argue that Intelligent Web Based Education (IWBE) has become increasingly significant as a pedagogical tool that incorporates and leverages AI in web-based education (WBE) and other intelligent methods, tools, and theories for modelling engineering agent-based systems and technologies [19]. According to the results of their research, IWBE entails taking into account a variety of factors such as the learner's prior knowledge and competence, learning, performance capacities, and compatibilities in order to better facilitate teaching and learning. According to Heradio and Torre et al.'s [19] research, "studying and understanding different social agents, teachers, and students leads, an integral part of the IWBE ensures the development and use of robust, intelligent, interactive, learning, and adaptive AI systems in education, especially on the web, which is accessible from anywhere in the world [19]". Evident from the evaluation of the nature of application of AI in

education and as listed in the UNESCO report, AI has the potential to foster improved access to learning by removing barriers to learning, automating management and administrative functions in academic institutions, optimizing instructions and learning, and fostering empirical or evidence based decisions and initiatives in education [16]. As a web based service, it has the potential to enhance the classroom setting for both teachers and students. Teachers' time can be freed up by using AI to evaluate papers and tests. In addition, it allows students to tailor their education to their own needs by letting them choose from a variety of curriculum pathways. The three distinct roles that AI can play in educational settings are illustrated in Fig. 2. In the sections that follows, you will discover a summary of the research done on the topic of using AI in the classroom.

IX. AI AND SCHOOL ADMINISTRATION

This section provides a brief overview of the research done on the use of AI in educational settings, with an emphasis on institutional management. In education, the performance of various administrative duties, such as reviewing student assignments and papers, grading them, and providing feedback to students, has been identified as one of the important areas likely to be impacted by AI. As stated by Bodily and Kay et al., when it comes to institutional and administrative functions, AI has proven to be very useful in the realm of distant and online education [13]. Some tools like Knewton make it easier on teachers since they let them provide pupils immediate feedback based on their actions within the software. There are parallel arguments in other studies and publications that focus on systems to facilitate administrative duties.
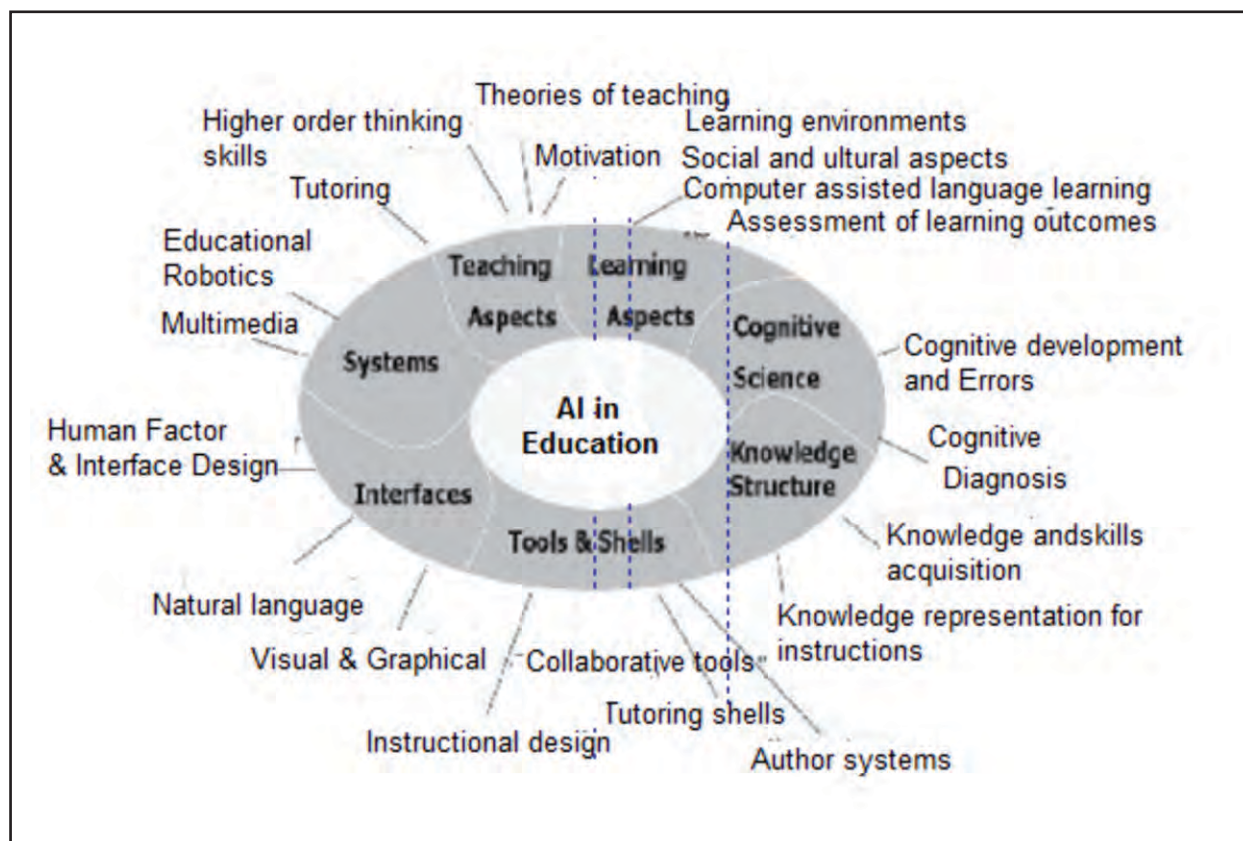

Fig. 4. The functions AI provides in educational scenarios

For instance, Alam [12] proposed that Intelligent Transport Systems (ITS) have many uses, including grading and providing students with feedback on their work. By collaborating with ITS, teachers may become more effective at both the administrative work they must do and the teaching that is vital to their students' academic success. These investigations are bolstered by the findings and arguments presented by Natale and Repetto et al.; the use of AI in education has improved the efficacy and efficiency of administrative duties like the grading of students' assignments [15]. Indeed, a look at the current state of the online classroom reveals software that helps teachers with administrative responsibilities like TurnItIn and Ecree, which provide suggested grades and detect instances of plagiarism in students' work. In the absence of AI, teachers would need a great deal of extra time to complete a variety of administrative responsibilities.

X. USE OF AI IN EDUCATION

According to publications used in the analysis, AI systems have been increasingly implemented in the realm of education and training. AI has allowed for the development and rollout of systems that are clearly very potent teaching aids. The use of these resources has led to higher standards in education. Articles are rated based on their discussion of and emphasis on various platforms and applications of AI as a teaching aid. Niankara talks about how AI can be used in the classroom in a variety of ways, including through simulation based instructions that make use of various technologies like virtual reality to show students concepts and materials in a hands on way [7]. Similar ideas being explored in other research, as is the use of VR components as an AI component in the classroom. Virtual reality, together with 3-D technology and highly interactive simulation, has been lauded as an effective teaching tool by researchers like Natale and Repetto et al. [15]. Wartman and Combs highlight the application of AI in medical education through virtual reality and simulation, which guides students through hands on experiences in areas like surgery and anatomy.

The incorporation of AI into machines or robots, the development of effective instructional tools, and the enhancement of the quality of applied pedagogical tactics have all been the focus of other research. As Niankara points out, robots that incorporate AI in education principles are being developed and used as teacher assistants and colleagues, cobots, and are being put to use doing everything from teaching students to read and pronounce words to grading their homework [7]. Bodily and Kay et al. [13] noted that improved teaching tools have been developed and used as a result of the integration or use of AI in education, especially integration with other technologies and usage as instructional tools. Huang and Zou et al., however, also highlight the incorporation of AI into computer programs, as well as the creation and use of chatbots, or online computer based robots with conversational and dialogue abilities to answer common student questions and disseminate course materials [14]. AI enables the humanoid or other robots to think and make decisions, engage in discussion and discourse, and thus, be used as a teaching tool.

In addition, the articles were analyzed to uncover more uses of AI in the classroom. For instance, numerous articles describe various types of intelligent teaching systems. For instance, Alam [12] note that the integration of animated conversational agents, such as chatbots or cobots has fostered the realization of ITS's potential for efficacy as a teaching tool. Similar ideas are emphasized in Huang's discussion of AI's educational applications, such as in Computer-Assisted Language Learning (CALL), which gives students or learners individualized guidance, and in writing and translation aides in language study [14]. Also mentioned are other ways that AI is being used in education, in particular in the form of instructions to carry out teacher or instructor responsibilities. Alam [18] discussed web-based education platforms that combine AI with teacher skills. He examines the application of AI in web-based education, specifically with regard to the usage of AIWBES in teaching, and how the platform can incorporate teacher-like characteristics to make it a powerful supportive pedagogical tool. Teachers are viewed as social agents in Heradio and Torre et al.'s (IWBE) discussion of intelligent and adaptive web-based systems, which seeks to understand and support teachers in the discharge of their mandates, to provide instructions and directions to students, with the goal of ensuring that the technology, web-based education, used in education is efficient and systematic way to improve learner experience [19]. AI has been utilized as a standalone teaching strategy or to assist teachers in carrying out their duties in a variety of contexts and context-specific contexts.

XI. LEARNING AI

The study also encompasses the process of learning, which is fundamental to education. Different ways in which AI has been accepted, implemented, or leveraged in supporting students' learning were determined from an evaluation and analysis of the many publications included in the study. It was also determined which applications and software programs make use of AI to boost educational outcomes for students. Customizing and personalizing curriculum and information in accordance with the learners' needs, talents, and capabilities [15] is a significant way in which AI has been employed to enhance students' learning. Learners' intake and retention of information, the bedrock of learning, are enhanced by other methods that provide a more enjoyable and engaging or experiential learning experience [15], [17]. From a different angle, the use of AI in education has made it possible for people all over the world to have access to the same educational resources by way of the internet [13], [15].

Various systems and software were uncovered from the articles. The learning experience can be enhanced by using a platform that allows for the individualization of content, which in turn increases the likelihood of information absorption and retention. For example, Nolen, which uses Machine Learning algorithms to deduce a student's preferred learning style and then gives real-time recommendations about what they should study based on that information [11]. Cerego, Immersive reader, and CALL are a few other platforms with similar capabilities; together, they have the potential to enhance the educational experience for students from kindergarten through graduate school [11], [14]. Huang and Zou et al. further noted that the usage of AI and chatbots enhances students' learning experiences since they employ a machine learning algorithm to tailor content to each individual learner's strengths and weaknesses [14]. The author goes on to discuss how AI is being used to enhance the educational experience by means of machine translation tools, adaptive education systems, and intelligent tutoring systems. AI can be used in a variety of ways to tailor lessons and resources to each individual student.

However, it is clear from reading around other articles that other AI applications were shown to have significant impacts on the educational experiences of students. Deep learning has been shown to improve student outcomes in a number of ways [13], including through the use of simulation based learning and Intelligent Tutoring Systems (ITS). The same idea is emphasized by Natale and Repetto et al., who likewise notes that pupils benefit from virtual reality and simulation [15]. With the gradual gravitation towards keeping pace with the application of AI in industry, it has been shown that the usage of simulation, virtual reality, and other parts of AI in learning better prepares students for future trends [17]. AIWBES is another way that AI is being used to improve the educational experience for students. AIWBES is more flexible than its predecessors and can produce unique lessons for each student [18]. Alam [18] claims that AIWBES's interactive problem solving feature will collaborate with students to provide intelligent support throughout the many stages of the problem solving process. IWBE, or intelligent and adaptive web-based systems, particularly Multi-Agent Systems (MAS), have a learner component, with the learner integrated as a social agent, in which the system focuses on understanding learner behavior and adjusting accordingly by generating content relevant to the learners' needs [19]. Heradio and Torre et al. highlight and discuss these same capabilities of AI in web-based education [19]. It is clear that AI integration or adoption and use in education has had a significant impact on the educational process as a whole, with a primary focus on enhancing the student learning experience.

XII. RELATION OF AI WITH EDUCATION

The purpose of this research is to evaluate the effect that AI has on classroom instruction. Only in part is the underlying research question addressed by an evaluation of the many applications of AI in education, with particular attention paid to administrative chores, classroom instruction, and student learning. According to Bodily and Kay et al. [13], incorporating AI into education has the potential to radically alter several facets of the field. The influence of AI on teaching can be seen, in part, through an examination of the field's other applications. Based on the findings from the articles, this section provides a more in-depth exploration and explanation of the actual effects of AI on administration, instructions, and learning.

A. Administration of Schools

The performance of administrative and management tasks in education has been profoundly affected by the use of AI in its many forms and for a variety of purposes. It has improved teachers' ability to carry out administrative tasks like grading and giving feedback to students. To facilitate grading and feedback for students, AIWBEs programs have integrated features that supply teachers with grading instructions [14]. Knewton and other systems with similar capabilities and features allow teachers to grade students and give them feedback on their performance in order to promote ongoing progress in their learning [13]. AI has improved teacher or instructor efficiency and effectiveness in offering instructions and guidance to pupils, and has made the performance of administrative chores easier. A variety of administrative activities, such as grading and providing feedback can be performed by teachers with the help of many features of intelligent tutoring systems [12]. Grammarly, Ecree, PaperRater, and TurnItIn are just a few examples of AI powered tools that help teachers with administrative tasks like detecting and preventing plagiarism, grading student work, and giving constructive criticism. Because of AI, teachers are able to devote more time to their primary responsibilities that are teaching and disseminating content and materials in accordance with the institution's or country's curricula [11], [13], and less time to paperwork and administrative tasks. There was evidence of improvements in the quality of administrative processes and tasks, as well as the effectiveness and efficiency of the instructors or educators in the performance of various administrative tasks in the articles that did cover this area of education.

B. Instruction

The investigation also looked at how AI is being used in classrooms and how teachers are using it to teach. Articles analyzed revealed quick adoption and usage of AI in various forms by educators for pedagogical reasons. The application of AI in the classroom or as a pedagogical aid has had far reaching effects on this facet of schooling. According to the literature study and analysis, it has led to an increase in instructor productivity without sacrificing quality. Effectiveness is evaluated by how well students or learners absorb and retain the material, or how well they demonstrate mastery

of the material, while efficiency and quality are determined by how well the material is delivered in accordance with the curriculum and taking into account the learners' individual needs and abilities. The study's findings suggest that AI has contributed to the actualization of quality, effectiveness, and efficiency in instruction or teaching, which is consistent with the operational definitions and descriptions of these concepts provided in the study's introduction.

Artificial Intelligence has helped make teaching more efficient. Evidence based or empirical evidence backed methods, such as the widespread use of cognition and learning models have been proposed by Alam [12] to account for the success of ITS in improving students' ability to absorb and remember information. In fact, as discussed by Alam [12], programs like DeepTutor and AutoTutor are learner centered in that they encourage customization and personalized content in line with the learner's capabilities and needs, thereby enhancing learner experience and increasing the likelihood that learning goals will be met. Moreover, Nolen's arguments show that AI has improved the quality and efficacy of education systems by making them more responsive to individual students' learning styles, and preferences through the use of adaptive technologies [14], especially in online and web-based learning platforms, AI ensures improved dissemination of course content, beginning with the curriculum building process and ending with the actual delivery of content or instructions.

According to Natale and Repetto et al., better pedagogical tools for online and web-based learning platforms were made possible by the growth and use of AI, particularly when AI was integrated into these platforms [15]. Other research that were reviewed found the same gains or enhancements to learning. According to Heradio et al. [19], adaptive IWEBS and instructions based on observed and learned learner behavior allow platforms to improve learning quality and instructional efficacy through customization of AI-backed pedagogical methods. As Pappas and Drigas point out in their research, "ITS tailors, individualizes, and personalizes learning, whereas Computer Aided/Assisted Learning (CAL) and Computer Based Training (CBT) take a generalized put it all on the web approach that may not address the learning needs of the student" [20]. Pedro and Subosa, in a discussion of the developments in AI and its applications in education, summed up the impact of AI on education by noting that

AI, in particular tutoring or instructional systems, have been designed with the aim of solving the various challenges eminent in one-on-one teacher-student tutoring, thereby improving the overall quality of instructors' work [21].

Other significant motifs, or ways in which AI has impacted the quality of instructors' works were also uncovered through the investigation. Plagiarism checkers, online proctoring, and online supervision of students' actions on sites like Grammarly, TurnItIn, and White Smoke have all been cited as examples of the technology's positive impact on academic integrity in a number of studies [23], [24], [25]. Other studies have discussed the advantages of simulation, team-viewer applications, and gamification, all of which are closely related to VR and 3-D technologies or even leverage the technologies in pursuit of instructional effectiveness and efficiency [26], as well as gamification, which leverages AI for instructional purposes, with significant benefits to the instructional quality. Enhanced skills and human like looks of expressive humanoid robots with dialogue and conversational capabilities have been highlighted in other research [28], [29], [30], [31], [32], [33] for their potential to improve instructional quality through increased learner engagement.

C. Learning

The learning experiences of students are other areas of education investigated here that have been profoundly affected by the introduction and application of AI. Working with the conversational agents that make up an integral part of the system will probe and prod students until they are able to adequately explain themselves in detail, including the reasoning behind their position, which in turn improves the uptake and retention of information, as Alam et al. [12] note in their summary of the effect of AI on learning. Numerous studies, including this one, have illustrated the many ways in which AI might improve students' educational experiences. AI allows for the monitoring of a learner's knowledge and comprehension gains, with the data then being used to improve the system's ability to tailor content to the individual learner, thereby increasing engagement and retention [12], [14]. Intelligent virtual reality and the use of the same in simulation teaching and learning, for example, have been shown to have a positive impact on learning [14], which Nolen attributes to the fact that AI

has made their creation and use possible. Similar points are made by researchers, who note that the use of simulation and related technologies gives students access to real-world examples and hands-on experience, thereby enhancing the quality of their education. The studies reviewed by the authors of this article also highlight the advantages of virtual reality and three-dimensional learning environments.

Other research that looked at web-based platforms reveal additional AI benefits and its impact on learning quality. When discussing the core principles or building blocks of AIWBES, such as adaptive hypermedia, information filtering, class monitoring, and collaborative learning, among others, Alam made the observation that these features all promote student cooperation, discussion, and knowledge acquisition [18]. Heradio and Torre et al. [19] note similar advantages of web-based platforms when discussing the connection between AIWBE and higher quality learning as a result of the system's ability to modify and tailor instructions and content based on identified and assessed learner behaviours. Such educational approaches for the AIWBE might be adapted, for instance, by using online information about the learner, such as completed activities, learning tracking, time, and other components. Facilitating worldwide access to education and making education more affordable are two additional benefits of web-based platforms that have been shown to promote learning [20]. In most cases, these mediums have improved the educational experience.

Further research highlight further AI related benefits to learning and impacts on learning. For instance, AI has been utilized to promote academic honesty and integrity [23], as well as to enhance study and learning using tools like TurnItIn's revision aid and Pearson's Write-to-Learn [24], [25], [27], [28], [29]. However, some researchers have drawn attention to the potential negative consequences of AI on education. According to the research conducted by Brieger and Arghode et al. [24], students' use of paper mills and paper churning sites or platforms may be encouraged or made easier by AI. However, as shown in a number of other researches [35], [36], the benefits of AI to learning generally outweigh the difficulties.

XIII. EVALUATION OF TEACHER AND STUDENT RESULTS

It will be interesting to see how AI, as an intelligent system influences the efficiency of the classroom. AI systems will be useful in reducing teachers' workloads as enrollment grows in educational institutions. Instructors can benefit from AI systems that analyze course materials and syllabi and then recommend relevant material [11]. Exams can be made and graded automatically by these systems as well. In the long run, this would allow teachers to concentrate on matters of greater importance, such student achievement. AI solutions can better evaluate studying data, assisting teachers in developing unique programs of study for each student in autonomous learning and individualized instruction. An emerging problem for AI in classrooms is human prejudice. An AI approach can eliminate prejudice in grading by using a set of standards and rubrics to evaluate student work [41] [42]. AI systems that rely on computer vision to read and detect handwritten paper pictures can accomplish this. Systems like this also discourage students from engaging in dishonest practices like plagiarism and cheating [43].

Data analysis by AI systems has helped teachers identify and remediate their students' learning gaps at an early stage. The conventional school system generally treats students the same [44]. Therefore, the best results in education cannot be achieved by applying a single strategy to all students. Using each student's unique personality, capabilities, and complimentary skills, AI might recommend a specialized approach to instruction. In this approach, the educational experience can be enhanced for all students. While doing so, it aids in the development of a student's knowledge system through enhanced learning skills, routines, and originality. Students' individualized academic journeys are supported by AI systems that analyze their academic data and make predictions about their future careers. Students can improve their academic performance and acquire marketable skills when they tailor their studies to their unique strengths and career goals.

From what has been said previously, it is clear that AI has considerable promise in automating and speeding up administrative chores for both institutions and teachers [7]–[10]. Already, AI can automatically grade assignments and evaluate essays, freeing up teachers' time to work one-on-one with pupils. Designers of AI systems are also working on improving the grading of written assignments and tests. AI is being used to design flexible digital learning interfaces appropriate for students of all ages and grade levels. According to Brightspace's developer, Nick Oddson, AI can help teachers understand more about their students by analyzing data from the full ecosystem of learning resources they use. Robotic tutoring devices help students who are having trouble understanding the course material. In the past, students had to wait until office hours or send letters to their professors in the hopes that they would be answered [11], [12]. These days, you can find intelligent tutoring solutions like Carnegie Learning that use individual students' data to tailor their feedback and instruction. One day soon, AI will be able to serve as a fully functional assistant, able to accommodate a wide range of teaching and learning approaches. In particular, it assists educators and learners in all aspects of their education.

XIV. ANALYSIS AND DISCUSSION OF RESULTS

Computers, computer-related technologies, and other innovations have fostered the growth of AI, which has spread throughout many areas of society and has the potential to have far-reaching effects on the industries in which it is employed. This is evident from the articles and studies that were reviewed. The educational sector is one area where AI has been utilized and is having a significant effect. A definition and description of AI were seen as necessary in order to comprehend the influence of AI on schooling. Varied definitions of AI were derived from the research that were analyzed, and these definitions revealed varied tenets, traits, and the nature of AI. As the name suggests, a central feature and principle of AI is intelligence, a quality that has previously been limited to human beings [4], [5], [7], [11], [16], [24], [35]. Intelligence endows machines with cognitive, learning, adaptability, and decision-making capabilities similar to those of humans [6], [13], [16], [19], [22]. This includes AI, computers, and by extension embedded systems like robots and facilities. The educational sector, and universities in particular, have been afforded an opportunity to harness and use AI as a result of the breakthroughs and advances that have culminated in the development and usage of AI.

Indeed, as evidenced by the plethora of materials

examined and synthesized here, the adoption and usage of AI in the classroom has taken all shapes and sizes. Scope areas determined from the description of AI application in technology [11], [15], [19] indicate that AI in education first took the form of computers and computer related technologies used to execute a wide variety of administrative activities, instruction, and to stimulate learning among students. Humanoid robots (cobots and chatbots) perform, independently or in collaboration with human instructors, educators' duties, including the dissemination of learning materials and grading assignments. These developments and innovations foreshadowed the development and use of AI in web based and online platforms, and robotics. Furthermore, it is clear from the analysis and descriptions of the platforms offered in the various reviewed publications that AI application in education in its various forms, has accorded learners a richer and more satisfying learning experience [19], [22], [25], [31], [34], [35].

Therefore, it can be deduced from the analysis that AI has had a substantial effect on the educational sector as a whole, and on its implementation in specific educational institutions. Administrative chores like evaluating, grading, and providing feedback to students on submitted assignments can be completed more quickly and accurately when teachers or instructors use or use AI. Improved teaching quality is another benefit of incorporating AI into the classroom. AI comes in many forms, including web-based and online intelligent systems, cobots, and chatbots. Students, on the other hand, benefit from AI's use of Machine Learning, as evidenced by the aforementioned studies, because AI uses Machine Learning to assess capabilities and needs, and then uses the results of such an analysis to develop and disseminate personalized or customized content, which guarantees higher uptake and retention and thus, improves learning.

Additionally, AI improves students' learning experiences by presenting them with practical or experiential learning opportunities, especially when combined with other technologies like virtual reality, 3D, gaming, and simulation. The erosion of academic integrity and cheating via paper churning and paper mill services made possible by AI were both explored or underlined in a single study. The majority of the reviewed research provided concrete examples and thorough explanations of how AI might be utilized to improve educational settings in a variety of ways. The benefits, or pros, far outweigh the drawbacks, or cons.

At this point in time, AI learning is mostly seen as an education aid, but as time goes on and learning requirements evolve, the function of AI-enabled education will grow in significance. It has not yet achieved the highest intelligence level in intelligent education, but it does offer courses of varying difficulties based on simple rule judging. Research into teaching AI systems has utilized both a knowledge map and a probability model. More data will be generated by AI systems as they engage with the educational process more frequently, painting a more complete picture of the teaching and learning process and allowing for more precise information recommendation. AI technologies will help teachers and students by providing high-quality materials that are supported by learner analytics, Machine Learning, and data mining. In this phase, users can choose from several viable strategies for arriving at the right solution to any given puzzle. The ideal AI system of the future will mould students' imagination and creativity by assessing their learning style, emotional state, and initiative to boost students' ability to learn, their capacity for original thought, and their motivation to take personal initiative. The widespread adoption of AI systems has broad implications for education, including the enhancement of students' general competence, depth of knowledge, capacity for learning, and prospects for future employment.

XV. CONCLUSION

The study set out to determine how AI affects classroom performance. The study was qualitative and made heavy use of the literature review technique. The research goal was advanced by locating and analyzing relevant journal papers, professional publications, and reports from professional conferences. Advances in computing and related technologies foreshadowed the discoveries and breakthroughs that would eventually lead to the widespread adoption of AI across industries. AI has been shown to have a significant impact on the sectors it permeates, and its development and use have been encouraged by the proliferation of computing power and the ability to integrate or embed computer technologies in a wide variety of machines, equipments, and platforms. The educational sector, specifically educational institutions, has been an early adopter and

user of AI. The research looked at the ways in which AI has been implemented in the school system and the implications it has had on administration, classroom instruction, and student learning.

AUTHORS' CONTRIBUTION

Umme Thayyiba Khatoon (Ph.D.) conceptualized the research, conducted the analysis, and prepared the draft transcript. Rafeef Ahmed Madkhali (Ph.D.) worked on the literature review and revised the draft. Both the authors collectively finalized the article.

CONFLICT OF INTEREST

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About the Authors

Umme Thayyiba Khatoon is a dedicated teacher and researcher. She is a Research Scholar at Kakatiya University, Warangal, Telangana with Department of Commerce and Business Management. She has more than 15 years of teaching and research experience in Human Resource Management, Strategy, Entrepreneurship, empowering women for sustainable development in global economic growth at Jazan University in Saudi Arabia. In addition to lecturing, she has attended conferences, conducted workshops, mentored, and written many articles promoting her subject.

Rafeef Ahmed Madkhali is an accomplished and dedicated academic. She has an MBA from Cardiff University, UK. Her insightful research projects have focused on the influence of Saudi Arabia's 2030 vision on women leaders in politics. In her career progression, she has sought hands-on business experience. She has been working as a Lecturer at Jazan University since 2014, demonstrating her commitment to sharing knowledge and mentoring future business leaders.

She is a Certified Business Manager (CBM), underlining her robust managerial skills and solid business insight, always looking for opportunities to effectively contribute towards success.