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PAPER

Role of AI in Education: A Review

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ABSTRACT

In general, recent developments in AI or artificial intelligence have resulted in positive expectations about the future effects of AIED or AI in education and learning. However, it is important to note that most of these expectations are usually based on misunderstanding the current possibilities and lack of awareness about the current applications of AI in education. That is why in this review paper, a detailed review of the role of AI in education is offered together with a typology of AIED. Different AI systems in education are reviewed, and the obstacles of AI in education are also identified and discussed that must be addressed to make sure that AI systems can be better used in the field of education.

KEYWORDS

artificial intelligence (AI), AIED, applications of AI, typology of AIED

1 INTRODUCTION

1.1 Brief history

Typically, the history of AI, or artificial intelligence, in education goes back to the development of systems that are designed for improving learning by mimicking different cognitive processes. In fact, early AI systems known as ITS or Intelligent Tutoring Systems were built for offering learning experiences that were adaptive and personalised [11]. These systems were based on the idea that the human brain works like an information processor and learning is focused on the improvement of abilities of problem-solving. Different cognitive architectures that could mimic these brain functions were at the centre of many of these AI systems [21]. One major influence on AI in education was the work of Georg Polya in the 1940s. His book, How to Solve It, introduced the idea of using heuristics or shortcuts for solving problems. Polya believed that problem-solving involved narrowing the gap between known information and the needed solution by using systematic methods like understanding the problem before making a plan and carrying it out and reflecting on the result [31].

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In the 1950s, experts like Alain Newell and Herbert Simon took these ideas further by programming computers with different problem-solving heuristics and showed that computers could process symbols and solve problems just like humans. Their famous program, The General Problem Solver, showed early AI's potential in education [27]. Technological advancements in AI for education were affected by earlier efforts, such as the creation by Sidney Pressey of the first mechanized MC, or multiple-choice machine, in the 1920s. His machine offered immediate feedback to students and helped them in learning while saving teacher's time [32]. Similarly, B.F. Skinner made a "teaching machine" in the 1950s, which allowed students to make their own answers and acted like a modern ITS. In the 1970s, the application of AI in education advanced further with the SCHOLAR System of Jaime Carbonell. This system used AI for responding to student inputs on the basis of a network of concepts, which was a major milestone in the integration of AI techniques in educational settings [6]. Over the years, the development of new technologies has led to wrong expectations and misunderstandings about their possibilities. For understanding where AIED or AI in education and learning is going, it is important to understand where it started from. That is why this paper takes a look at the actual role of AI in education and the possible obstacles that it experiences.

2 METHODS

In this review paper, a qualitative approach is taken for collecting information and synthesising it. As the title of this paper suggests, it uses the method of a qualitative literature review to make sure that enough data is collected and synthesised for studying the topic. This approach is taken because it suits the topic and allows the exploration of different studies relevant to the topic in its context. Different databases ranging from Google Scholar to JSTOR have been used to collect relevant and credible sources from where the required information can be obtained without a problem.

3 REVIEW

3.1 Artificial intelligence

Actually, AI is a field that has been defined in many different ways, and there is no definition that is universally accepted. The concept of AI refers to machine-based systems that are capable of performing tasks that typically need human intelligence, like decision-making and learning [28]. Different definitions focus on different aspects of AI, depending on the context in which it is used, and some early definitions of AI focused on the ability of machines of mimic human thought processes. AI is described by a classical definition as technology that is capable of carrying out tasks that would need intelligence if done by humans [46]. This idea is based on the work of Alan Turing, who determined that if a machine could imitate human behaviour so well that it was indistinguishable from a person, then questions about whether the machine was truly intelligent would become irrelevant [13].

Usually, AI is often categorised into two main approaches, including data-driven AI and knowledge-based AI. Data-driven AI, also known as machine learning, depends on a large amount of data for making predictions or decisions, while knowledge-based AI uses rules and logic that are pre-programmed for solving problems [17]. Both approaches have played major roles in the development of AI, with data-driven AI being more focused upon in recent years. A definition that is quite influential is offered by UNICEF, and it defines AI as systems that can make predictions and decisions on the basis of objectives defined by humans [44]. These systems interact with and influence their environment and often seem like they are working autonomously, appearing to operate autonomously.

3.2 Data-based AI

Data-driven AI has advanced to a large extent in recent years, particularly in fields like computer vision and robotics, among others. The basic idea behind data-driven AI is simple: with enough data and a method of improving its predictions, a computer can gradually learn to make better decisions. This process works by adjusting the behaviour of the system when it makes a mistake and focusing on correct predictions, all with the aim of improving the accuracy of its predictions [1]. The challenge is in determining how the system should change its behaviour and this is solved with the use of basic calculus. Through the calculation of how changes in the parameters of the system affect its output, these parameters can be adjusted incrementally by AI for improving performance. This improvement process, which happens over millions of iterations, is referred to as "training" the model. The AI is expected to carry out well on new data it has not seen before after it has been trained, which is also called "generalisation" [26].

It can be said that one popular method in data-driven AI is known as "deep learning", which involves several layers of artificial neurones that are interconnected and process data [23]. Lower layers basically in the network learn to identify simple features in the data, like edges in images, while these features are combined by higher layers for recognising more complex patterns such as objects or faces. This method has been highly effective in tasks such as image recognition and even playing complex games like chess [2]. Actually, the development of data-driven AI has been facilitated by three main factors. First of all, developments in computing hardware like GPUs, or graphics processing units, have allowed a large number of calculations needed for training different AI models. Second, the availability of large datasets from the internet that include videos and texts, among other things, provides the raw material for the training of these models. Third, the involvement of humans labelling data, such as in projects like ImageNet, has been very important in training many of the AI systems that have made advancements [4].

However, a number of challenges are faced by data-driven AI. An important issue is the sheer amount of computational power and energy that are needed for training large models, such as OpenAI's GPT-3, which uses a large amount of energy and data, which tends to raise concerns about environmental effects [9]. Moreover, different ethical issues are faced when data is used without approval, as seen in cases like the use of personal photos by Facebook for training the algorithms of facial recognition.

3.3 Knowledge-based AI

Even though data-driven AI has obtained most of the attention in the past few years, AI based on knowledge continues to be very important, especially in different areas like education. The main idea behind this is to obtain human knowledge in a form that can be processed by different computers. Typically, these systems are often recognised as expert systems because their aim is to mimic the decision-making of the expert level. However, in spite of their usefulness, in the 1980s, expert systems decreased in popularity because of the high costs of making and maintaining knowledge models [42]. Knowledge-based AI in education is often used for making domain models that describe the structure of the subject that is being taught. These models are effective in subjects such as physics and mathematics, where the rules are defined properly and stable over time. In less formal fields, however, making and maintaining these models can be complex and costly. Moreover, this challenge has limited the broader use of knowledge-based AI in fields with proper structures of knowledge [3].

In contrast with data-driven systems, where the computer is known for learning from data through trial and error, AI systems based on knowledge depend on rules that are obtained from experts in the field. An inference engine is used by these systems for applying stored rules for making decisions or solving problems [35]. The system is allowed by this rule-based approach to carry out logical reasoning that is like human experts. Because predetermined rules are followed by the system, its behaviour is predictable and can be explained through the evaluation of its programmed logic. Actually, in education, these systems have been the major part of AI for many years, especially in different ITSs. Structured learning environments are offered by these systems where students can learn complex subjects' step by step. Still, in contrast with data-driven AI, which is capable of improving with new data, AI based on knowledge tends to be more static [25]. In the case of AI systems based on knowledge, the same output will be produced always by the given input on the basis of programmed rules, which makes these systems highly explainable but less flexible.

3.4 Taxonomy of AI in education

Actually, AIED or AI in education can be applied in a number of ways, which makes it challenging to make generalizations about its effectiveness. Considering the fact that there are so many different forms of AIED, it is important to clarify which type is being discussed, as some applications are still under speculation, and others tend to raise concerns. For guiding the discussion, it is important to classify different AIED tools into three main categories, including institution-, student-, and teacher-focused AI [18]. The following figure shows a very comprehensive taxonomy of AIED:

STUDENT-FOCUSED AIED	
Intelligent Tutoring Systems (ITS)	××××
AI-assisted Apps (e.g., maths, text-to-speech, language learning)	××××
AI-assisted Simulations (e.g., games-based learning, VR, AR)	××××
AI to Support Learners with Disabilities	××××
Automatic Essay Writing (AEW)	××××
Chatbots	××××/××
Automatic Formative Assessment (AFA)	××××/××
Learning Network Orchestrators	××××/××
Dialogue-based Tutoring Systems (DBTS)	××××
Exploratory Learning Environments (ELE)	××
AI-assisted Lifelong Learning Assistant	×
TEACHER-FOCUSED AIED	
Plagiarism detection	××××
Smart Curation of Learning Materials	××××
Classroom Monitoring	××××
Automatic Summative Assessment	××××/××
AI Teaching Assistant (including assessment assistant)	××××/×
Classroom Orchestration	××
INSTITUTION-FOCUSED AIED	
Admissions (e.g., student selection)	××××
Course-planning, Scheduling, Timetabling	××××
School Security	××××
Identifying *Dropouts* and *Students at risk*	××××
e-Proctoring	××××

Fig. 1. Taxonomy of AIED

Student-focused. When it comes to student-focused AIED, it refers to technologies of AI that are designed specifically for supporting students in their learning. With time, there has been a large growth in the making and implementation of different AI-based tools that are aimed at the improvement of educational outcomes. Some of these tools have been improved and taken from other areas, while others were made with education as their main focus. Not all AI tools that students use was initially made for educational purposes, and some technologies were made for other but have since been redesigned for learning, and an important example of this repurposing is the use of tools like Google Docs and Google Sheets, which were not designed for education but have become quite important in group projects [29]. These tools allow collaboration in real-time and allow students to work together, even when they are separated geographically. Some other non-educational tools that have been redesigned include platforms of social networking such as WhatsApp and WeChat and platforms such as YouTube and TikTok, which tend to offer educational content in a format that is more accessible. Even though these tools were not specifically made for educational purposes, they have no doubt found their place in modern classrooms, especially after the COVID-19 pandemic [22].

Actually, ITSs are perhaps the most funded and common applications of AI in education, and they offer step-by-step tutorials in subjects like mathematics. Data is collected by these systems based on the behaviour and performance of students during learning activities, and the data is used for adjusting the content and exercises that are offered to the student. It is ensured by this personalised pathway that

students get personalised instruction, which helps in improving their weaknesses. Other than supporting students [8], ITS can offer important insights to teachers using dashboards, which give a detailed overview of the progress of students. Some examples of ITS include different tools like Spark and Gooru Navigator, which help in showing personalised journeys of learning for students on the basis of their performance and needs [39]. Educational apps based on AI have also become quite popular in recent years. These apps tend to cover a large range of subjects and purposes, from the translation of language to problem-solving in mathematics. In fact, tools like SayHi [34], which is a translation app, and Photomath, which is an app for solving problems, have gained a lot of attention for their ability to help students with complex tasks. Still, there is a concern that the learning of students might be decreased by these apps, as they offer solutions without much effort.

In addition to it, AI simulations involving VR and AR, especially in the form of learning through games, have introduced different interactive ways for students to learn. AI technologies are combined by them, like machine learning and image recognition, for making learning experiences that are engaging. VR, for example, has been used in medical education for training neurosurgeons, while AR has been used for helping students in manipulating and exploring 3D molecular structures [20]. The integration of AI into digital games has also offered learning experiences that are adaptive to adjust difficulty and gameplay on the basis of the learning and abilities of a student. Students with disabilities have also benefitted from the developments in AIED. AI-based and intelligent tutoring tools have been adapted for supporting learners with disabilities, including those with learning challenges ranging from dyslexia to ADHD [40]. Moreover, AI has been used for different diagnostic purposes and has helped in determining different learning disabilities. Meanwhile, for children with autism, positive results have been shown by educational robots in improving both communication and social skills. There are also popular AI tools such as text-to-speech apps that have been redesigned for supporting students with difficulties related to learning, which makes learning easier for students.

It should be noted that AEW or automatic essay writing tools based on AI, are another area of growth in AIED. These tools, like the ones developed with the use of language models like GPT-3, are capable of writing content in the face of a prompt. Even though the technology is still improving and often makes nonsensical text, its increasing power is raising concerns about the integrity of academic work [37]. As these tools are improving, differentiating between content by AI and student-written essays is becoming challenging. This has implications for how student assessments are carried out in the future, as the traditional format of essays may need to be reconsidered with respect to these developments. Not to mention, chatbots tend to show yet another application of AI in education, as they are capable of offering support in real time to students by answering questions related to assignments and class schedules. These AI assistants, like the Ada chatbot or the assistant made at Georgia Tech, have the potential of decreasing the burden on human staff, especially in educational settings that are large [45].

In addition to it, AFA or automatic formative assessment tools use AI for offering feedback on student writing or other outputs. Even though they are not yet as advanced as human teachers in offering a very comprehensive analysis, AFA tools like Grammarly can offer some feedback on areas like style and grammar. Research suggests that students generally accept the feedback offered by these systems, sometimes even more so than feedback from their teachers, which shows the potential of these tools in supporting learning [5]. Other AI-based tools, such as DBTS or dialogue-based tutoring systems and ELEs or exploratory learning environments, are some

new areas in AIED. These technologies offer new ways of connecting learners with peers and educators and encouraging better understanding through dialogue and offering learning experiences that are personalised for catering to unique needs.

Teacher-focused. Even though many AIED tools are designed with students in mind, there is also a focus on making AIED systems with a focus on teachers. These systems are aimed at helping teachers in different areas of their work, including the management of classrooms and assessments, among others. Some of the important areas where AIED has been introduced for teachers include the detection of plagiarism and AI teaching assistants, among others. Even though these tools are promising, they also come with some practical and ethical considerations.

It should be noted that the detection of plagiarism is one of the most common AIED applications with a focus on teachers. Over the past decade, techniques of machine learning have been integrated largely into systems of plagiarism detection, which has made it easier for educators to find copied content in student assignments. In fact, some popular tools like Turnitin and iThenticate are used mostly by institutes. Sophisticated algorithms are used by these tools for the comparison of student work against a large range of public content to identify similar content and instances of plagiarism in their works. Even though plagiarism detection software helps teachers in ensuring academic integrity, it also raises questions about the privacy of students and the likelihood of false positives. However, for many educators, these systems save a lot of time and effort that would otherwise be spent checking for plagiarism manually [19].

The internet offers a large amount of educational content, but not all of it is relevant or of high quality, and teachers often struggle with finding the right materials that suit the needs of their students. AI systems that are designed for the smart use of learning resources are aimed at tackling this challenge. In fact, tools like Clever Owl and X5GON use algorithms for scraping the web and filtering content on the basis of specific queries of teachers [43]. These tools can be helpful in finding important videos and articles that match the educational level and subject needed by the teacher. Educators are helped by smart curation systems in saving time and making sure that they are using the right resources. However, these tools are still in the early stages of development, and there are also concerns about the biases that might be present in the algorithms that are used for selecting content.

Actually, classroom monitoring tools that are based on AI are becoming more prevalent in different educational settings. Technologies are used by these systems, such as video cameras and portable EEG headsets, for monitoring the levels of engagement and attention of students. For example, some video systems based on AI can track where a student is looking and can help teachers in determining whether they are properly focused on the lesson. Meanwhile, other systems like BrainCo's EEG headsets are helpful in monitoring brain activity for the identification of students who may need additional help [33]. Moreover, in some countries like China, these headsets are used in detail, with both teachers and parents capable of accessing the data of students online. Even though these tools offer the potential of improving management and student support, they are also controversial to a large extent. It is argued by critics that they infringe on the privacy of students and raise ethical concerns about monitoring in education. Not to mention, there is limited evidence to show that these systems properly measure the engagement of students.

It should be noted that one of the more effective applications of AIED for teachers is the automatic assessment of assignments, which is also known as autograders. These systems are capable of decreasing the time spent by teachers in grading assignments through the automation of the process. Some systems, like the one used in the

US SATs, have been implemented in standardised testing on a large scale, and these autograders not only grade the responses of students but also offer feedback and suggestions for improvement. In spite of their efficiency, the use of autograders is quite controversial, especially in different important assessments [15]. The reliability of AI in evaluating more subjective tasks is questioned by critics such as essayists, and they also raise concerns about the fairness of using systems that are automated in high-pressure situations. Not to mention, the proposed AI Act by the EU determines that testing in high-stakes papers is quite a risky application of AI.

In addition to it, AI teaching assistants are a new area of interest in the case of AIED with a focus on teachers. These systems are designed for supporting instead of replacing teachers by improving their abilities and offering help with tasks such as grading and the management of classrooms. Graide is one such tool that offers teachers feedback phrases that are prewritten and can be reused when evaluating the work of students. This helps in speeding up the process of grading while still allowing the teacher to maintain control over the evaluation [41]. Even though AI teaching assistants are still in the initial phase, they have the potential of decreasing teacher workloads and allowing educators to focus on more detailed interactions with students. However, there are concerns that depending a lot on AI assistants could decrease the role of teachers and lead to an approach that is more mechanised to education.

Institution-focused. Artificial intelligence solutions, which are targeted at institutions, are aimed to increasing the effectiveness of the functioning of the educational organisations. All these AI tools offer different processes while making it easier for institutions to run as well as offering a better environment for both the students and teachers. Some of the fields in which the AI application is embraced are enrolment, resource allocation, course/online content generation, etc. For example, in enrolment systems made by AI, large numbers of applications are processed by an automated system to identify candidates who meet specific criteria. This lessens the burden of paperwork and fast-tracks the admission process.

Further, AI has been applied in the management of resources where it helps to match calendars with the students as well as matches the resources such as the classroom, library and laboratory so as to increase its efficiency. Students' needs can be predicted for further advising; while applying such analytics, the inventories of resources can be made available as per need. This is useful for institutions because it saves money, but, at the same time, the students are able to make use of potentially needed facilities. In curriculum planning, idea generation, sourced from AI technologies, uses trend analysis to identify areas of improvement while recommending changes to the curriculum to conform to the current job market and student's performance records [38]. Also, AI can help the institutions to oversee the general performance of the students at a macro level. Hence, AI system draws patterns from the attendance, performance, and engagement of the students in which teachers can take part in early intervention. From this approach, institutions gain a comprehensive understanding of student needs and succeed in scaling up retention rates and academic success. It is through such automation of what can be deemed as unnecessary paperwork that allows instructors to introduce efficiency into the learning process while reducing the paperwork that disturbs a teacher's routine.

3.5 Obstacles

The concept of using AI in education is promising, but the use of AI has certain challenges that contribute towards barriers to deployment. These challenges include

technology, finance, ethical, and social aspects which ignite unique hurdles to the application of AI in teaching and learning academically. The most apparent challenge that stands in the way of the integration of Artificial Intelligence in education is the high costs of both creating and purchasing AI applications and systems. It is going to be even more difficult to control its deployment; for example, educational institutions, especially those in the areas that have less funding will reach the limits of attainable funding, before they can invest in AI [50]. Obviously, acquiring the superior AI software and hardware as well as supporting IT infrastructure remains an expensive affair. Also, training the faculty and staff in the proper utilisation of AI put other expenses on the list of drawbacks, while teachers want to rely heavily on traditional means of teaching [30]. These costs can be expensive for many schools and universities, especially in the developing regions of the world, and, thus, a divide in the use of AI-enhanced education. Successful application of AI in a learning environment calls for techno experts in the process. This has been established that most institutions experience a challenge when trying to hire appropriately experienced and skilled human capital that has knowledge in both AI and education. Such a situation is also capable of limiting the efficiency of organisational use and sustenance of AI systems. The use of AI also presents technical challenges while teachers & administrators may prove ignorant of such situations and hence require training, which has to be done across all the personnel in the teaching hub. Another consequence of the lack of experts in AI is the incorrect application of technologies, hampered growth of which can cause them to be used improperly for educational purposes. This gap between technological innovation and on-ground expertise reduces the possibilities of application of AI in learning institutions such as schools and universities. Almost all AI digital application cases in education require huge data input, and in the case of learning analytics and personalisation, this often involves the use of student data. It gives rise to some privacy and security issues with regard to data. Any process involving the collection, storage or use of student data must meet regulatory requirements of the specified countries, including privacy regulations [36].

Playing our part for institutions, we will need to make sure AI applications being created have good data protection features like encryption and authenticated access. However, the attainment of this level of security is not very easy, as it is very time consuming hence requiring a lot of resources, which an institution, especially a developing one, does not have or lacks the necessary security infrastructure to embrace. It is worth noting that, like any other intelligent algorithms, AI algorithms have defected that impact on educational results, including bias. These biases, in the majority, originate from the data applied for training the concerned AI models; this data may not capture the diversities of the students. Therefore, it is feared that AI-based systems will deepen the dis-equalising effect on education. For instance, in cases where an algorithm is used to select students in admission or rate students' performance, it might be inclined to student from the given status, thus, discriminating against others. Moreover, some familiar ethical issues of AI usage, for example, how much of the decision-making process should be delegated to the AI system, complicate its integration into the learning environment. Integrating both the human face and automation to the process of learning is always a herculean task given a set of prerequisite balanced parameters [10].

Another important obstacle is that educational institutions are characterised by resistance to change. Teaching staff, school leaders and even learners may not be willing to use AI tools in learning and teaching processes but rather use conventional practices like preferring traditional teaching methods over online lectures. This might be because some people have not realised that AI can have positive impacts on their lives, some are scared about losing their jobs to AI, or they are

worried about less personal touch in learning. Many educators will develop a negative attitude toward the use of the AI because they will be concerned about the fact that the technology may disrupt their job, rather than enhancing it, and hence will lack the motivation level required to foster the use of new technologies. To overcome such resistance, it is inevitable that institutions change their organisational culture in emphasising how AI technologies will elevate the value that they bring to their work. It is always important to ensure acceptance of the change management strategies or the workshops and the change discussions, but this needs time and effort. Thus, the integration of AI in education completely depends on the strong digital facilities, such as the internet connection and good hardware resources. Currently and especially in the rural and distant areas these forms of infrastructure are non-existent, thereby contributing to the digital divide that affects the use of AI in enhancing educational tools. Such a gap can contribute to inequality of education where well-connected areas get to enjoy the advanced AI technologies while areas that are not well connected do not get the same or any at all. Further, some of the institutions have bad infrastructure, and when these tools are applied, it becomes hard to integrate, hence becoming less effective. Solving this issue requires putting more resources in regard to digital structures and focused endeavours aimed at narrowing down the gap between the two education realms.

Integrating AI tools into the existing learning models and frameworks is not an easy endeavour. AI solutions require development that is specific to the institution and will differ from one institution to another depending on the country, students, and educational objectives [49]. This customisation can be a complex process, particularly when it comes to the delivery of an AI solution that does not directly fit an institution's various forms of teaching or a curriculum. One of the biggest challenges of creating AI systems is how they will fit into the existing and other learning software tools. Also, the institutions need to make sure that an AI tool does not contradict the curriculum rather than complement it, which very often means that a lengthy process of integration must be conducted together with teachers and developers of certain AI tools and applications [14].

4 DISCUSSION

AI puts light on the teaching-learning environment, administrative tasks and overall functioning of an educational institution. Among the two types of AI being adopted in education, data AI and knowledge AI serve different parts in the change. A taxonomy of AI in education highlights three key focus areas. This divides general applications into the student, teacher and institution-based applications. Both the data-based and the knowledge-based approaches to AI enhance each area of educational transformation, and, thus, it becomes a complex view of the problem. Academic AI is mostly dependent on large sets of data to search for patterns and trends, as well as to make predictions and provide suitable educational access. This one relies on artificial intelligence algorithms for student learning, as they provide an analysis to create student learning paths.

Another application of data-based AI that is especially beneficial for students is the ability to design individualised learning process with considering the individuals' preferences. For example, in adaptive learning, performance data of students is utilised in real-time to change the level of difficulty and the content provided per lesson so that everyone can be made to work. This approach is focused on as a way of noticing learning deficits early enough to provide extra assistance or material to the learners who appear to be having difficulties. It also can be used to accelerate advanced students,

thus maintaining their interest and rendering them productive [12]. Such information helps the students to get the feedback and, at the same time, enhances students' self-assessment skills to know where to concentrate the most. As an alternative, data-based AI helps teachers evaluate students' progress and offer relevant information. Through these developments, teachers can benefit from reports made by artificial intelligence, i.e., to boost their knowledge about the general and specific performance in each class. This information is useful for improving the methods of teaching, providing specific assistance to learners and decision-making concerning course changes. AI also helps reduce workloads like grading, while this provides the teachers with enough time to devote to their students in comparison to traditional education [7].

On the other hand, knowledge-based AI is a subset that aims at the use of structured data and expert knowledge to combat challenges and achieve interaction. Unlike data-based AI, it does not depend very much on big data but uses predetermined rules and knowledge structures in decision-making. Among different categories of AI, knowledge-based AI is implemented in the student-centred context. [48] These systems mimic the part played by a human tutor in the sense that they acknowledge certain subject areas and give explanations, hints or even feedback. For instance, in the teaching of Mathematics and Language, these knowledge-based AIs can help the learners to complete certain questions or types of problems with the provision of suggestions and instructions in relation to their knowledge as well as comprehension level.

This type of AI enhances an effective student experience and provides the means to promote education & learning based on the students' possibilities. Therefore, knowledge-based AI can be of significant use to teachers and work as an assistant for the accomplishment of their tasks [47]. One advantage of using AI in education is in the fact that AI algorithms can write lessons and lesson plans based on educational benchmarks, thereby freeing up the teachers' time and energy to help students get more involved. Knowledge-based AI can also aid in the delivery of annual professional development plans and target a specific teacher's strengths and weaknesses by providing recommendations regarding resources to use when teaching a specific subject [16].

5 CONCLUSION

To conclude, AI has become an innovative agent in many industries, education being the most impacted sector. AI can be defined as the ability to frame the human education system and traditional ways of learning by automating tasks, analysing data, and personalising learning [24]. It adds a dimension to teaching and learning practices and has the potential to solve some of the major problems faced by students and teachers as well as institutions. The incorporation of AI in education is not about the introduction of new technologies but about how the employment of these tools makes education faster, enjoyable and more effective for everyone.

Data-based AI and knowledge-based AI are the two primary types of AI that are basic in the support of different educational activities. Learning AI, on the other hand, employs big data and machine learning algorithms to learn from the data collected from students and make a prediction as well as customising the learning styles and offering solutions on student performance. This aspect of AI makes it possible to have learning systems that must adapt to the needs of every learner; no learner should be left behind. Due to its ability to examine the learners' performance, AI can detect learning loss areas and recommend compound solutions, hence increasing the efficiency of education delivery services. With reference to the split of AI in education, the taxonomy divides the use of AI into three categories relative to the students, the teachers, and the institutions. All of these areas are more availing and

advantageous when both the data-based and knowledge-based AI are is involved. In real-time, for students, it generates intelligent learning paths that assist in identifying the right paces at which they can be trained to fit their learning abilities as well as the mode they prefer most. AI applications in educational institutions support organisational leaders to allocate resources, design curricula, and plan student retention issues to enhance learning outcomes within institutions.

The learning applications that are based on artificial intelligence primarily support the students by designing an interactive learning process. With constant supplemental applications and intelligent tutoring systems, students effectively get the assistance they require to work through learning difficulties. This enables learners to be more in charge of their learning processes and encourages them to be autonomous, which is an important requirement for 21st-century learners. In addition, the organisation and improvement of an educational process are possible with the help of AI tools that provide individual options such as voice recognition & content translation, which makes an education process more inclusive. These are the possibilities of the future, where AI will enable the delivery of highly customised learner experiences while helping teachers and supporting institutional functionality. When explaining the benefits of turning to AI as well as coping with the risks connected with its application, educators and professionals in the field can build progressive educational approaches that are well-established and ready for integration. In short, as the technology advances, it is expected that a newly enhanced function will be to support the function of teaching in education and ensure that the trend continues to meet the demand of the ever-advancing society.

6 DECLARATIONS

Availability of Data. For this review paper, only data that is publicly available has been used, and credit is given to the authors through proper referencing.

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7 REFERENCES

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