

## **ARTIFICIAL INTELLIGENCE IN EDUCATION AND ITS ETHICAL IMPLICATIONS**

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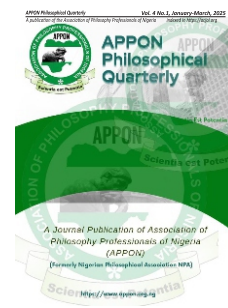
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### **ABSTRACT**

The integration of artificial intelligence (AI) technology in education has introduced numerous possibilities and benefits. However, it also raises ethical concerns that demand careful consideration. This research work explores the ethical implications associated with the implementation of AI in education. The work examines key ethical dimensions, including privacy and data protection, equity and bias, and the impact on the teacher-student relationship. The findings highlight the importance of transparency, accountability, and fairness in AI design and deployment. The work proposes a comprehensive framework to guide ethical AI implementation in education, emphasizing the need for robust policies, algorithmic transparency, and addressing biases. By proactively addressing these ethical considerations, educational stakeholders can ensure a responsible and inclusive educational environment that harnesses the potential of AI while upholding ethical principles.

**Keywords:** Artificial Intelligence, Education, Ethics, Implementing AI

### **INTRODUCTION**

The use of Artificial Intelligence for a vast range of purposes has become increasingly popular. From self-driving cars to creating award-winning pictures, analysing billions of tweets, and (ironically) writing entire articles. No one can deny that the growing production of digital data and the advancements in computational power have changed our daily lives and the way we think about intelligence. Some scholars have referred to AI as one of the radical technologies that will forever change human interactions. In recent years, the field of education has witnessed a rapid transformation, primarily driven by advancements in artificial intelligence (AI) technology. AI has the potential to

revolutionize various aspects of education, ranging from personalized learning experiences to efficient administrative systems. However, as educational institutions increasingly integrate AI into their practices, a crucial aspect that demands careful consideration is the ethical implications of such implementations. This research work aims to explore the multifaceted ethical challenges associated with the implementation of AI in education and shed light on the potential consequences for students, teachers, and the broader educational ecosystem.

While these technological advancements bring promising benefits, they also raise significant ethical questions that need to be addressed to ensure a

responsible and inclusive educational environment. The ethical implications of AI implementation in education extend beyond mere technical considerations. They encompass issues related to privacy, fairness, transparency, accountability, and the broader impact of AI on educational outcomes. For instance, the collection and analysis of vast amounts of student data by AI systems raise concerns about data privacy, security, and potential misuse. Moreover, the use of AI algorithms in decision-making processes, such as student placement or teacher evaluation, may introduce biases or reinforce existing inequalities if not carefully designed and monitored.<sup>1</sup>

Furthermore, the role of teachers and their interaction with AI technologies becomes a focal point of ethical analysis. As AI systems assume certain teaching functions, questions arise about the implications for the teacher-student relationship, the development of critical thinking skills, and the human touch in education. Striking the right balance between AI-assisted instruction and human guidance becomes paramount to ensure that the educational experience remains nurturing, empowering, and sensitive to individual needs.

To comprehensively examine the ethical dimensions of AI implementation in education, this research work will delve into the ethical principles that should guide the design and deployment of AI systems in educational settings, emphasizing the importance of transparency, accountability, and fairness. Additionally, it will explore the ethical implications for student privacy and data protection, highlighting the need for robust policies and safeguards. Furthermore, the work will examine the

potential impact of AI on educational equity and inclusivity, focusing on issues of bias, discrimination, and access.

### **The Modern Philosophical Perception of Artificial Intelligence and the Chinese Room Thoughts Experiment**

The modern philosophical perception of artificial intelligence has evolved significantly since Descartes and Turing. Today, many philosophers recognize that machines can simulate aspects of human cognition and decision-making, but they are less convinced that machines are truly conscious or possess a mind in the same sense as humans. René Descartes, one of the most influential philosophers in the modern era, has been credited with ground-breaking contributions to philosophical thought, including his views on artificial intelligence. In his famous work, *Meditations on First Philosophy*, Descartes laid down a foundation for the possibility of having machines that act as if they had minds and consciousness like humans.

Descartes began by positing that human beings are composed of two distinct substances—the physical body and the immaterial mind (or soul). He argued that while physical bodies can be examined objectively, thoughts and mental states can only be known through introspection. This idea is often summarized as “cogito ergo sum” or “I think therefore I am.”<sup>2</sup>

He further argued that since thinking is essential to an individual's existence, it must necessarily be possible for a being to think without possessing a physical body. This led him to believe in the possibility of creating a thinking machine that could operate much like a human being. For Descartes, the key factor in determining whether something was capable of thinking was language

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<sup>1</sup> Cathrin, S. & R Wikandaru, “The future of character education in the era of artificial intelligence.” *Humanika, Kajian Ilmiah Mata Kuliah Umum*, 23(1), (2023), 91-100. <https://doi.org/10.21831/hum.v23i1.59741>

<sup>2</sup> René Descartes, *Discourse on Meditation & Principles* translated by Veitch John (London: Orion Publishing Group.1960),15.

processing. He believed that if we could create a machine capable of understanding and using language fluently, then it would demonstrate evidence of true intelligence. In other words, he saw language processing as an essential marker for consciousness, reasoning that there must be some kind of inner capacity within such a machine that holds concepts and thoughts through languages like us humans.<sup>3</sup> Descartes' contributions and justifications set up an important conceptual foundation for artificial intelligence.

One important aspect of contemporary philosophy concerned with AI is its reliance on cognitive science. Cognitive scientists view the mind as a computational system and have therefore sought to understand how algorithms and programs could mimic the functioning of a human mind. However, they tend to be cautious about the extent to which artificial systems can really “understand” meaning or truly “reason” about information in the way humans do. “Can machines think?”—this important question was raised in 1950 by the British mathematician and logician Alan Turing. He emphasizes that the traditional approach to this issue is first to define the concepts of “machine” and “intelligence.”<sup>4</sup>

Turing, however, took a different path; instead, he replaced the original question (which he found to be nearly impossible to answer) with another “which is closely related to the original and is relatively unambiguous.” Essentially, he proposed to replace the question “Can machines think?” with the simpler question “Can machines do what we (as thinking creatures) can do?” A computer can be considered intelligent if it can make us believe that we are not dealing

with a machine but with a person.<sup>5</sup> The advantage of the new question, according to Turing, is that it draws a clear line between the physical and intellectual capabilities of a person, for which Turing offers an empirical test. The essence of an actual, practical Turing test is as follows: A judge, a man, and a machine are all put in different rooms. The judge is in correspondence with both the man and the machine, not knowing in advance which of the interlocutors is a man and which is a machine. The response time to a question is fixed so that the judge cannot determine the machine by this feature (in Turing's time, machines were slower than humans, but now they react faster and this limit is not important anymore). If the judge cannot determine which of his interlocutors is a machine, then the machine has passed the Turing test and can be considered thinking. Moreover, the machine will not just be a semblance of the human mind—it will simply *count* as a mind. We will have no way of distinguishing its behaviour from human behaviour. This interpretation of artificial intelligence as a full-fledged equivalent of natural human intelligence has been called “strong AI.”<sup>6</sup>

Let us pay attention to the fact that the Turing test does not mean at all that the machine should “understand” the essence of the words and expressions with which it operates. The machine only needs to successfully imitate meaningful responses to be considered truly intelligent. In 1980, John Rogers Searle, an American philosopher, influenced by Wittgenstein's later philosophy, proposed a thought experiment that criticized the Turing test and the notion that an intelligent mind can exist without understanding. He tackled this

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<sup>3</sup> Rene Descartes, Discourse: *Discourse on Meditation & Principles*

<sup>4</sup> G. James Jones, “Alan Turing- Towards a Digital” Mind:art1system toolbox. (August 2007), 18

<sup>5</sup> G. James Jones, “Alan Turing- Towards a Digital Mind”

<sup>6</sup> G. James Jones, “Alan Turing- Towards a Digital Mind”

problem in his book *minds, Brain, ad Science*.<sup>7</sup> John Searle has argued that AI can never really *think* like humans do. To demonstrate this, he has constructed the notorious Chinese room argument, which became highly influential in contemporary philosophy. He argued that programs can imitate mental processes made by humans, but only formally i.e., they do not *understand* what they are doing. Put differently, such intelligence is just following a set of rules (algorithms) without assigning meaning to them. To illustrate his point better he devised a thought experiment: “Chinese room argument”.<sup>8</sup> Searle asks us to imagine ourselves locked in a room where various baskets of Chinese symbols can be found. In that room, you will find a rulebook in your native language with instructions on how to manipulate the Chinese characters. The rulebook only provides rules like: “if you see symbol [X], answer with the symbol [Y]”, and so on. In this sense, you never get to know the meaning of those Chinese symbols.

Assume, furthermore, that someone outside the room slips some Chinese characters under the door. You can respond to those messages by taking characters from the baskets, ordering them according to the rulebook, and slipping them under the door. Let us suppose that the instructions are so clear and detailed that very soon your answers are indistinguishable from those of a native speaker. The person outside the room now thinks you understand and speak Mandarin.

Thus, the man in the room passes a kind of Turing test for knowledge of the Chinese language, which he actually does not know. Searle shows that the Turing test is not a criterion for the presence of consciousness at all, but only a criterion for the ability to

successfully manipulating symbols. The essence of Searle's position on the issue of artificial intelligence is as follows: the mind operates with semantic content (semantics) or *meaning*, while a computer program is completely determined by its syntactic structure (the form of the symbols it operates with). Therefore, passing the Turing test does not imply the presence of a mind.

Searle then asks, can we conclude that you know Mandarin? It seems that you do not. By way of analogy, as this is exactly what happens with Artificial Intelligence, AI does not *understand* as humans do. Searle writes: “understanding a language (...) involves more than just having a bunch of formal symbols. It involves having an interpretation, or a meaning attached to those symbols”.<sup>9</sup> Then, it appears that the road to Artificial General Intelligence is blocked by inherent limitations. Against this line of thinking, Luciano Floridi, a professor at the University of Oxford, agrees with Searle. Regardless of technological advancements, he says, the inherent limitation of AI will remain. It is like multiplying numbers by zero: regardless of how big the number is, the result will always be zero. Going back to Searle's Chinese room thought experiment, even if the instruction manual gets ticker and more complex, the person inside the room will never understand Mandarin.

In another direction, one could observe that in Searle's Chinese room, the point is that the people outside are convinced that you are fluent in Mandarin. Isn't that the whole point? Wouldn't that be sufficient? For Alan Turing, the father of Artificial Intelligence, if someone cannot distinguish between a fellow human and a machine, that program has succeeded! Could simulation be enough? We do not need to speculate.<sup>10</sup>

<sup>7</sup> J. Searle, *Minds, Brains and Science*. (Harvard University Press.1984).

<sup>8</sup> J Searle, *Minds, Brains and Science*.

<sup>9</sup> J Searle, *Minds, Brains and Science*. (Harvard University Press 2003), 31

<sup>10</sup> G. James Jones,” Alan Turing- towards a Digital Mind: art1system toolbox. (August 2007), 23

Examples are easily found: Google's virtual assistant can make phone calls and arrange appointments without people realizing they are speaking to an AI; Open AI model GPT-3 has been interviewed by YouTubers; finally, you have probably interacted with a chat-bot when requiring assistance with your bank or with the food order you placed. As Turing put it, it is an “imagination game”.<sup>11</sup>

The imitation game, nevertheless, is not sufficient. As mentioned earlier, single algorithms can outperform human beings in some tasks but that does not mean that they are thinking, or that they are learning continuously. Deep learning networks can play chess (IBM's Deep Blue) or Go (AlphaGo) or even win at Jeopardy on TV shows (IBM's Watson), but none of them knows they are playing a game. Besides, we tend to forget that during the “confrontation” dozens of engineers, mathematicians, programmers, cables, laptops, and so on, are behind the AI making everything work; they are indeed great puppeteers! Intelligence is more than having the right answers or calculating the right move. As Jeff Hawkins writes: “We are intelligent not because we can do one thing particularly well, but because we can learn to do practically anything.”<sup>12</sup>

Given the above, the argument made by Searle's Chinese room stands. So, if simulations fall short of the ideals of Artificial General Intelligence and the images that we have from science fiction e.g., *I Robot* or *Ex Machina*, what is the future of AI? Perhaps a different approach is needed. When IBM's Deep Blue won against Garry Kasparov in 1997, the Chess grandmaster said: “Anything we can do (...) machines will do it better (...) *If we can codify it*, and pass it to computers, they will

do it better.”<sup>13</sup> There is a clue in Kasparov's words: if we can *codify* what we do. The thing is that we are still trying to understand how is it that human beings are intelligent and how they, for example, develop language skills. Many aspects of our cognition remain mysterious; we are yet to codify the process. Could it be that the road to Artificial General Intelligence is closed by our lack of clarity regarding how the brain works?

This is the attitude taken by Jeff Hawkins in his book *A Thousand Brains*. He believes that an AGI needs to work as our brain does, which includes being able to navigate in the world, that is, having a body. Embodiment is crucial because it is through the body that the brain works: we learn by touching, moving, seeing, hearing, exploring, tasting, wondering about, etc. An AGI would need, similarly, sensors and moving mechanisms. The body does not require to be human-like; only being capable of exploring and navigating the world is essential. That is why neuroscientists, robotics researchers, and AI developers need to work together. The philosophical consequence of this intuition goes against the old dualism of Rene Descartes: we cannot think without a body.<sup>14</sup>

### Artificial Intelligence and the Philosophy of Education

The educational philosophy of John Dewey places an emphasis on hands-on experience and making connections between classroom learning and real-world situations. His philosophy of education focuses on the value of experiential and hands-on learning in preparing learners for civic engagement. Artificial intelligence (AI) in education, on the other hand, has the potential to individualize instruction and expand

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<sup>11</sup> G. James Jones,” Alan Turing- towards a Digital Mind: art1system toolbox. (August 2007), 23

<sup>12</sup> J. Hawkins, *A Thousand Brains: A New Theory of Intelligence*, Kindle Ed. (Basic Books 2021)

<sup>13</sup> J. Epstein, *Range* (Kindle-Ver). (Penguin Publishing Group 2019)

<sup>14</sup> Rene Descartes, *Discourse on Meditation & Principles*, translated by Veitch John (London: Orion Publishing Group.1960), 35

students' access to course materials, but it has also been linked to a decline in student-teacher contact. Experiential learning and making connections between classroom instruction and real-world problems and challenges are central to the **progressive pedagogy** that John Dewey championed. AI could be utilized in this setting to give students access to simulations and VR settings that are both realistic and interesting to them. **Constructivism**, which places an emphasis on the student's active participation in the learning process, may find a friend in AI in the form of individualized learning algorithms that can be tailored to each learner's specific requirements.

### Ethical Guidelines and Frameworks

Several researchers have proposed ethical guidelines and frameworks to inform the design and deployment of AI in education. For instance, Floridi et al. advocates for the incorporation of ethical considerations in AI design, emphasizing the principles of fairness, transparency, and accountability.<sup>15</sup> Van Wynsberghe proposes a set of ethical guidelines that encompass principles such as beneficence, autonomy, and informed consent, aiming to guide educational stakeholders in the responsible implementation of AI systems.<sup>16</sup>

The biggest challenge that the implementation of AI has arisen is in the form of ChatGPT, a Chabot designed by Open AI in 2019, mentioned in research done by Su, J. et al.<sup>17</sup> With ChatGPT, users may communicate with the model in a conversational setting while doing so in a straightforward and natural way. ChatGPT is a potent AI program that can write stories,

essays, document summaries, and answers to inquiries. ChatGPT can be utilized in the educational setting to make virtual tutors, respond to student inquiries, and offer specialized learning opportunities. The ability to comprehend, apply, and critically assess AI technologies and their effects on society may also be developed through its use as a practical application of AI for instructors and students.

In addition to providing people with various forms of convenience, AI-based services like ChatGPT, Perplexity, Bing Chat, and other comparable services also raise ethical concerns, particularly when used in the field of education. As is already generally known, ChatGPT has made it possible for users to communicate commands to "computers" in the form of requests, such as asking for the creation of a 1000-word essay, which would subsequently be completed instantly. These types of services unquestionably save people time and effort when they are compiling writing, for instance to make content for websites. Because ChatGPT is so simple and easy to use, it might encourage lazy behaviour in students because they don't have to worry about coming up with original ideas or conducting in-depth research—they can just state the issue they're trying to solve and get content that will help them pass—and because without AI plagiarism software checking the sources, students have less rich and important learning experiences. As people regrettably frequently choose the least difficult option, providing answers so quickly on a computer screen from ChatGPT would undoubtedly discourage curiosity and

<sup>15</sup> L. Floridi, and J. Cows, "A Unified Framework of Five Principles for AI," *Society*. Harvard Data Science Review, 1(1). (2019) <https://doi.org/10.1162/99608f92.8cd550d1>

<sup>16</sup> A. van Wynsberghe, "Designing Robots for Care: Care Centered Value-Sensitive Design." *Sci Ethics*, 19, 2013, pp. 407–433 <https://doi.org/10.1007/s11948-011-9343-6> "Ovidius" University Annals, *Economic Sciences Series* Volume XXIII, Issue 1 /2023421

<sup>17</sup> N. Selwyn, "What's the Problem with Learning Analytics?" *Journal of Learning Analytics*, 6(3), (2019), 11–19, <https://doi.org/10.18608/jla.2019.63.3>

the development of independent skills. The followings are the drawbacks of ChatGPT

Lack of Common Sense,  
Limited Understanding of Context,  
Biased Data,  
Inability to Perform Physical Tasks As a language model,( practical chores like cooking or cleaning.),  
Lack of Emotional Intelligence,  
Vulnerability to Adversarial Attacks

### **The Pros for Implementing the AI Technology in Higher Education System**

**The teaching–learning process:** that, in the future, and with the aid of AI, the process of learning will alter, bringing with it a new learning content, processes, and methodologies in addition to better educational experiences and outcomes.

**Positive effects on competencies and capabilities:** is related to bettering the knowledge and skills that students acquire during their academic training (mainly digital skills, which will be upgraded) and to developing new knowledge and skills as a result of technology advancement in general and the use of AI in particular.<sup>18</sup>

**Inclusion:** Due to specific learning methods that are adapted and tailored to suit their demands, students with a variety of needs and backgrounds will have the chance to continue their academic progress with the aid of AI.

**Administrative cost efficiency:** The enrolling procedure is thought to be the most cost-effective in this situation. which could improve the information flow between students and administrative personnel, "speed up the registration process", "process enormous amounts of data" and "reduce

bureaucracy" for the benefit of students.<sup>19</sup>

### **Negative Impacts of Implementing AI in Education**

**Social and psychological effects:** "addiction" and "isolation" are linked to "alienation", "a lack of empathy", "decreased emotional intelligence" and a delayed process of exchanging and comparing ideas. They also agreed that "social interaction" is "critical" for mental health. The detrimental effects of interactions between humans and machines have been identified as "lack of motivation" and "barriers in communication".

**Security:** One of the most sensible features of using AI in institutions was mentioned as "data protection." The three concepts of "data storage security," "confidentiality," and "loss of privacy" were considered to be the aspects of the virtual environment that are most vulnerable to hackers and those with criminal purposes.

**Ethical aspects:** if AI advocates replacing student-written texts with algorithm-written texts, it may cause a rise in unethical behaviour among students in higher education, according to a study.

**Unemployment:** voiced worry over the possibility of "being replaced" by silicon-based knowledge suppliers.

Additionally, according to the academics' predictions, it is very possible that administrative staff members will be replaced or reduced in number in the near future ("staff reduction/replacement").<sup>20</sup>

### **Ethical Implications of Artificial Intelligence in Education**

**Ensuring responsible** use of AI in a school environment involves establishing clear policies, educating staff, and

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<sup>18</sup> V. Božić, "Chat GPT and education." (2023). <https://doi.org/10.13140/RG.2.2.18837.40168>

<sup>19</sup> C. D. Gordon, "How Are Educators Reacting To Chat GPT?", *Forbes*, [online] Available at: <<https://www.forbes.com/sites/cindygordon/2023/04/30/how-are-educators-reacting-to-chat-gpt/?sh=cdfba962f1ca>> [Accessed 22 June 2023]

<sup>20</sup> A.I. Pisica, T. Edu, R.M. Zaharia, R. Zaharia, "Implementing Artificial Intelligence in Higher Education: Pros and Cons from the Perspectives of Academics." *Societies* (2023), 118 <https://doi.org/10.3390/soc13050118>

prioritizing data privacy and security. Schools should develop comprehensive policies that address ethical considerations and communicate them to all stakeholders. Training teachers and staff on its capabilities, uses, and risks are paramount to ensure responsible usage in the classroom. Regular monitoring and evaluation of AI usage, involving parents and guardians, and continuously reviewing and updating policies are also key steps to ensure responsible AI use in schools.

**Addressing Algorithmic Bias:** When used in schools, algorithmic bias in AI tools can lead to unequal learning opportunities and misclassifying students' abilities. The bias can also reinforce harmful stereotypes, lead to unjust discipline. To ensure that these issues are accounted for, it's crucial to ensure the tools used are trained on diverse data representative of the people using it and to consistently monitor them for fairness and accuracy.

**Data Privacy and Security:** With the integration of AI tools, safeguarding student data is paramount. This includes obtaining explicit and informed consent for data collection, ensuring minimal data collection, implementing strong data security measures, and defining clear policies on data retention and deletion. Schools must be transparent about their data practices and be able to inform students, parents, and staff about what data is collected, how it's used, and who can access it. Compliance with data protection laws and regulations is crucial. Finally, educating students about their data rights and the importance of data privacy should be integral to the school's approach to AI and data handling.

**Promoting Digital Literacy:** AI introduces potential risks to children's learning and digital literacy, including overreliance on technology, the digital divide, and the proliferation of misinformation. Overreliance on AI tools may hinder the development of critical problem-solving skills, while the digital divide may exacerbate educational

inequalities. AI-driven content recommendations could potentially spread misinformation, thus creating challenges for students in discerning credible information. To address these risks, schools should adopt blended learning approaches that combine traditional teaching methods with AI tools, ensuring a balanced learning experience. Additionally, schools must strive to provide all students with access to the necessary technology, helping to bridge the digital divide. Including digital and media literacy in their curriculum is also critical, as it enables students to critically evaluate online information, promoting better understanding and responsible use of AI and digital tools in the learning process.

**Ensuring Equity and Inclusion:** AI tools in education, if not properly designed or implemented, can potentially exacerbate educational inequalities, particularly for students with Special Educational Needs and Disabilities (SEND). For instance, if AI tools are not developed with accessibility in mind, students with different learning needs may find them challenging to use. Algorithmic bias can also occur, making AI tools more effective for mainstream students than for those with special needs. In addition, while AI has the potential to offer personalized learning, improperly designed tools may follow a one-size-fits-all approach, disadvantaging students who would benefit from more individualized attention. Schools must emphasize accessibility and personalization when implementing AI tools. They should collaborate with AI providers to ensure tools are designed with accessibility features, making them usable for students with diverse learning needs. Personalization should be at the forefront of AI implementation, with tools catering to each student's unique learning pace and style.

## Conclusions

The integration of artificial intelligence (AI) in education brings numerous opportunities and benefits, but it also raises significant ethical implications that must be carefully

examined. This research work has explored the multifaceted ethical challenges associated with AI implementation in education, focusing on the dimensions of privacy and data protection, equity and bias, and the impact on the teacher-student relationship. The importance of transparency, accountability, and fairness in AI design and deployment. Respecting privacy rights and ensuring user control over student data are crucial to maintain ethical practices. Safeguarding against biases and discrimination in AI algorithms is essential to promote educational equity and inclusivity. Furthermore, preserving the teacher-student relationship and the human touch in education is paramount, striking a balance between AI-assisted instruction and personalized guidance. To navigate the ethical implications of AI in education, it is imperative to establish comprehensive frameworks and guidelines. Incorporating ethical considerations in the design and development of AI systems, is fundamental to ensuring responsible AI implementation. Stakeholders, including educators, policymakers, and researchers, should collaborate to establish robust policies and safeguards to protect student privacy, address biases, and promote equity.

Also, note, a teacher should not be replaced by the implementation of the artificial intelligence, as the technology does not have the finesse and the emotions that a pedagogue has after years and years of training in children character and psychology. Future research should, first concentrate on creating and assessing AI-based educational apps and investigating the possible advantages and difficulties of utilizing this technology in various educational contexts and settings. Secondly, it is important to make sure that the technology is applied responsibly and morally. By using voice-activated interfaces like smart speakers or virtual assistants, ChatGPT can be used by young children in the early childhood education setting who are unable to read and write. Children can use voice commands or inquiries to interact

with ChatGPT, and the AI model can answer with audio outputs. Children who are not yet able to read or write can nonetheless use technology and engage with it. To ensure safety and wellbeing, it is crucial to stress that young children should utilize AI technology under the close supervision and guidance of adults.

ChatGPT and other AI tools won't go away, thus we need to make sure that we set up moral and pertinent boundaries for our students to use these technologies successfully. All educational organizations must purchase AI plagiarism toolkits. In order to guarantee that students are developing critical thinking and judgment abilities, educators must simultaneously adapt their teaching and curriculum strategies. As the purpose of education is to equip students with the necessary abilities to gain employment, as well as to solve business difficulties and problems that develop the organizations they are employed by, a judicious balance is required to ensure that cognitive off loading and critical thinking skills are not disregarded.

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