Research on the Effect of Interaction between Artificial Intelligence and Conventional Education on Improving Teaching Effectiveness under the Background of Big Data

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Abstract. The popularity of AI technology has been widely focused on all walks of life, from the pharmaceutical sector to the industry, it is one of the most famous technologies of modern society. However, there are few examples of AI technology used in the education area. Educators mostly prefer to explore its influence on the educators and learners, rather than popularizing this technology to the whole area. Combining this phenomenon with the problems of the current education system-conventional education, this article aims to discuss the influence of AI technology on the education area and the possibility of integrating AI technology with conventional education. By analyzing the pros and cons of AI used in education, this article concluded that even with some problems, AI technology can still bring huge potential to improve the education area and make conventional education more effective. Based on the conclusion, this article suggests that the education area should pay more attention to AI technology and try to integrate it with the current education system instead of waiting for the technology to mature, which will make the integration easier and more efficient.

Keywords: Artificial Intelligence, online learning, confluent education, inclusive education.

1. Introduction

Education has always been a cornerstone of social development for centuries, with conventional education by standardization and instructor-centered teaching playing a dominant place in it. However, with the development of technology and society, conventional education can no longer satisfy the needs of education areas, it exposed several questions such as the lack of personalized learning. Artificial intelligence (AI) has been considered one of the most popular technologies these days. Petkov praised the efficiency of AI in the accounting area and discussed its possibility of being the starting point of a company's structure [1]. Apell& Eriksson proposed the idea of using AI technology to monitor the performance of medical systems [2]. These cases provided the aim of this article: to find out whether it is possible to use Artificial Intelligence technology to recover the problems of conventional education and make it more effective and suitable for current and future education areas.

2. Strength and Weakness of Conventional Education

2.1. Introduction to the Conventional Education

Conventional education refers to 'instructor-centered traditional education, which includes all the requirements of traditional teaching and learning such as crowded classrooms, instant information sharing, impersonal approach to students, materials like black/whiteboards, desks, and pencils' [3]. This education mode is used in most schools in the education field, where teachers lead the study progress and transfer knowledge into students' minds. For centuries, conventional education has been the cornerstone of education area and played an important role in the history of education. From the 18th century when learning was seen as a 'work' of children and learning places changed from factories to classrooms, schools made disciplines for students to make them submit to the school rules

and the teachers, which built the leading role of the teacher and enhanced their influence on students, which is how conventional education is created [4].

2.2. Advantages of Conventional Education

There are several advantages of conventional education as one of the major teaching methods in the education area. The first one is the standardized curriculum. The curriculum is often formulated by educational authorities or government bodies, it includes most of the core curriculum, including mathematics, sciences, languages, and human arts. Conventional education also provides a controlled environment, which will help maintain discipline and minimize distractions, hence increasing student's efficiency.

2.3. Problems of Conventional Education

With the advantages being said, there are lots of problems of conventional education presented in several ways. The first one is the lack of personalization and flexibility. As conventional educations are often carried out by teachers to transfer knowledge to students' minds by talking, there is limited space for students to communicate with teachers and present their ideas and thoughts. This may reduce students' ability of critical thinking and force them to learn knowledge against their wills. This problem can be often seen in medical education since teachers may not respond to student's questions. Nandi et al compared the difference between problem-based learning and conventional learning in undergraduate medical education [5]. They mentioned that the conventional teaching method separates the basic science segment from the clinical segment, teaching is tutor-centered and includes large lectures, lab experiences, and tests. It can be analyzed that when students finish their basic science segment, they may forget some of the knowledge they've learned and make mistakes because of this. It is also hard for them to prove their ideas and strengthen their skills after learning the theory since they have little chance to experience the basic science segment. The personal identity of students is eliminated in the conventional curriculum since they have no chance to develop personal interests and curiosity about the subject because of the controlled environment and curriculum, which highlights the inflexibility of conventional education. Conventional education lacks flexibility and individuation of students, which can cause severe problems in some subjects. Ghosh also investigated students' ideas of conventional medical courses [6]. Researchers collected data from first-year medical students at a medical school in India. Results showed that students were more keened on mixed teaching of problem-based learning courses (PBLC) and lectures and thought PBLC is better than lecture only, which proved Nandi et al's concept and showed the weakness of conventional curriculum, which is hard to stimulate students' motivation of study because of its inflexible curriculum.

Another problem of conventional education is the unequal allocation of educational resources, which includes unequal access to quality education and technological gaps. As introduced before, conventional education needs lots of tools, including a place for study, tools, and textbooks. These tools are hard to find in urban areas and cannot be afforded by some of the students. Condron & Roscigno analyzed the spending and achievement among 89 public elementary schools in a large, North Central, urban district of the US [7]. Results showed that with more money spent on the operation and maintenance, the degree of order/consistency of schools increased, the attendance rate of students increased, and the degrees of teachers with at least master's degrees also increased. In the result, researchers proposed that with a 1000-dollar increase in a student's education spending, the number of students who pass the exam and tests increased by 6-10%. Schools that spend more exhibit better academic achievements. Therefore, the unequal allocation of education resources is inevitable because of the gap in wealth between different families, which is a common problem of conventional education. The same problems also happened in the urban areas as families in these areas are not capable of paying for equipment like computers and salaries for teachers in schools.

3. Interaction between AI and Conventional Education

With the advantages and disadvantages analyzed before, is it possible to absorb the advantages of conventional education and avoid its disadvantages? It may happen when combining online education, AI technology, and conventional education.

AI technology has progressed at a rapid speed over time, from being used in program code to a Machine Learning integrated AI, it has been widely used in several areas these days. Alam analyzed the potential of AI technology in the education area [8]. He pointed out that there are many 'experiments' about AI technology used in education, but they are not widely used now because of technical problems. The analysis of AI-combined education should be focused on its potential rather than current performance.

3.1. Teacher Training

Teacher training can be upgraded by using AI technology. Alam indicated that 40% of teaching time can be automatic rather than letting teachers focus on these things [8]. With more free time, teachers may improve their quality of teaching and adjust their states to provide better classroom learning outcomes. Those non-direct student interactions like grading papers may be transferred to an AI system to lower the difficulty of training a teacher. Vlasova, Avksentieva, Goncharova & Aksyutin investigated an AI training system for teachers to let them become more mobile in learning new technologies [9]. The system used a collaborative approach to find common features in various subject areas, to train teachers who can face different situations, and to skillfully use the internet to solve problems. AI technology can be added to teacher training to cultivate teachers with more extensive abilities.

3.2. Personalized Learning

AI technology can also play a major role in the personalized study plan of learners. Personalized study is very popular these days. It is widely believed that this kind of study can encourage students' enthusiasm and cultivate their motivation for education. Alam mentioned the education revolution based on AI technology and personalized learning [8]. He introduced a platform where students can customize their study based on their own needs. By concentrating on each student's learning style, the platform adjusts and supports them. After that, the platform will recognize the content students have already learned and reinsert knowledge they haven't mastered to help them advance their studies. With collected data and AI algorithms, AI technology can produce customized study plans for every student without occupying the teacher's time in making the plan. Klašnja-Milićević & Ivanović indicated that AI technology can customize students' study plans from preschool education to master degree students, it can adjust based on students' needs, emphasize students' themes, and help students to learn in their pattern [10]. Based on this study mode, students can focus on the theme they are interested in and encourage their enthusiasm for learning. Students can also propose their questions about the standardized curriculum of conventional education on the platform to let AI present the solutions. Although this technology still needs improvements and cannot be widely used today, it shows the potential to be a major part of future education.

3.3. Administrative Efficiency

With AI technology imported into education administration, AI can undertake some of the basic educational tasks such as grading exams and scheduling courses. Klašnja-Milićević & Ivanović indicated that grading homework and tests are often time-consuming [10]. With AI added to the education system, it can grade multiple choices and grade assessments automatically. This will save professor and teacher's time to let them get more chance to focus on interactive activities with students and increase their efficiency. A useful example of an AI-supportive system in the administration of education is the Decision Support System (DSS) in higher education administration [11]. Initially, DSS in universities primarily consisted of reporting systems and basic data analytic tools, with the

added AI systems, it now provides powerful tools for data-driven decision-making, which helps administrators to make wiser decisions based on the data provided by the system. Moreover, it can provide personalized proposals for different positions in the education system, which can maintain the correlation between the objectives and the decisions made by AI. With the powerful DSS, the decision of the administrators relies more on the data-based system rather than their minds. This change results in greater transparency, accountability, and interdepartmental collaboration. Suggestions proposed by DSS may help education institutions to optimize their resource allocation, improve students' achievements, and help to adapt to the complex educational environment rapidly.

3.4. Reduced Educational Cost

To be a well-educated individual needs to spend a lot to get more educational resources in conventional education. However, with online courses and AI technology, all the student needs is a computing device and the internet. Alam introduced the Massive Open Online Courses (MOOCs), which are free lectures proposed on the internet for everyone to watch [8]. Gaebel provided more detailed information about the MOOCs [12]. It is provided by the combination of companies and colleges/scholars, while colleges/scholars are in charge of the quality and contents of the courses and companies take charge of the technological support. Students who join MOOCs come from all around the world and have various reasons to attend the courses. Gaebel mentioned that universities are trying to lower education costs by using MOOCs to supply conventional education, provide more opportunities for college students, and widen the group of learners to increase their visibility. On this occasion, learners can join free courses online without paying expensive fees and attend an offline education institution, those institutions can receive investment from society as they've released free educational resources online for everyone to watch, which is beneficial for every individual. Therefore, based on the online platform, the cost of spreading educational resources can be lowered and the popularity of this knowledge can be increased, which is a supplement to conventional education.

3.5. Accessibility

Combining AI technology with conventional education can also make education more accessible to students, including those with disabilities as they can view knowledge and online courses at home instead of going to the education institutions. Apart from online courses, AI technology can also be capable of supporting learners with mental disorders. Ahuja et al introduced the Intelligent Tutoring System (ITS), which is based on Augmented Reality (AR) combined with AI methodologies [13]. This system aims to improve the learning experience of learning-disabled learners and provide a suitable study environment for the learners. They collected participants with dyslexia, dysgraphia, and dyscalculia difficulties and texted the influence of ITS assistance on these participants. They concluded that with the change of study methodology (adding AR support), the ITS system can raise the active learning experience of learners, including those with study difficulties. Standen et al also provide Artificial intelligence tools for education (AIEd) which focus on the emotional state of students [14]. The method is to detect the emotional state of students (like upset, or bored) and help them to adjust, keep their best emotional state, and increase their study efficiency. This study concluded that AI intervention can increase the engagement and study efficiency of learners based on the adjustment of emotional states. Therefore, adding AI technology can help all kinds of learners in various areas to create a better study environment and increase their study efficiency.

4. Possible Problems and Future Exceptions

With benefits being considered, AI technology has some flaws with current technology in blending into the education system. One major argument is the ethical problems. Sijing & Lan discussed these problems and found out that the AI algorithm is based on a large amount of data, which may include subjective information such as racism [15]. Also, if the data collected are not enough for the AI to

cover every situation that may happen, it will face problems that cannot be found in the database. This will cause the AI system to fail to provide accurate and useful information for the users. The study also pointed out that it is not the AI system that has the problems, the problems are brought by the users and developers. They suggest that people should form the correct values to guide them in correctly using the system. Apart from their ideas, it might be better to wait for the technology growth, which may produce better AI systems that do not have those problems.

Another problem is how to merge AI systems and conventional education. With the popularity of AI tools such as ChatGPT, the difficulty of assessing students' articles or reports has been raised rapidly. Alasadi & Baiz pointed out that teachers are worrying about whether is it still appropriate to judge descriptive assignments by checking the clarity and formatting since AI tools can help learners to finish that part [16]. Teachers should also know how to use AI systems to help students express their ideas and critical thinking and make suitable plans for them. Equity among students should also be considered, as those who used AI tools may get higher grades than those who didn't use them, which is unfair.

AI technology may have little problems when being used in education areas, but they are minor compared to the huge improvement of how these tools can bring people. AI technology can help create a better study environment, adjust students' moods, and help disordered people gain the chance to study like normal individuals. This article suggests that the education area should accept the involvement of AI technology in the system. One particular reason is that online courses based on AI technology can be used as a platform for conventional education in some special circumstances. For example, during the pandemic caused by COVID-19, people were not allowed to study at school or go out, conventional education was taught through online courses at that time and provided an opportunity for learners to study even if they could not go to school, which shows the flexibility of the online learning based on AI technology. Leo, Shirley, et al discussed the online courses of UAE higher education and their influence during the pandemic [17]. They proposed that higher education can be improved by using the form of online study and integrating the benefits of online education into conventional education. This article suggests that AI technology should not be the substitution of conventional education, but the complement. Based on the regular courses, AI technology can help learners expand their knowledge in courses and deepen the understanding of those learners are interested in, stimulate their enthusiasm, and help develop their interest in courses. Teachers can also use AI to understand the learning situation of learners and adjust the study plan based on this information. AI technology can also be used to follow up on the state of learners after class and help control the administration part such as tests and assignments. Overall, this article suggests that AI technology should be the cornerstone of the future education system and help make conventional courses more effective and completed. There may be some problems at first, but the efficiency of educators and learners will be increased massively as soon as they get used to AI technology and put it in the right position of the system.

5. Conclusion

The educational landscape has been shaped by conventional education, which has a long history and provides a standardized curriculum and controlled environment conducive to learning. Despite its advantages, this traditional approach has its drawbacks, including lack of personalization, inability to be flexible, and unequal access to resources. These issues can hinder the development of critical thinking and creativity among students, and exacerbate educational inequalities. Most of these disadvantages can be fixed or reduced by the integration with AI technology. AI technology can be used to reduce teacher training time, provide advanced personalized education for learners, increase the efficiency of administration, and reduce educational costs to make education more accessible. Although AI technology has some disadvantages like technical problems, it is undeniable that it has the potential to help the education area, making it more adaptable, inclusive, and effective for future

generations. In conclusion, AI technology has great potential to help increasing the effectiveness of global education area in the future.

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