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AI in Education: Cracking the Code Through Challenges: A Content Analysis of one of the recent Issues of Educational Technology and Society (ET&S) Journal

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Abstract - AI is rapidly being utilized in education, potentially altering the learning process by enhancing outcomes, increasing efficiency, and enriching the educational experience. However, the use of AI in education raises several concerns, including the need for high-quality data, ethical and privacy concerns, challenges in integrating AI technology into existing educational systems and practices, and a lack of expertise and knowledge of AI among educators and learners. This study investigated these topics by doing a content analysis of one of the most recent issues of the journal Educational Technology and Society (ET&S), with an emphasis on AI in education. The study adopted qualitative content analysis to identify and categorize the prevalent themes and issues connected with AI in education, such as possible advantages, challenges and risks, ethical and privacy concerns, and the need for additional AI education and training. The findings of this study suggest that a thoughtful and careful approach is necessary for integrating AI into education, focusing on addressing critical challenges identified in this study.

Keywords: AI Challenges, AI in Education, High-quality data, Ethics, Advantages, Privacy Concerns.

1. INTRODUCTION

Artificial Intelligence (AI) has enormously impacted many sectors of our life, including education [1]. The use of AI technology in educational settings has the potential to transform the learning process by improving results, boosting efficiency, and enriching the educational experience [2]. However, the use of AI in education raises several concerns, including the need for high-quality data, the difficulty of integrating AI technology into existing educational systems and practices, ethical concerns about the use of AI, security, and confidentiality of data concerns, and a lack of expertise and knowledge of AI.

Stahl claims that the current emphasis on machine learning [3] in the debate regarding AI ethics also results in a focus on ethical issues that are connected to some of the theoretical and practical implications of machine learning, particularly its need for enormous data sets for training and validation purposes, the low transparency of many techniques, and the computational needs that machine learning require. According to [4] to make generative and self-adaptive AI models more transparent and to make their results less complicated for individuals to comprehend, it is required to create new approaches.

The embedded ethics approach, which intends to address moral concerns in the creation of Machine Learning Health Care Applications (ML-HCAs), is conceptualized and logically represented by Fiske [5]. The pipeline model recognizes ethical issues as they arise along the developmental pipeline, but it is not without shortcomings such as conceptual flaws, unanswered questions of accountability, and difficulties in dealing with trade-offs. (Fiske et al., 2020) utilize an embedded ethical method to provide answers to these cautions. They stress that their strategy accepts the limitations of ethical issues and places pragmatism

above prescription. These researchers [5] [6] argue that ethicists should oversee how AI development reflects ethical principles.

Given the rapid pace of advances in technology and the increasing use of AI in education, it is critical to investigate the issues raised by its application. This necessitates a thorough awareness of the present state of AI integration in education, as well as its prospective consequences for students and instructors. This research aims to do a content analysis of January 2023, Volume 26, Issue 1 of ET&S, Educational, Technology, and Society Journal using qualitative content analysis [7] to uncover common themes linked to the usage of AI in education. Furthermore, ET&S has a global audience and has a considerable international effect on educational technology. The journal's extensive publication of research findings guarantees that the content analysis on AI in education reaches many educators, academics, policymakers, and industry experts from many nations and educational systems. This worldwide reach enables a more inclusive debate of the problems and possible benefits of AI integration in a variety of educational settings.

Utilizing the directed approach, this analysis will focus on relevant research findings related to AI as guidance for initial codes. The analysis attempts to give important insight into the present level of AI application in education and the existing challenges that must be considered by examining papers from prominent publications in the area. The findings of this study may add to existing discussions and debates concerning the responsible and successful integration of artificial intelligence in educational settings, guiding future research and policy development in this area.

2. METHODOLOGY

Due to its dedication to an interdisciplinary approach, the Journal of Educational Technology and Society (ET&S) was selected as the major source for this content analysis. ET&S invites contributions from a wide range of disciplines, including education, computer science, psychology, and sociology, to name a few. This multidisciplinary approach guarantees that conversations on artificial intelligence in education are supplemented with concepts from other disciplines, resulting in a thorough knowledge of the intricate interplay between technology and learning processes. 17 articles from January 2023, Volume 26, Issue 1 of the journal Educational Technology and Society (ET& S) were selected for the content analysis. This issue received attention because it focuses on "AI in Education." Other issues of the journal related to AI in education, such as Issue 3 "From Conventional AI to Modern AI in Education- Re-examining AI and Analytics Techniques for Teaching and Learning" and a special issue on "Precision Education - A New Challenge for AI in Education," contained papers published in 2021. The goal of this content analysis, however, is to concentrate on newer articles linked to AI. As a result, choosing one of the most recent issues, January 2023, assures that the papers are current and reflect the most recent advancements in the area. By focusing on a specific topic related to the theme of "AI in Education," the analysis is more focused.

The decision to focus on this journal was made for several reasons. First, ET& S is a highly reputable academic journal that publishes research related to educational technology and society, and its papers are rigorously peer-reviewed prior to publication to ensure their quality and academic rigor. By analyzing articles from this journal, one can gain insight into the current state of the discussion on the use of AI in education within this academic community. Second, by analyzing articles written by experts in the field of educational technology and society, the reliability and validity of the findings can be ensured. Additionally, the selection of the issue of ET&S, which focuses on AI in education, coincides with the research aim of studying the most recent advances in the field. This content analysis provides insights into the present level of discourse on AI in education by reviewing one of the most recent types of research published in the

journal, highlighting unique difficulties and potential solutions that may not be effectively addressed in other existing literature. ET&S is positioned as a forward-thinking platform because of its emphasis on new subjects, making it a perfect source for understanding the changing role of AI in defining the future of education.

To conduct the content analysis, the articles were read and categorized using nine pre-determined codes. These codes were generated after an in-depth review of the literature on the application of AI in education. The codes address topics such as the purpose of AI in education, the role of AI in education, the benefits of using AI in education, the challenges of implementing AI in education (such as the difficulty of integrating AI technology into existing educational systems and practices, the shortage of high-quality educational data from which AI systems can learn, and data privacy and security concerns), and AI ethical issues. I added a code for educators' and learners' lack of expertise and understanding of AI throughout the process since [8] inductive content analysis technique (2019) allowed for the creation of additional codes and topics during the analysis process. These codes which were categories of words, were identified based on a review of the literature on the use of AI in education and were refined through a process of reading and coding the articles. Each article was analyzed line by line, and each relevant sentence or paragraph was assigned to one of the nine codes. The data were then analyzed to identify the most common themes related to the use of AI in education in the ET& S journal.

To analyze the detected codes in the collection of 17 articles from the ET&S journal, descriptive statistics were applied to describe the frequency and distribution of the coded categories. This method allowed for the identification of trends and patterns in the data without drawing judgments outside the sample investigated, offering insights into the present status of the debate on the use of AI in education among the academic community that appears in the journal.

The coding scheme includes the following categories:

- Potential Benefits of AI in Education: This category includes the potential benefits of using AI in education, which was found in three articles. Some of the potential benefits include improved learning outcomes, personalized learning, and the ability to provide feedback and support to students.
- Challenges and Risks Associated with AI in Education which include the challenges and risks associated with using AI in education, the need for high-quality data, difficulty in integrating AI technology into existing educational systems and practices, ethical concerns related to the use of AI, data privacy and security concerns, lack of knowledge and understanding of AI among educators and learners.
- AI Literacy Skills for Students and Educators: This category includes the importance of developing AI literacy skills for students and educators which was found in three articles. AI literacy skills include the ability to understand and critically evaluate AI systems and their impact on society.
- Human-Centered Approach to Designing AI Systems for Education: This category includes the importance of a human-centered approach to designing AI systems for education, which was found in three articles in this journal. A human-centered approach involves designing AI systems that prioritize the needs and values of students and educators.

3. RESULTS

After applying the coding frame to these articles, Commonalities were found between these three articles [9] [10] [11] in their focus on the role, benefits, challenges, and ethical issues related to incorporating AI in education. They all discuss the advantages of using AI in education, such as personalized learning and improved student engagement. They also address the challenges in implementing AI in education, such as the lack of knowledge and understanding of AI among educators and learners, ethical issues, and difficulty in integrating AI technology into existing educational systems and practices. The articles also discuss the ethical issues associated with AI, such as bias and privacy concerns, and the need to address these issues in the design and application of AI in education.

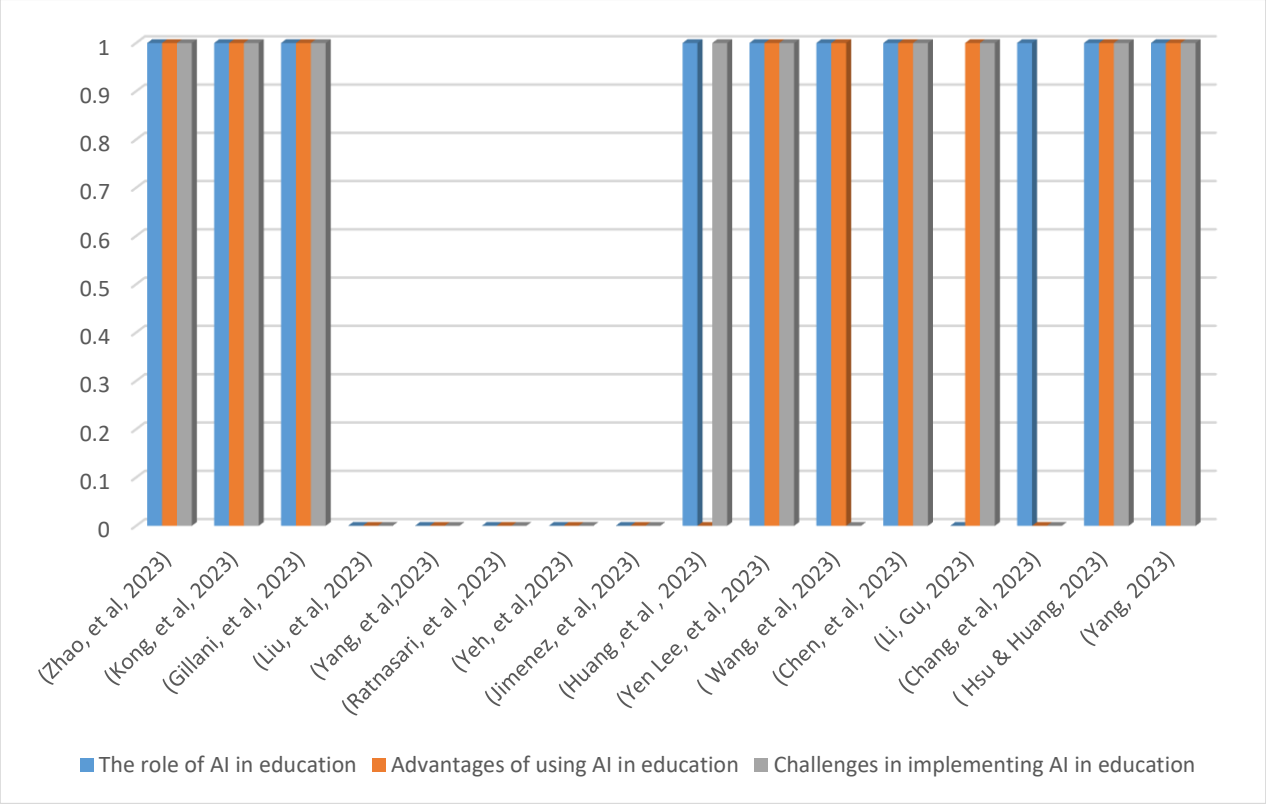

Fig -1: The Frequency of the Themes Appearing in the Articles

As can be seen in Figure 1, all the articles discuss the potential benefits of incorporating AI into education. Each article offers different perspectives on how AI can be used to improve learning outcomes, such as personalized learning, adaptive assessment, and enhanced student engagement. Additionally, all three articles acknowledge the challenges associated with implementing AI in education, such as data privacy and security concerns, ethical issues, and difficulty in integrating AI technology into existing educational systems and practices. The articles also mention the need for educators and learners to have a better understanding of AI and its applications in education.

While the previous articles focused on the use of AI in education and its potential benefits, challenges, and ethical considerations, Liu, et al [12] examine the factors that influence students' engagement in online discussions from a social-cognitive perspective. The article investigates the relationship between students' perceptions of the learning environment, their self-efficacy, their social presence, and their level of

engagement in online discussions. It uses an integrated analysis approach to explore the complex interplay of these factors. Therefore, the focus and subject matter of this article are distinct from the previous three articles.

One of the reviews that are included in this issue of the journal [13] is a review of the literature on the use of technology in self-regulated language learning. The article discusses various studies that have used technology to enhance self-regulated language learning and provides an overview of the different approaches, methods, and technologies used in these studies. The authors also explore the effectiveness of technology-enhanced self-regulated language learning and discuss the challenges and future directions for research in this field. Overall, the article aims to provide insights into the current state of technology-enhanced self-regulated language learning and suggest ways to improve the design and implementation of such programs. While the article implicitly mentions data privacy and security concerns in the use of technology for learning in a few ways, AI has not been mentioned as a technology listed in this paper.

Another article in this journal [14] explores the research trajectory of digital game-based learning by conducting a citation network analysis. The authors analyze articles published between 2000 and 2019 and identify key authors, journals, and research topics. They also examine the evolution of research trends and themes over time and highlight future directions for research in this field. The paper specifically focuses on the research trajectory of digital game-based learning and does not cover the broader topic of AI in education. Neither of the other codes was found in this article.

The article [15]is not related to AI and the mentioned codes because it focuses solely on psychological factors and their impact on self-efficacy in game-based creativity learning. While the study suggests strategies for fostering positive psychological traits in students to enhance their engagement and self-efficacy in game-based learning, it does not address the role of AI in education or any related AI concepts or issues.

Jimenez et al. [16] investigate how utilizing Yupana, an indigenous information system, with modern technology in a game-based learning setting, influences students' knowledge and usage of numbers. Despite lacking anything related to AI, the article demonstrates the power of integrating conventional knowledge and innovative technology to create culturally responsive learning experiences. This research, however, was excluded from the final analysis of AI-related articles.

Huang [17] present developments, and research concerns with the use of artificial intelligence (AI) in language education. The article discusses the different uses of AI in language learning, such as intelligent tutoring systems, chatbots, speech recognition, and machine translation. The authors also examine the benefits and drawbacks of employing AI in language instruction, such as increased student engagement and individualized feedback, as well as the possible absence of human contact and the necessity for high-quality data.

The paper emphasizes the significance of taking pedagogical concepts into account while developing AI-based language learning technologies that are student-centered, flexible, and successful. This code appears in the article's introduction, where the researchers highlight the potential for AI to modify language instruction. "AI has great potential for education because it can generate predictive and diagnostic models for precision education, help visualize students at risk, provide timely intervention, and reduce dropout rates " as mentioned in [17]. The advantages of AI in education are covered throughout the article, including

delivering specific input, improving student engagement, and aiding language acquisition outside of the classroom.

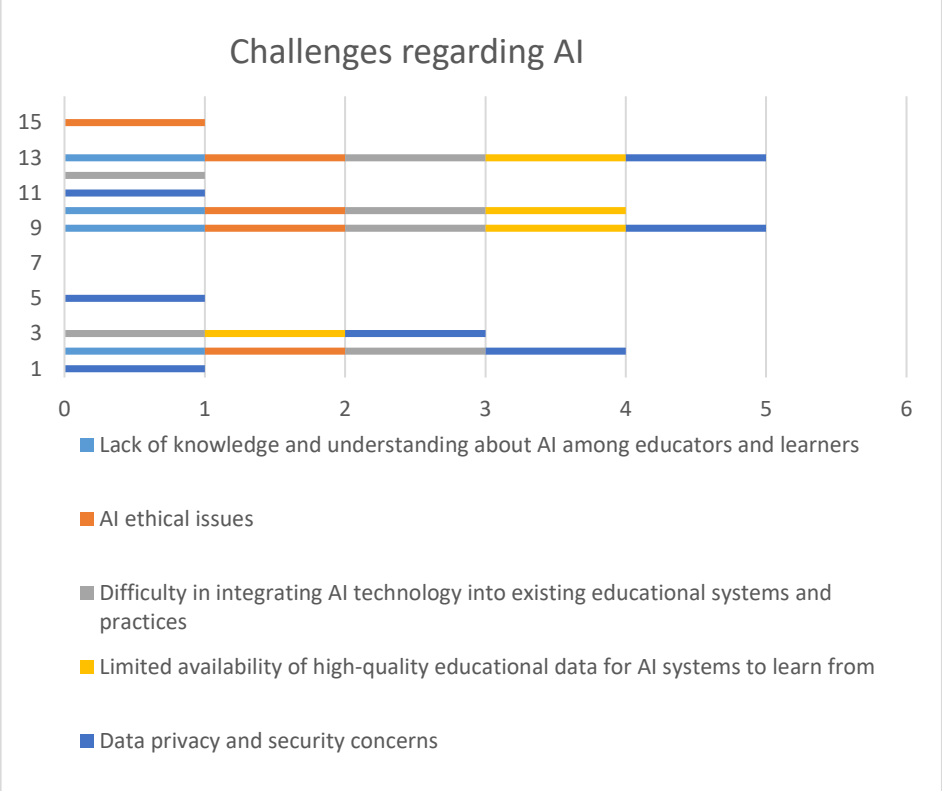

Fig -2: Frequency of the Themes in the Articles Regarding Challenges

Figure. 2 illustrates the different challenges involved with the application of artificial intelligence in education. It shows five specific challenges, including the need for high-quality data, the difficulty of integrating AI technology into existing educational systems and practices, ethical concerns about AI use, data privacy and security concerns, and a lack of knowledge and understanding of AI among educators and learners.

Four of these concerns are mentioned in [17]. The need for high-quality data, the difficulty of integrating AI technology into existing educational systems and practices, and ethical concerns regarding the use of AI in education are all mentioned in the introduction and discussed throughout the article. In one of the sections of this paper, the researchers mention that many educators and learners may not wholly comprehend the possibilities and limits of AI, this section is coded for "Lack of knowledge and understanding about AI among educators and learners". The "ethical concern" code can be found in the introduction and described in a section devoted to investigating ethical considerations with the use of AI in language instruction.

Data privacy and security concerns are addressed in the section discussing the ethical concerns related to the use of AI in language education, where researchers emphasize the necessity for ensuring data privacy and security when utilizing AI in education [17]. An example of this is to establish principles and ethical codes before employing AI to prevent the leaking of personal information.

Table -1: Data Sources

Coding scheme			
Categories	Sub-Categories	Appearing in the Journals	Number of papers they appear in
Potential Benefits of AI in Education	Improved learning outcomes/ Personalized learning/ The ability to provide feedback and support to students.		8
AI Literacy Skills for Students and Educators	Importance of developing AI literacy skills for students and educators, the ability to understand AI, and critically evaluate AI systems, and the impact on society.		2
Challenges associated with the Use of AI	The need for high-quality data	[17] ,[11] ,[21] ,[23]	4
	Difficulty in integrating AI technology into existing educational systems and practices	[9],[11],[17],[21],[22],[23]	6
	Ethical concerns related to the use of AI.	[9],[17],[21], [23], [24]	5
	Data privacy and security concerns	[20],[10],[11],[9],[17],[23]	6

	Lack of knowledge and understanding of AI among educators and learners	[9],[17],[21],[23]	4

The table illustrates the data sources, categories, sub-categories, and the number of articles relating to the application of Artificial Intelligence (AI) in education. The table shows possible AI benefits in education, such as enhanced learning outcomes, individualized learning, and the capacity to offer students with feedback and help. Furthermore, the table identifies several challenges associated with the use of AI in education, such as the need for high-quality data, the difficulty of integrating AI technology into existing educational systems and practices, ethical concerns about the use of AI, data privacy and security concerns, and a lack of knowledge and understanding of AI among educators and learners.

4. DISCUSSION

Based on a content analysis of 17 papers published in a single issue of the journal Educational Technology and Society, the findings of this study give significant insights into the present status of discourse on the use of AI in education. According to the findings, the most often discussed subjects include difficulty in integrating AI technology into existing educational systems and practices, and data privacy and security concerns.

The results of the content analysis revealed that there are many commonalities among the examined articles [9,10,11] when it comes to the function, benefits, challenges, and ethical problems regarding the implementation of AI in education. The findings emphasize how important it is to understand the potential as well as the consequences of AI in educational situations which are in line with the literature that currently exists on that subject.

Three studies in this issue of the journal highlight the advantages of using AI in education, including personalized learning, higher levels of student engagement, and the ability to provide students with personalized feedback and assistance as part of personalized learning. Regarding the benefit of personalized learning paths, similarly, [17] state that past student data and current data on student profiles and performance can be used to analyze and predict learning. These benefits meet the current educational expectations for personalized learning and increasing student engagement and motivation. AI-powered technology can assist teachers in creating more adaptable, dynamic learning environments that accommodate the unique requirements of each student.

The papers, however, also highlight the difficulties in integrating AI into the classroom. The lack of AI understanding and expertise among teachers and students is a recurring barrier. Zhao et al., [10] similarly, state that AI-related challenges in education are caused due to the inappropriate use of AI techniques, changing roles of teachers and students, as well as social and ethical issues. The significance of supplying instructors with the training and professional development opportunities they require to successfully integrate AI technologies into their teaching techniques should be highlighted to narrow this knowledge gap. The difficulties in integrating AI into the systems and practices of today's educational institutions

underscore the need for meticulous preparation and infrastructure development to ensure an integration process.

The examined publications also address ethical concerns connected to the use of AI in education. Major concerns that require to be addressed include the potential for bias in AI algorithms as well as the privacy and security hazards associated with data collection and utilization. In K-12 contexts, according to [18] the major concerns associated with utilizing these algorithms include magnifying sexism, xenophobia, and other kinds of injustice and inequality, as well as maintaining systematic prejudice and discrimination, and unfairness for students who are mostly from disadvantaged and marginalized groups. Teachers, legislators, and academics must work together to develop ethical frameworks and norms for the use of AI in education. Fairness, transparency, and data privacy must come first to promote trust and ensure the proper implementation of AI technology.

This content analysis's findings are consistent with ET&S's aim of delivering practical insights and concrete recommendations to educational practitioners and policymakers. The determined common themes and issues related to AI in education can provide educators and decision-makers with invaluable advice on how to effectively integrate AI technologies in an approach that aligns with ethical principles, protects student privacy, and improves the overall educational experience. Because of ET&S's practical approach, the findings of this content analysis are applicable and beneficial to stakeholders considering adopting AI in education.

It is crucial to note that, even though the articles under evaluation provide valuable information regarding the benefits and challenges of AI in education, not all of the studies expressly addressed AI, or the specific codes associated with AI. Some articles covered a variety of technological or educational topics, highlighting the wider context in which AI operates.

Further research could look at the most effective methods that can be utilized to teach with AI in the classroom. Moreover, a human-centered perspective should be used in developing the technologies associated with AI. Future research should address the challenges that have been identified while continuing to examine the potential applications of AI in education. This ensures the proper implementation of AI technologies as well as awareness regarding their use.

5. LIMITATIONS OF THE STUDY

One limitation of this study was having a single coder. To strengthen the study's inter-coder reliability, it is recommended that two independent coders code the articles and resolve any potential conflicts that arise. It is worth noting that the sample size is rather small, consisting of only 17 articles from a single issue of Educational Technology and Society (ET& S). As a result, the findings may not completely represent the current state of the academic community's discourse on the use of AI in education. Furthermore, because the study focuses solely on the ET& S journal, it may overlook the diversity of perspectives found in other relevant publications.

Despite these limitations, the study's findings have important implications for educators, researchers, and policymakers interested in the use of artificial intelligence in education. The study emphasizes the importance of continuing research into the benefits and difficulties of AI, as well as the Lack of knowledge and understanding of AI among educators and learners that must be considered.

6. CONCLUSIONS

This content analysis reveals that the literature on AI in education focuses on potential benefits and challenges associated with its use, AI literacy skills for students and educators, and a human-centered approach to designing AI systems. Among these themes, challenges related to the use of AI stand out as particularly significant [19], [9], [11],[17],[21],[22] & [23]. The analysis identified the need for high-quality data, difficulties in integrating AI technology into existing educational systems and practices, ethical concerns, and data privacy and security concerns as the most critical challenges. Difficulty in integrating AI technology into existing educational systems and practices and Data privacy and security concerns appear to be the most pressing issue in the field, with ethical issues also frequently mentioned in the literature (Kong et al, [17] et al., Lee et al., [23][24]. Although the lack of knowledge and understanding of AI among educators and learners is a challenge, it appears to be of a lower frequency in the literature, mentioned in only four papers [9][17][21] &[23].

The lack of AI literacy skills among educators may result in missed opportunities to enhance student learning outcomes, increase efficiency in administrative tasks, and ultimately hinder the overall progress of education. Educators need to be trained in AI literacy skills to ensure that they can understand the capabilities and limitations of AI, identify its potential applications in education, and effectively integrate it into their teaching practices.

It is also worth noting that AI technology is continually evolving, and its impact on education will only continue to grow. As such, it is essential to promote ongoing education and professional development opportunities for educators to stay up to date with the latest advancements and trends in AI technology.

Certainly, more research should be conducted to investigate the precise causes of educators' and learners' lack of awareness and comprehension of AI. Examining existing teacher training programs and finding places where AI education might be integrated into the curriculum can be part of this process. Furthermore, additional research can be conducted to examine the efficacy of various approaches to teaching AI literacy to educators and students, such as using interactive online resources or incorporating AI-related projects and activities in the classroom. It is critical to close the knowledge gap among educators for them to properly integrate AI technology into their teaching techniques and prepare students for the growing usage of AI in many industries.

The findings of this study suggest that a thoughtful and careful approach is necessary for integrating AI into education, focusing on addressing the critical challenges identified in this study.

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