Role of Artificial Intelligence in Education

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Abstract

This study was conducted to find out the role of Artificial Intelligence in education. The objectives of this study are: 1) To examine the significance of artificial intelligence in the field of education. 2) To determine the problems and possibilities of using artificial intelligence within the land of education, examining the relevant factors is important. 3) To explore the challenges of artificial intelligence inherent in the educational field. 4) To examine the potential benefits of incorporating artificial intelligence in education. The population of this study is all colleges (government and private) in the district of Rahim Yar Khan. Of these 20 colleges, 400 students (boys and girls) and 150 teachers (males and females) participated as a sample. The study is descriptive, and the quantitative research method is utilized. Two self-structured questionnaires were used as a research tool: one for students, comprising 40 items, and one for teachers consisting of 30 items. A simple random sampling technique is used for data collection. The collected data was analyzed with the help of SPSS. The results revealed that artificial intelligence plays a significant role in education and improves personalized learning experiences. AI technology is capable of fulfilling the needs of teachers and pupils in the teaching and learning process effectively e.g. tutoring, communication, evaluation, analysis, supervision, etc. It enhances the teaching and learning process by using modern technologies and methodologies. In short, the use of AI in education and learning is very noteworthy.

Keywords: *Artificial Intelligence, Role of AI, Machine Learning, Education*

Introduction

Artificial Intelligence often refers to computers that can do mental tasks that are associated with human thought processes, such as learning and problem-solving (Legg & Hutter, 2007). Artificial instrumentation is the process of observing its surroundings and drawing conclusions in a way that maximizes the likelihood of achieving the desired outcomes (Russell & Norvig, 2010). As artificial intelligence has advanced over time, jobs requiring intelligence are increasingly excluded from AI, which has come to be known as artificial intelligence results (S. F. Ahmad, Rahmat, Mubarik, Alam, & Hyder, 2021), as the responsibilities they are carrying out became their predictable work and they became predictable technology (Tai, 2020).

Progressive machines taking the ability to recognize human speaking effectively arise in the form of AI (Arrieta et al., 2020). The display of knowledge, reasoning, planning, learning, and processing, as well as the capacity to utilize objects, is one of the main objectives of AI research (Dreyfus, 2014). Various techniques, including geometric modeling and computational intelligence, are taught to accomplish AI goals. AI is fascinating not just in the field of computer science but also in mathematics, engineering, linguistics, and many other fields (Kurzweil, 2005).

Given the resources and technologies that go together with it, artificial intelligence is becoming more common in higher education. Unfortunately, there are still many instructors who are ignorant of the significance, possibilities, and subject matter of AI (Hinojo-Lucena, Aznar-Díaz, Cáceres-Reche, & Romero-Rodríguez, 2019). This study aims to learn more about the use of AI in education, with a specific emphasis on the difficulties encountered by teachers unfamiliar with it. Examining the uses of AI in education and how it affects the learning process are the main goals of this research.

Education communicates values and assists in the development of society as an entire. It allows people to mold themselves into more accountable participants in society. Educated personalities are also additional expected to get well-paying professions and be involved in effective trade and business practices.

In light of these facts, Artificial Intelligence (AI) has had a significant impact on education. The use of AI in this particular setting has introduced new prospects and potentialities for enhancing teaching and learning procedures and revolutionizing the methods by which knowledge is obtained and controlled. AI has shown its capacity to customize education by adjusting to pupils' unique requirements and preferred learning methods in recent times. AI

uses algorithms and data analysis to detect trends in student performance and preferences, allowing for tailored material and activity suggestions. Not only can this improve the students' learning experience, but it may also boost their motivation and engagement.

Rationale of the Study:

There are various reasons to consider artificial intelligence and its role in education. It is a fast-growing field already being used in diverse ways. As AI technology continues to develop, we can expect to see it play a bigger role in education. AI also has a main influence on various parts of our lives, including the way we work, communicate, and consume entertainment. It is essential to know how AI is being used in education and the possible benefits and threats of its implementation.

Objectives of the Study

The present research aims to meet the following objectives:

- To examine the significance of AI in enhancing the field of education.
- To determine the problems and possibilities of using AI within the land of education, an examination of the relevant factors is important.
- To find out the role of AI as a potential resolution to the challenges inherent in the field of education.
- To examine the potential benefits of incorporating AI into the field of education.

Research Questions

- What role does AI play in the field of education, and what are its significance and implications?
- What are the major problems and possibilities associated with the use of AI in education?
- In what ways, AI does provide solutions to the challenges facing the education sector and what are the key benefits of its implementations?
- What are the potential benefits of using AI to personalize learning, and how it can be tailored to meet the diverse needs of students?

Literature Review

Artificial Intelligence (AI) is defined as the intelligence that robots exhibit compared to human intellect. The term AI was coined in 1955 by John McCarthy, who defined it as "having a machine behave in ways that would be called intelligent if a human was behaving in that way" (McCarthy, Minsky, Rochester, & Shannon, 2006). Alan Turing advocated in 1950 that computing computers may someday possess human intelligence (Turing, 1950). He

imagined that in the future, computers would be able to do computations that would be absurd for humans. The primary question is how human senses will be required for binary computations performed by computing machines using binary numbers. The first steps towards enabling computers to reflect intelligently or rationally about humans are hypothesis-making and gameplay.

Additional devices that may also be classified as artificial intelligence include those that assist in complex strategic games and autonomous vehicles (G. Allen, 2020). Owing to its multidisciplinary setting, less agreement has been seen amongst AI experts over its shared understanding and gratitude (Tegmark, 2018). In addition to computers, more gadgets have been added to the classroom, either replacing or enhancing desktop computers.

The quantity of data produced by digital tools and their computing capacity has increased dramatically, much as these gadgets have developed and become more connected. These systems can, therefore, do tasks on their own or assist clients in completing activities (Becker, 2017).

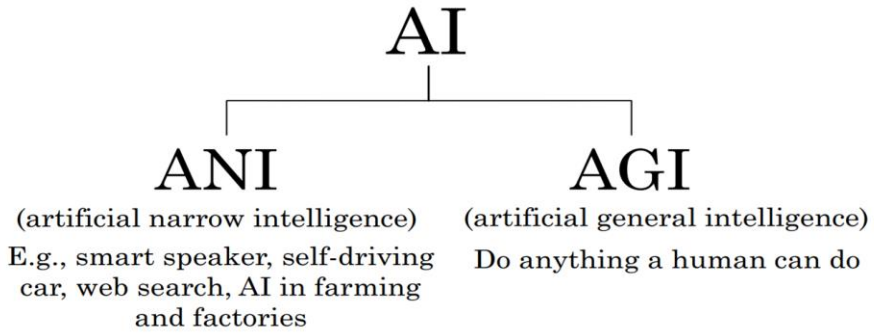
What is Artificial Intelligence (AI)?

"Artificial Intelligence" is the name given to the branch of computer science that focuses on building intelligent computers those can-do jobs that normally require human intelligence. Intelligence is the ability to reason, develop original ideas, understand information, and gain knowledge, AI refers to anything that is not real or happens naturally. Intelligence encompasses the capacity to engage in cognitive processes such as conceptualizing, envisioning, memorizing, comprehending, discerning patterns, decision-making, adjusting to new circumstances, and acquiring knowledge via past encounters. Artificial intelligence focuses on developing computer systems that mimic human behavior more efficiently and advance (Guo, Yang, Yu, & Buehler, 2021).

The discipline of computer science that focuses on creating intelligent computers that can do jobs that normally require human brains is known as AI (Russell & Norvig, 2010). Artificial intelligence is the term used to describe the ability of technology, especially computer systems, to replicate human cognitive functions. Expert systems, machine learning, speech recognition, and natural language processing are some specific uses of AI (Carter, 2007).

Demystifying of AI

Figure 1
Demystifying of AI



Artificial Intelligence in Education

Integrating STEAM (Science, Technology, Engineering, Art, and Mathematics) in education has become more relevant in light of advancements in AI technology (Pannu, 2015). This has enabled us to uncover solutions to various current real-world challenges. The process of natural language is complex and unpredictable, and Artificial Intelligence may play a role in simplifying it. However, several researchers have refuted this notion and have demonstrated that only methods that can be taught are effective in reducing language barriers. The instrument does not guide the student, yet the outcomes derived from this process are quite favorable (Ozer & Perc, 2020). The instruments will not go to the next idea until the student thoroughly comprehends the subject. The application will showcase a single examination that the learner is ready to do in an enhanced way. It assists the students by offering accurate answers, evaluating their performance, and providing feedback to facilitate improvement.

Can AI provide a resolution to the challenges linked to education?

Academic problems and administrative concerns are the two main obstacles that occur in the field of education. In addition to helping employees and departments do their tasks, AI offers most of them automated solutions. Admissions and record-keeping departments are now using AI solutions to save workloads. Similarly, AI is helping academic staff members efficiently with tasks like rating homework, rating tests, keeping track of attendance, and keeping records.

Both sorts of problems have been resolved via the automation of tasks and the use of intelligent teaching methods. From the learner's perspective, the primary challenges lie in obtaining education and receiving teaching that aligns with their intellectual capacity. Both individuals were again conversing with the AI, which offered round-the-clock availability and easy access to learning materials from any location. AI algorithms assess learners'

historical data, interests, and cognitive abilities, and then tailor their instruction to match their intellectual level and areas of interest.

Can AI Enhance Education?

Artificial intelligence enhances education in several ways. For example, the ability to operate an aircraft cannot be learned just from textbooks and teachers. Understanding the components and operation of a certain topic is necessary to have practical experience. Through its virtual environment, artificial intelligence (AI) supplies the required conditions and knowledge of its operation. A virtual environment may help with several problems, including safety and health issues and linguistic challenges.

Acquiring mathematical knowledge has often been a difficult obstacle for several pupils. The progress of computer technology, particularly artificial intelligence, offers a chance to address this issue (Hwang & Tu, 2021). AI facilitates adjusting its approach to match a student's evolving learning process rather than only offering feedback on correct or incorrect responses. Targeted modifications may facilitate students' sustained advancement in a program by using their strengths and circumventing hurdles.

It is clear that AI and its applications improve education and learning by making education more accessible via a variety of channels, such as social robots, Intelligent Tutoring Systems (ITS), and Virtual Simulations (SL). It also makes it easier for students to do academic and administrative tasks while traveling. It involves them in a virtual reality classroom, which promotes efficient skill development without any related risks. The current COVID-19 epidemic has greatly increased the benefits of AI. It's also possible that advancements in education and learning have happened with AI's rise.

Opportunities and Threats

Artificial Intelligence is a flexible technology that may be used in a variety of ways to support a range of educational objectives. In this study, we look at the main opportunities and difficulties related to using AI in education.

Opportunities

Threats

AI's concentration on technology may be dangerous for educational goals. There is a worry that as AI develops and becomes increasingly centered on data and technology; its uses could no longer align with educational objectives.

Bias in humans in interpreted to data, and integrated by AI

The availability and quality of the data needed to train the models are major challenges when adopting AI systems. Although data is easily accessible, human biases might affect it. Historical data may display biases based on cultural and gender-related issues. AI may pick up on these biases and perhaps defend them. This might create an ongoing cycle that prevents specific components from working together.

The labor market for teachers

There is a worry that for educators to successfully use AI, they need to pick up important new skills. Data-driven education is not yet included in teacher training, although AI assumes users have a basic understanding of computers. If instructors fail to keep up with this progress, there is a possibility that future teachers may be data scientists with a worse educational foundation. However, the likelihood of 'the instructor' being automated is quite low. For an AI to fully replace a teacher's functions, it would need to possess Artificial General Intelligence, which, is currently considered unattainable in the foreseeable future (Grace et al. 2018).

The Reliance on black-box Models Compared to the Accountability of Instructors

Artificial intelligence (AI) systems have the potential to take over education, with unclear, fully developed implications. To reduce this risk, both AI and instructors must be adjusted. To reduce this risk, it is essential to improve teachers' expertise in artificial intelligence as well as machine learning models' descriptive powers. You cannot hold a teacher responsible for institutions beyond your understanding.

Implementing artificial intelligence without the essential requirements

Several prerequisites must be considered before AI may be successfully used in education. Before the functionality of AI, a technological foundation and data are necessary. If AI is implemented hastily, there is a possibility that it may not fulfill expectations. Consequently, AI, like other sophisticated educational technologies, may lead to significant discontent. It might potentially result in a negative sentiment towards AI in the field of education and could also impede progress in other digital advancements in this domain. When it comes to tallying, several legal issues (often for valid reasons) pose challenges in using AI effectively and promptly.

Research Methodology

The study is descriptive in nature and the quantitative research method is employed. Two self-structured questionnaires were used as a research tool: one for students, comprising 40

items, and one for teachers consisting of 30 items. A simple random sampling technique is used for data collection. The collected data was analyzed with the help of SPSS.

Quantitative research is the collection and analysis of numerical data to investigate the connections between variables, detect patterns, identify trends, and questionnaires are often regarded as very productive and user-friendly tools for data gathering. The surveys used a 5-point Likert scale, with the following response options: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly Agree (5).

The population of this study is all colleges (Government and private) of district Rahim Yar Khan. Of these 20 colleges, 400 students (boys and girls) and 150 teachers (males and females) participated as a sample. The data was collected from the following 20 colleges of district Rahim Yar Khan.

Table 1
Description of the Participants

Sr. No.	Colleges Name	Students	Teachers
1	Govt. Khawaja Fareed College, Rahim Yar Khan	36	23
2	Brookfield College, Rahim Yar Khan	26	12
3	KIPS College, Rahim Yar Khan	20	12
4	MTB College, Sadiqabad	16	10
5	NICASS, College Khanpur	08	14
6	NICASS College, Rahim Yar Khan	29	
7	Oxbridge College, Rahim Yar Khan	14	11
8	Govt. Graduate College for Women, Rahim Yar Khan	84	15
9	Govt. Fatima Jinnah College, Khanpur	21	07
10	Govt. Associate College, Kot Samaba	24	12
11	Alpine College, Khanpur	21	
12	Govt. Associate College, Rahim Yar Khan	12	
13	Govt. Graduate College, Liaquatpur	12	
14	NICE College, Rahim Yar Khan	25	
15	Punjab College, Rahim Yar Khan	18	
16	Superior College, Khanpur	24	
17	Aligarh College, Rahim Yar Khan		10
18	Iqra College, Sadiqabad		08
19	Punjab College, Liaquatpur		16
20	Aspire College, Liaquatpur	10	
	Total	400	150

Validity of the Tool

To verify the tool, it was consulted to experts or specialists. The questionnaires were revised according to the experts' assessment and correction of the recommended few grammatical adjustments to enhance clarity and understanding.

Tool Reliability

The data obtained were assessed for reliability using Cronbach's alpha, a technique for calculating the correlation coefficient between variables.

Table 2
Reliability Statistics of Students' Questionnaire

Cronbach's Alpha	Number of Items
.918	**40**

Table 3
Reliability Statistics of Teachers' Questionnaire

Cronbach's Alpha	Number of Items
.842	30

Further, pilot testing was conducted and the questionnaires were finalized based on the participants' feedback during the pilot testing phase.

Data Analysis

The collected data was inputted using SPSS version 26. The data go through a process of double-verification to ensure their accuracy. Missing values were included, and the formatting was reversed where needed. After processing the data and filling the missing values, the data folders were prepared for data analysis. To accurately represent the data and address the research issues raised in the study, descriptive statistics, including percentage, frequency, standard deviation, and mean were used.

Findings of Students' Data

- 96.8% of the participants agreed with the statement, "Are you familiar with AI?"
- 97.8% of the participants agreed that AI is particularly important in education.
- 84.3% of the respondents agreed with the statement, "Do you think that AI affects our educational system?"

- 90.1% of the participants agreed with the statement, “AI tools can help you as deeper engagement with topics.”
- 98.3% of the participants agreed with the statement, “AI applications can improve my educational opportunities.”
- 97.1% of the participants agreed that AI helps them to solve educational problems independently.
- 81% of the participants agreed that AI technology helps them to think innovatively.
- 76.8% of the participants agreed that AI applications help them to engage in learning activities.
- 86.3% of the participants agreed with the statement “AI applications can help to motivate the learning process.”
- 67.8% of the participants agreed with the statement “AI applications can be helpful in the social and emotional development of a learner.”
- 71.8% of the participants agreed with the statement “Are you sure that AI creates an equitable educational system for all learners?”
- 98.8% of the participants agreed with the statement that AI improves their personalized learning experience.
- 89.5% of the participants agreed with the statement “Do you think that AI feedback can help me in the specific area of improvement?”
- 97.6% of the participants agreed that AI helps them to understand a topic effectively.
- 87% of the participants agreed that AI helps them to identify the weak areas in a specific subject.
- 94.3% of the participants agreed with the statement “Ethical considerations should be important when using AI in education.”
- 90.8% of the participants agreed with the statement “Do you think that AI will transform education in the future?”
- 87% of the participants agreed that AI provides equal opportunities for all learners.
- 73.6% of the participants agreed that AI learning systems are more reliable than traditional systems.
- 95.5% of the participants agreed with the statement “AI tools can be used to create gamified learning experiences for pupils.”
- 77.8% of the participants agreed with the statement “Do you think that AI provides a fair educational system that is free from bias?”

- 93.6% of the participants agreed with the statement “AI technology can help deliver an immediate response to learners.”
- 83.5% of the participants agreed with the statement “Do you think that AI affects the method of learning?”
- 95.6% of the participants agreed that AI can be helpful in creating an interesting learning environment for learners.
- 85.8% of the participants agreed with the statement “The education system of Pakistan is supporting the use of AI in education.”
- 89.3% of the participants agreed that the use of AI in the field of education can enhance students’ performance.
- 86% of the participants agreed that AI can help them to express their ideas effectively.
- 86% of the participants agreed that they can use chat GPT effectively.
- 95.3% of the participants agreed with the statement “Do you think that AI can create a lot of learning opportunities for pupils?”
- 86.3% of the participants agreed that AI can be a more beneficial tool for learners.
- 77.3% of the participants agreed that AI can help to develop a student's personality effectively.
- 86.8% of the participants agreed with the statement “Do you think students have a positive attitude about AI in education?”
- 86.5% of the participants agreed that AI can improve their thinking skills.
- 89.6% of the participants agreed that AI technology helps them to think more logically.
- 92.8% of the participants agreed with the statement “Do you think that AI is the solution to all educational problems?”
- 89.6% of the participants agreed that AI technology can help to improve digital literacy.
- 93.5% of the participants agreed with the statement “AI can help me to enhance my problem-solving skills.”
- 89% of the participants agreed with the statement “Students have a positive attitude about AI in education.”
- 93.8% of the participants agreed that AI tools empowered them in the field of education.

- 96.1% of the participants agreed that they feel excited when they use AI in education.

Findings of Teachers' Data

- 96.6% of the respondents agreed with the statement "Do you think that AI changes what we teach?"
- 94.0% of the participants agreed with the statement "Do you think that AI changes the educational system in Pakistan?"
- 0% of the participants agreed with the statement "Do you think that AI replaced the humanoid teacher in the classroom?"
- 0.7% of the participants agreed with the statement "Do you think that AI will decrease the opportunities of the educator's jobs?"
- 2.6% of the participants agreed with the statement "Do you think that AI is only for intelligent students?"
- 78% of the participants agreed with the statement "Do you think that AI enhances the critical thinking of the learners?"
- 94% of the participants agreed with the statement "Do you think that AI improves the teaching process?"
- 90.6% of the participants agreed with the statement "Do you think that AI helps to improve learning outcomes?"
- 68.6% of the participants agreed with the statement "Do you think that AI has a positive impact on our educational system?"
- 73.4% of the participants agreed with the statement "Do you think that your students can use AI tools during the learning process?"
- 76.7% of the participants agreed with the statement "Can you use AI tools during lesson planning?"
- 86.4% of the participants agreed with the statement "Do you think that AI technologies are helpful for learners"?
- 80% of the participants agreed that they allow the use of AI technologies for pupils.
- 66.7% of the participants agreed with the statement "Do you think that AI technologies developed an open-minded approach in the teaching and learning process?"
- 6% of the respondents agreed with the statement "Do you think that students are afraid of using AI tools in education?"

- 83.4% of the participants agreed with the statement “Do you think that a student’s intellectual level is a factor that affects the use of AI in education?”
- 94% of the participants agreed with the statement “Do you think that AI affects your teaching experience?”
- 85.6% of the participants agreed with the statement “Do you think that AI tools change the education system in the coming years?”
- 98.7% of the participants agreed that AI technologies help in the process of personalized learning.
- 96% of the participants agreed with the statement “Do you think that AI technologies improve what we teach in educational institutions?”
- 90.7% of the participants agreed with the statement “Do you think that AI technologies are helpful from an educational perspective?”
- 88.6% of the participants agreed with the statement “Do you think that AI helps to save teacher’s time?”
- 71.4% of the participants agreed with the statement “Do you think that your students can learn easily through AI tools?”
- 98.7% of the participants agreed with the statement “Do you think that ethical considerations should be important when using AI in the educational process?”
- 69.4% of the participants agreed with the statement “Do you think that your students feel comfortable when using AI tools?”
- 78% of the participants agreed with the statement “Do you think that the need for AI is very important in education?”
- 92% of the participants agreed with the statement “Do you think that AI is currently used in education?”
- 71.3% of the participants agreed with the statement “Do you think that AI in education promotes equality and access for all learners?”
- 74% of the participants agreed with the statement “Do you think that AI improves the problem-solving and critical thinking of the learner?”
- 97.4% of the participants agreed with the statement “Do you think that AI is helpful for both teachers and students?”

Conclusion

As per the analysis of collected data, it is concluded that:

The first goal of this project was to examine the significance of artificial intelligence in enhancing the field of education. The majority of participants thought that AI should place a particular emphasis on education. The use of AI in the field of education requires having clear objectives in mind. The ability to use AI in the field of education to evaluate the significance of new information.

The second goal of this research was to determine the problems and possibilities regarding using artificial intelligence in education. An examination of the relevant factors is important. The vast majority of participants believed that AI helps them to identify the weak areas in a specific subject.

To investigate the third objective that Artificial intelligence offers a potential resolution to the challenges inherent in the field of education. The majority of respondents thought that AI is the solution to all educational problems.

The fourth goal of this project was to find out the potential benefits of incorporating artificial intelligence into the field of education. The vast majority of respondents believed that AI tools empowered them in the field of education.

Ultimately, the education sector has widely adopted and used AI, especially in educational institutions. Before developing into web-based and online intelligent education systems, AI first took the form of computers and computer-related technology. Eventually, it integrated web-based chat bots and humanoid robots with embedded computer systems to carry out duties and obligations for teachers either alone or cooperatively (Chen, Xie, & Hwang, 2020). Various technologies have been created to enhance student's learning and provide a conducive atmosphere for instructors to teach more effectively. Intelligent tutoring systems (ITS) or e-learning are two examples of this. E-learning is a teaching strategy that uses online resources and has developed with web technology (Nagao & Nagao, 2019).

Discussion

This study sought to investigate AI and its role in education. Nowadays, AI is playing a significant role in various fields, particularly in education. The function of AI in education includes its intelligent techniques for tutoring, communication, analysis, assessment, and evaluation of students or learners, as well as supervision, process control, and optimization. AI technology is capable of fulfilling all the necessary responsibilities of both a teacher and a pupil.

AI systems differ from human instructors in that they engage in one-on-one communication with each student and tailor their approach based on the student's specific needs and degree of

comprehension. Students or learners can access educational materials based on their comprehension or proficiency level. In contrast to traditional classrooms, students have a sense of comfort and can interact with machines without any feelings of pressure or tension, which is essential for effective teaching and learning. Participants are free to register and participate without any limitations on the number of registrations. The computer will cater to each pupil based on their aptitude and preferences. The intelligent system will autonomously carry out tasks like marking, attendance, and assignment verification without any external intervention.

Education, like other sectors, is impacted by contemporary technology, including the integration of AI. The application of AI in education may effectively handle many difficulties that are otherwise difficult to tackle via other methods. Some examples include access to classrooms, educational material, and the lack of a competent instructor. An exemplification of significant magnitude is the shutdown of educational institutions during the COVID-19 epidemic. The use of AI technology has greatly aided the industry in several ways. The need for AI is generally acknowledged, and the technology is advantageous in addressing the problem.

Suggestions

The following recommendations were made in light of the results.

The use of AI in education is beneficial across several domains. The education industry seems to show little opposition, or rather excitement, towards the use of AI for automating certain processes, particularly those related to administration and education. Consider the act of evaluating assessments and tailoring a curriculum to individual needs. Simultaneously, it is evident that the implementation of AI with significant consequences necessitates the resolution of important legal and ethical inquiries.

Furthermore, there is ongoing debate on the teacher's involvement in using AI. Teachers may assisted by AI, which allows them to provide enhanced instruction. However, teachers are expected to assume accountability for the judgments made by a mysterious AI, handle data, evaluate the significance of findings drawn from such systems, and provide a rationale for the use of AI to all parties involved.

To promote the use of AI in education, policymakers, especially the Ministry of Education, Culture, and Science, may focus on several key areas to develop policies and act:

- Foster the use of AI in education among teachers, parents, and students
- Enhance the digital proficiency of educators
- Establishment of a data infrastructure

- Enable AI experimentation in education and policies should provide guidelines for the boundaries of experimental activities
- Promote a collaborative approach involving several disciplines in the development of AI applications in education
- Establish a standardized approval for the ethical and careful use of AI

Recommendations for Future Research

- Future research can be on different populations or a broader level.
- Further studies may use qualitative methods or a mixed research approach.
- Future researchers may use experimental research.

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