

## **Systematic Literature Review: Integrating Artificial Intelligence (AI) in Teaching and Learning of Language**

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**Abstract:** This article presents a comprehensive analysis of the incorporation of Artificial Intelligence (AI) in the field of language instruction and acquisition through a systematic evaluation of existing literature. The increasing prevalence of AI in diverse domains has generated significant interest in its possible utilization in the field of education. The evaluation commences by providing an overview of the methodology utilized, encompassing the search strategy, criteria for inclusion and exclusion, and the process of extracting data. An exhaustive examination of the chosen research uncovers fundamental patterns associated with the incorporation of artificial intelligence in language teaching. The aforementioned topics incorporate the advantages of artificial intelligence (AI) in language learning, including tailored learning experiences, improved language competency through AI-driven tools, heightened student motivation and involvement, immediate feedback and evaluation, and access to genuine language data and resources. Nevertheless, the review acknowledges the obstacles and constraints linked to AI in language teaching, encompassing ethical implications, apprehensions regarding job displacement, and the dependability of AI instruments. The review highlights the deficiencies in existing research and proposes avenues for future investigation, providing valuable perspectives on the possible influence of AI on language instruction and acquisition, and advising policymakers and educators on appropriate methods of integration.

**Keywords:** artificial intelligence, improved language competency, language instruction, language acquisition, tailored learning experiences

## **INTRODUCTION**

Since the introduction of first-generation computers and subsequent upgrades, technology has been utilized in education (Schindler et al., 2017 as cited in Tahiru, 2021). Educators were observed utilizing computers for a variety of purposes, including research, grading students, and instructing. Similarly, students utilized computers for problem-solving, research, and studying, among other activities. Subsequently, technology has undergone a series of advancements, culminating in the development of artificial intelligence (AI) as the most recent outcome of the technological revolution.

The prevalence of artificial intelligence (AI) applications in the field of education has been increasing and has garnered significant interest in recent years (Zawacki-Richter et al., 2019). Researchers and educational technologists are currently investigating the possible advantages and repercussions of integrating artificial intelligence (AI) into educational practices across all educational levels. Through the utilization of AI, educational practitioners strive to optimize pedagogy, individualize learning experiences, and expedite administrative duties. Moreover, AI has the capacity to scrutinize extensive quantities of data and offer valuable insights for educational decision-making and curriculum building. In general, the utilization of artificial intelligence (AI) in the field of education holds the capacity to completely transform the methods of instruction and the acquisition of knowledge, resulting in enhanced effectiveness, individualized learning experiences, and superior educational achievements for students.

### **Manuscript Search and Selection Criteria**

The process of searching for and selecting articles for this systematic literature review entailed an exhaustive investigation of numerous databases and sources. Web of Science, Google Scholar, ERIC, and Scopus were among the databases utilized.

In order to obtain pertinent articles, a collection of meticulously selected keywords and search methodologies were devised. Artificial Intelligence, Machine Learning, Natural Language Processing, Language Teaching, Language Learning, Second Language Acquisition, and Educational Technology were among the combined keywords. Modifications were applied to the keywords in accordance with the specifications and syntax of each database in order to optimize the search operation.

In order to make certain the inclusion of solely pertinent and suitable studies, precise criteria for inclusion and exclusion were established. The inclusion criteria were narrowed down to studies that investigated the incorporation of artificial intelligence in the context of language instruction and acquisition. In order to incorporate the most recent research, the chosen studies had to have been published subsequent to 2018 in peer-reviewed journals, conference proceedings, or academic publications. The studies were also required to be composed in English. In contrast, studies not pertinent to the incorporation of AI in language education, non-peer-reviewed articles, blog posts, editorials, studies published prior to 2018, and studies not accessible in English were excluded according to the exclusion criteria.

The search and selection procedure commenced with an initial screening in which the relevance of prospective articles was assessed by reviewing their titles and abstracts in accordance with the inclusion and exclusion criteria. Following this, complete texts of the chosen studies were acquired and meticulously evaluated to ascertain their pertinence. Discrepancies and disagreements were resolved by the authors through careful selection.

A process of data extraction was conducted in order to gather relevant information from the chosen studies. The information encompassed various aspects of the study, such as research methodology, learning outcomes, participant demographics, objectives, and limitations

pertaining to AI. The procedure of extracting the data facilitated a comprehensive comprehension of the literature.

The collated data underwent a thematic analysis as part of the synthesis procedure. A compilation of themes, patterns, and trends that emerged from the research was produced. The results were subsequently systematically arranged and displayed in a thorough fashion, incorporating pertinent visual aids such as textual descriptions, tables, and figures.

To summarize, the systematic literature review utilized a meticulous search and selection methodology to ascertain pertinent research on the incorporation of artificial intelligence in the domains of language instruction and acquisition. Through the application of multiple databases, judicious keyword selection, and clearly defined criteria, the reviewers guaranteed the incorporation of relevant articles. By means of data extraction and synthesis, crucial themes were identified and insightful knowledge was gained, which contributed to a holistic comprehension of the subject matter. This systematic review provides educators, researchers, and policymakers with a valuable resource regarding the application of artificial intelligence in language education.

### **Overview of Artificial Intelligence in Education**

The advancement of Artificial intelligence in education (AIEd) has the ability to revolutionize the educational landscape and influence the roles of involved stakeholder. Artificial Intelligence in Education (AIEd) is primarily centered around the rapid development of computers capable of performing cognitive functions that are typically associated with human intelligence, with a specific emphasis on enhancing learning and problem-solving abilities. The field aims to harness the power of technology to create intelligent systems that can simulate and replicate human-like intelligence while facilitating more efficient and effective educational experiences (Baker and Smith 2019 as cited in Chen et al., 2020).

The integration of AI in various aspects of educational practices has undoubtedly influenced the personal and professional growth of instructors and students, presenting them with a multitude of chances (Xu & Ouyang, 2021; Ouyang et al., 2022). The existing literature has presented a wide range of perspectives on the use of AI in education. These perspectives cover various aspects, including non-teaching functions like timetabling, resource allocation, student tracking, and providing information to parents/guardians. They also include the personalization of teaching and learning through tailored assessments, curriculum, and AI applications that support learners or monitor changes in learner engagement during foreign language learning (Fahimirad & Kotamjani, 2018; Reiss, 2021; Skinner & Walmsley., 2019). In their study, Hwang et al. (2020) identified four primary functions of AI in education, based on its practical implementations. These functions include AI acting as an intelligent tutor, tutee, learning tool/partner, or policy-making adviser.

As the quantity of research articles in AIEd continues to grow, it is crucial to thoroughly explore and discuss relevant matters in a systematic manner. Many studies focus on examining concerns related to the integration of AI in educational settings. Table 1 below provides a succinct summary of recent research endeavours that have examined these issues.

**Table 1: Studies related to AIED**

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Author(s) and year: Hinojo-Lucena et al. (2019)

Methods: Analyzed were 132 scholarly publications on artificial intelligence (AI) in higher education, which were indexed in the Web of Science and Scopus databases from 2007 to 2017, using bibliometric methods.

Aspect of analysis: The objectives of this study are to examine the current state of production, analyze the correlation between the number of authors and articles, and identify the primary sources, organizations, authors, and nations that contribute the most to scientific output in the field of artificial intelligence in higher education.

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Author(s) and year: Roll and Wylie (2016)

Methods: A systematic review of 47 Journal of AIED articles published in 1994, 2004, and 2014.

Aspect of analysis: To investigate the representative scenarios and foci that have occupied the field of AIED.

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Author and year: Garg (2020)

Methods Analysis: A position paper that guides medical educators on how to adequately prepare for artificial intelligence.

Aspect of analysis: To educate medical educators with the new challenges and opportunities; to outline the direct effects of AI on the methodology and content of medical education; and to introduce the overarching concepts of AI.

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Author(s) and year: Ocana-Fernandez et al. (2019)

Methods: The subject of this position paper is the implications of artificial intelligence on higher education.

Aspect of analysis: To discuss a variety of topics, including AI and its impact on the global world, human intelligence and AI, traditional versus new universities, digital skills, intelligent tutoring systems, and online learning, as well as new trends toward international social learning.

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Author(s) and year: Zovko and Gudlin (2019)

Methods: Position paper examining the repercussions of AI disruptive technology on students, educators, and society.

Aspect of analysis: To provide a comprehensive examination of disruptive technologies and innovations, with an emphasis on artificial intelligence as a disruptive force. The limitations and challenges associated with the implementation of artificial intelligence in educational processes and the educational system as a whole are emphasized in particular.

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Author(s) and year: Florea and Radu (2019)

Methods: This is a position paper that addresses concerns regarding the intersection of AI and education.

Aspect of analysis: To explore contrasting perspectives on the correlation between AI and education: one focuses on the potential of AI to improve education by enhancing the learning process, personalizing instruction, assisting teachers, and impacting e-learning. The other perspective examines how AI education should be designed to cultivate the workforce needed to confront this emerging technological revolution.

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There are certain limitations to be acknowledged. Firstly, a substantial portion of the literature consists of position studies, where authors express their personal perspectives on AIEd matters (Garg, 2020; Ocana-Fernandez, Valenzuela-Fernandez, & Garro-Aburto, 2019; Zovko & Gudlin, 2019). These types of studies may be biased and lack the objective representation of real-world scenarios due to their subjective nature and lack of substantial supporting evidence. Secondly, the bibliographic exploration of AIEd issues is significantly restricted. Although a bibliometric analysis conducted by Hinojo-Lucena et al. (2019) examined 132 academic studies on AI applications in higher education between 2007 and 2017, a more comprehensive examination requires a systematic review methodology. It is recommended to meticulously examine representative articles to gain a comprehensive understanding of the AIEd field.

Additionally, it is important to note that a 2016 study by Roll and Wylie (as cited in Chen et al., 2020) analyzed scholarly literature published in the *International Journal of Artificial Intelligence in Education* in 1994, 2004, and 2014, rendering it outdated. This single-journal focus limits our understanding of AIEd research and the review process for studies published after 2014 has not yet commenced. Consequently, there is a scarcity of comprehensive analyses summarizing the patterns, advancements, and ground-breaking AI technologies implemented in the field of education. However, a comprehensive analysis conducted by Zawacki-Richter et al. (2019) identified four key domains of AIEd applications: adaptive learning systems, intelligent tutoring systems (ITSs), assessment and evaluation, and profiling and prediction. It is worth noting that the selection of articles in this study was not based on academic influence or impact. Therefore, there remains a need for further research and analysis in order to gain a more complete understanding of the integration of AI in education.

### **Benefits of Integrating AI in Language Teaching and Learning**

Linguists and language teachers find AI intriguing from multiple perspectives. Utilizing AI and Natural Language Processing (NLP) techniques enhances the generation of comprehensive explanations for natural languages, resulting in improved processing of large collections of texts. Furthermore, it facilitates a deeper comprehension of the cognitive processes involved in human verbal communication. AI-driven technologies are utilized in computer linguistics for tasks such as developing computer languages, machine translations, and enhancing human-machine communication through speech recognition and synthesis. AI-powered tools are part of the developing field of educational technology, and many authors recognize the significant advantages they can offer to both students and teachers. AI-powered education (AIEd) provides the potential for a learning experience that is highly individualized, adaptable, inclusive, and captivating. It can equip educators and students with the resources to address not only the content being learned, but also the methods of learning and the emotional state of the student. It can assist learners in acquiring the knowledge and skills that businesses are actively seeking,

while also enabling teachers to establish more advanced learning settings beyond what would be achievable otherwise. AIEd, for instance, facilitates collaborative learning, which is challenging for a single teacher to accomplish independently. It achieves this by ensuring that the appropriate group is established for the specific activity and by offering precise guidance at the optimal moment (Luckin et al., 2016 as cited in Pokrivcakova, 2019).

Foreign language instructors and students have access to an extensive selection of AI-driven tools that are designed to facilitate their tasks. The implementation of AI in the instruction of foreign languages offers students prompt and remarkably personalized assistance, serving as an essential basis for personalized learning, which is considered an ideal pedagogical standard in the twenty-first century. AI-powered tools exhibit a distinct advantage over human instructors in this regard. Human teachers are limited in their ability to continuously assess the outputs of every learner, diagnose their unique learning requirements, adjust the learning content accordingly, and provide learners with reliable feedback within seconds – all while instructing a class of twelve or more students. However, tools propelled by AI have the capability to gather substantial volumes of data regarding the progress of learners. This data can then be utilized to construct personalized learning curves for each learner and to modify learning materials accordingly. In addition, by means of the functionality of small, consequential actions and immediate feedback, they facilitate the development of learners. As a result, educators can utilize these programs and applications as highly effective supplementary resources, as they liberate instructors from laborious, time-consuming, and energy-intensive tasks like exercises on grammar or pronunciation.

AI language learning tools refer to computer programs or software that employ artificial intelligence (AI) algorithms to assist users in acquiring and enhancing their proficiency in a foreign language. These tools encompass software that can perform real-time translation of text or speech, language tutoring systems that provide tailored lessons and feedback, and language production systems that can produce original writing in a certain language (De la Vall & Araya, 2023).

The utilization of AI in language learning has grown in popularity as a result of its convenience and effectiveness. Smart devices and the Internet have rendered it simpler for individuals to discover alternative methods of language learning. Language learning AI tools have the potential to optimize students' time by executing designated tasks and providing a more individualized learning experience that is tailored to their individual requirements and advancements. On the market, there are numerous varieties of AI language learning tools, each with its own capabilities and features. Prominent instances encompass Duolingo, Elsa Speak, and Google Translate. These tools are utilized by individuals and organizations across the globe to enhance their language proficiency for academic, professional, or recreational purposes.

The advancements in AI language learning technologies over the past few years have been significant, both in terms of their efficacy and user-friendliness. With the aid of virtual reality and augmented technology, these tools now offer an interactive and immersive learning experience. The utilization of AI in language acquisition has both benefits and drawbacks, as stated by Kannan and Munday (2018). These include the requirement for increased human engagement and the challenge of accurately reproducing cultural and contextual subtleties.

Nevertheless, this does not obscure the advantages of employing AI language learning tools for language acquisition. To begin with, these tools improve the speed and effectiveness of the learning process through the automation of tasks and the provision of individualized learning experiences that are customized to each student's progress and requirements (Xie et al., 2019). Instantaneous corrections and feedback can be advantageous for students, as it accelerates their skill development. Additionally, AI language learning tools offer customized experiences through the utilization of algorithms that monitor user advancement and modify instructional resources correspondingly (Kessler, 2018). This individualized strategy increases

learner engagement and productivity by accommodating their distinct learning styles and rates. Furthermore, certain tools enable users to acquire proficiency in multiple languages concurrently, thereby facilitating the development of language capabilities for private or professional objectives. Furthermore, it is worth mentioning the accessibility of AI language learning tools, which can be accessed conveniently from any internet-connected device or through mobile applications. These tools are accessible both online and via mobile application. This adaptability permits studying from any location and at one's convenience.

In summary, AI language learning tools frequently provide economical alternatives, such as free or low-cost alternatives, which render them more economically viable in comparison to conventional approaches like in-person classes or private tutors. Additionally, the adoption of AI language learning tools facilitates the efficient improvement of language proficiency, guarantees individualized learning encounters, and offers affordability and accessibility in the realm of language acquisition.

### **Challenges and Limitations of AI in Educational Setting**

Although AIED has the potential to transform education, researchers and practitioners face various challenges in their work due to the field's heavy reliance on technology and its interdisciplinary nature.

UNESCO (2019) identified six key challenges for achieving sustainable development in the field of Artificial Intelligence in Education (AIED): the need for comprehensive public policy, promoting inclusion and equity in AIED, adequately training teachers for AI-powered education, enhancing AI's understanding of education, establishing high-quality and inclusive data systems, prioritizing significant research on AIED, and ensuring ethical and transparent practices in data collection, use, and dissemination.

At the individual level, challenges encompass significant societal disadvantages such as systemic bias, discrimination, inequality for marginalized student groups, and xenophobia (Hwang et al., 2020). Additionally, there are complex ethical concerns regarding privacy and bias in the collection and processing of data (Holmes et al., 2021). The extensive consequences of AIED have given rise to growing apprehensions over its adverse implications, such as the exacerbation of educational inequities among learners due to the commercialization of education and the division between homeschooling and traditional education (Reiss, 2021). The use of AI may become widespread to the point where individuals may be exposed to hazards without their knowledge, and this situation may be further exacerbated by the continued effects of the COVID-19 pandemic (Borenstein & Howard, 2021). These hurdles highlight the need for teachers and students to be educated and familiarized with the ethical issues related to AIED and how to handle them.

In addition, AIED also presents ethical considerations and privacy concerns that require careful examination to distinguish between ethical actions and actions carried out ethically (Holmes et al., 2021). As Russell and Norvig (2002) stated, "all AI researchers should be mindful of the ethical implications of their work" (p. 1020). Multiple studies have shown that there are different ethical issues arising from the development of general AI and AIED. These issues mainly revolve around the responsibility of handling data in various contexts, including higher education, K-12 education, schools, and specific subjects. These addressed the topics of informed consent, privacy violation, skewed data assumption, fairness, accountability, and statistical apophenia.

There are concerns raised by others regarding the effects of AI-related areas such as surveillance and consent, learner privacy (Sacharidis et al., 2020), identity configuration, user confidentiality, integrity, and inclusivity (Deshpande et al., 2017 as cited in Nguyen et al., 2023). Another topic of conversation has focused on the ethical considerations around the use

of data for educational purposes and learning analytics (e.g., Kay & Kummerfeld 2019; Kitto & Knight, 2019). These encompass the domains of data analysis and administration, alternative viewpoints on data utilization, and the hierarchical dynamics among relevant stakeholders such as students, teachers, and educational goals (Slade & Prinsloo, 2013 as cited in Nguyen et al., 2023). Additional ethical concerns about AI in Education (AIEd) encompass challenges related to data collecting, limited accessibility to data sources, bias and representation, ownership and control of data, data autonomy, AIEd systems, and human agency (Akgun & Greenhow, 2021; Miao et al., 2021). However, it is essential to thoroughly understand these values and principles before making judgments that are guided by ethics and responsibility. It is also important to be mindful of potential, and possibly unforeseen, consequences in the field of education.

Although recent work has attempted to establish different ethical frameworks for general AI use (e.g., Ashok et al., 2022), ethical and privacy issues are suggested to be contextualized (Ifenthaler & Schumacher, 2016), hence the prior guidelines established in other disciplines might not be appropriate for education. The contextual approach to the ethical design and use of AIEd could play an essential role in addressing the issues of ethical and privacy concerns in education context. Prior research has emphasised the importance of the sociotechnical context configured by educational technology and educational practices in ethical considerations (Kitto & Knight, 2019). The understanding of ethics and privacy from various perspectives could promote the design of ethical and trustworthy AIEd and the adoption of such systems. The consensus assessment of policies and guidelines would inform a comprehensive and integrated instructions for different stakeholders in adopting AIEd. This contributes to establishing a common ground and solid foundation for further development and implementation of AIEd.

### **Concerns About the Future of Artificial Intelligence**

The topics of ethics, bias, and fairness continue to be at the forefront of conversations over the expanding influence of artificial intelligence. In most cases, the data that is used to train artificial intelligence includes data that has biases that are either inherent to the data itself or to the process of developing algorithms. Furthermore, the outcomes that are produced as a consequence of this bias can be problematic or even harmful to particular populations. It is conceivable to improve the fairness of algorithms by adopting the approaches of cognitive scientists who are accustomed to working with the ‘black box’ of the human brain (Taylor & Taylor, 2021). While responses such as explainable AI are possible routes to improve the fairness of algorithms, vital insights may be gained by adopting these methods.

It is becoming increasingly evident that all faculty, teachers, and students in higher education need to have the necessary literacies and competencies (Long & Magerko, 2020; Ng et al., 2021 as cited in Gasevic, 2023). This development is a direct result of the sudden public interest in artificial intelligence, which was driven by the success of big language models. What information about artificial intelligence should the general public be aware of? What are the significant differences between the reskilling of society in computer science literacies during the past few decades and the general competencies in artificial intelligence? It is at this point that important concerns arise: what should the general public know about artificial intelligence, and what should academics (both students and faculty) know about it? What methods will be utilized to reskill vast segments of the population, and who will be responsible for initiating and supporting this process of reskilling? Literacy in artificial intelligence should be a state and national initiative. On the other hand, should this need be left to the public and private education sectors to address? No matter the manner in which those judgments are made, it appears to be an essential and fundamental requirement to have a functional grasp of what



artificial intelligence (AI) is, what it does, and the potential ramifications it may have on persons and society.

There will always be a difficulty to overcome regarding the trustworthiness and dependability of AI technologies. The notion of generative artificial intelligence, which is built on transformer-based architectures for the purpose of training huge language models, is the foundation of several artificial intelligence technologies that have recently gained a lot of attention. These artificial intelligence technologies are capable of producing textual replies that are remarkably realistic and human-like across a wide variety of genres. On the other hand, the architectural designs of such technologies do not have any conceptions that may guarantee the truthfulness of facts and reason about the relationships between causality and time (Marcus & Davis, 2019). Furthermore, they are able to generate eloquent comments that are written in an authoritative tone on issues that are completely incomprehensible, such as the financial consequences of pension plans and the effects of elderly care on immune cells. Arguably, in order to overcome these challenges, a fundamental paradigm shift from the technologies that are currently being used in artificial intelligence is required (Marcus & Booch, 2023). While we are working with the current iteration of artificial intelligence technologies, which is generative, we recognize the need to identify effective learning and teaching practices that will utilize the shortcomings of generative AI technologies as opportunities for promoting higher-order learning (for example, analyzing and scrutinizing outputs produced by ChatGPT). To be successful in this process, we cannot expect teachers and educators to solve the issue of artificial intelligence (AI) in their classrooms on their own. Instead, we need to have a significant amount of involvement from researchers, technology developers, and policy makers.

As generative AI technologies, such as ChatGPT, gained increased media attention in late 2022, academics and universities reacted with concern. As institutions, universities have had an impact on the discovery and dissemination of human knowledge for centuries or millennia. Consequently, universities are not evaluated based on how quickly they react to emerging trends. Although this feature of higher education systems is commendable for preventing minor yet significantly publicized trends from overshadowing the noble long-term objectives of universities to support democracies and society at large while improving the standard of living for all, it hinders the ability of school systems and universities to adapt and respond systemically to profound and potentially existential trends, as well as to conceive of novel contributions to a society where artificial intelligence is prevalent. Critical discussions arise for university administration. Prior to anything else, can the early indicators of effective AI approaches in the classroom be extrapolated to accommodate large numbers of students and a growing diversity of students? Furthermore, in regard to the rate at which systems ought to react to AI and the degree of assertiveness with which they should reconfigure themselves in light of AI.

## **CONCLUSION**

The incorporation of artificial intelligence (AI) into the domain of education has yielded substantial progress and a multitude of prospects for educators and students alike. Adaptive and individualized learning experiences have become possible due to the implementation of intelligent systems that supplement conventional classroom environments. By adapting to various learning styles, the software can track student progress in real-time, provide immediate feedback, and enable students to progress at their own tempo. This functionality is especially beneficial for students who have learning disabilities and necessitate individualized instructional approaches. Moreover, the integration of AI in education facilitates seamless communication between distant learners and online tutors, mentors, and peers. Ongoing

development of novel applications aims to expand the scope of accessibility for this technology, thereby facilitating its utilization by learners from diverse backgrounds.

Furthermore, the integration of AI technology into the field of education may lead to enhanced oversight of academic establishments, streamlined administrative procedures, and improved curriculum management systems. By identifying patterns in academic achievement and recommending curriculum modifications based on the requirements of the students, intelligent systems have the potential to improve educational outcomes. By detecting instances of academic dishonesty and plagiarism, they promote the value of academic integrity. Additionally, AI can improve academic community stakeholder engagement, information sharing, and communication.

However, the incorporation of artificial intelligence presents ethical complexities, specifically concerning matters of privacy, security, and autonomy. Hence, prior to deploying AI-integrated education systems, it is critical to comprehensively evaluate these and any other potential negative consequences for education. It is crucial to continue monitoring the effects of AI as its application expands and to ensure that its implementation enhances the quality of education at every level and this can potentially via extensive research about AI.

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