

Transforming Education with AI: Teachers' Views, Challenges, and Pathways to Success

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Abstract— The aim of this study, intended to identify educators' expectations and concerns concerning the advantages and limitations of applying artificial intelligence (AI) in the sphere of education. The results point out that there exist multitude of challenges that must be resolved in order to fully capitalize on AI based pedagogical technologies for learning processes. The research report of this study carried out a systematic review process in an attempt to identify knowledge, skills and attitude that the instructors require in the application of AI based schemes in a classroom. Designing the methodology for training teachers for the use of digital technologies in their teaching work and ensuring that these teachers are provided with adequate skills, as well as paying attention to the technical issues of the application of digital technologies in the practice of teachers, is now the primary conclusion of the work. It can be suggested that the results of this study can underline the significance of the effective professional development programs supported by students' achievements along with ethical and/or privacy concerns. This might help the instructors to manage better the constantly changing nature of education fortified by the artificial intelligence.

Keywords— Artificial Intelligence; Teachers Development; Teacher Perception; Technology Integration; Systematic Review; Transformative Education System

I. INTRODUCTION

Artificial intelligence (AI) began its existence in the 1950s; the computer scientists/informatics pioneers such as Turing, Minsky and McCarthy hypothesized on the creation of machines that exhibited learning behavior akin to the human models. After that the field of AI has exploded and now it is used in virtually all spheres of our lives and in the ways people work changing the society dramatically. (Makridakis, S. 2017). This field has several important concepts that are absolutely essential to know, including machine learning, and natural language processing, and computer vision, and robotics, and neural networks, and deep learning – all of which these are foundational to this constantly evolving field. It has also been applied to

education since 1960s in the form of computer aided instruction or CAI systems. Since then AI remains to be a significant progress and has changed the education systems in various ways.

Like most innovations of the 1980s, ITS was characterized by the ability to provide individualized learning. Then into the 1990s and 2000s, a form of adaptive learning with help of Thelate 2010s witnessed the integration of AI-driven analytics, virtual learning platforms, and intelligent chatbots in education. This period marked the emergence of advanced technologies that

revolutionized online educational resources and learning experiences. The adaptation of AI in contexts concerning learning has attracted a great deal of attention and research attention. In turn, the development of artificial intelligence technologies suggests the necessity for dramatic shifts in teachers' professional functions and organizational learning systems (Zhai et al., 2021). Furthermore, it has been acknowledged in literature that several factors influence the AI-based educational tools adoption and utilization and teachers' attitude and perception towards the effectiveness and difficulties of the system is a key determinant (Çelik et al., 2022).

At the present time, artificial intelligence is making significant and positive changes to education to increase its relevance, relevance and availability. However, it also prompts certain issues on partisanship, privacy, as well as how human teachers function in AI-enhanced educational settings. There are about 10 key areas that demonstrate how AI benefits students and teachers namely-appliable learning, grading & feedback, AI professional development, the accessibility, and equity, as well as data-driven decision-making. As highlighted in figure -1 several key elements were analysed, and these include the following. Personalized Learning: AI makes it possible to provide education delivery that can include the student's needs, interests, and learning capacity as possible. ITS

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stands for Intelligent Tutoring Systems and is a set of AI based virtual instructors who are able to help and assist learners while making assessment of their performance. their performance.

Key elements of AI Application in education

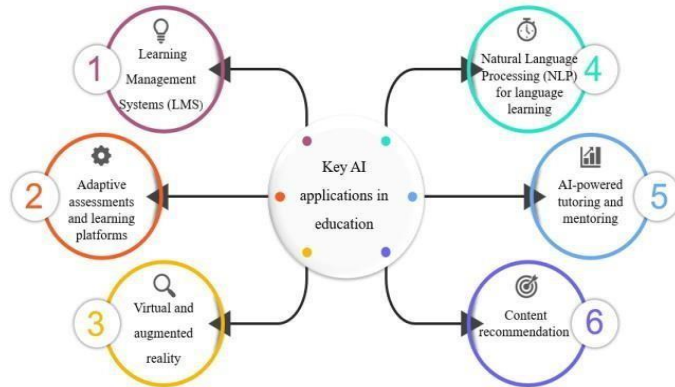


Fig. 1. Key elements AI applications in education

Assessments: AI enabled assessments propose content and difficulty levels to the student depending on his/her performance. **Natural Language Processing (NLP):** Computer aided Language Development enhances Writing Skills, Reading Level and Acquiring New Language. **Predictive analytics:** Machine learning models assess the students' performance and possible outcomes regarding their learning process, as well as discover which segments need more attention. **Automated assessment:** AI helps educators grade the works done by students and even provides recommendations on the task done. **Virtual Learning Environments (VLEs)** employs the use of Artificial Intelligence enabled platforms for designing stimulating learning environments. **Chatbots** powered by artificial intelligence provide the students with details, directions and solutions. **Content Recommendation:** Using AI algorithms, appropriate educational content and information that will be of interest and useful for students and according to their needs are provided. **Teacher Support:** It assists in curriculum design, planning and check on students' performance.

II. LITRETURE REVIEW

Artificial intelligence (AI) has become pervasive in everyday life, spanning diverse areas including smartphone applications, healthcare services (Jabeen et al., 2024), and online search engines (Sánchez Prieto et al., 2020). The rapid advancement of AI technologies has significantly impacted educational and learning settings. Experts predict that the adoption of AI-enhanced training will bring about major changes in the education sector (Zawacki-Richter et al., 2019). Consequently, substantial monetary investments have been made to integrate AI within educational environments (Cope et al., 2020). However, a major obstacle impeding the successful adoption of AI in education is the pervasive problem that most current AI-based educational tools are primarily driven by profit-oriented goals.

Opinions of teachers about the use of AI in education reveal a number of opportunities and challenges related to the integration of AI into education. Research shows that teachers understand the change making capabilities of AI in and for

learning, because AI can facilitate contextual accommodation, resource customization, feedback, motivation and performance (lima et al. , 2024). Nevertheless, there are challenges including a lack of technological proficiency, resistance to change, as well as time taking when implementing the AI instruments in teaching exercises are some of the pressures (Wadat et al., 2024). Teachers are enthusiastic about using AI tools, and indeed, they recognize the effectiveness in changing their learning practices but they also express concerns related to over essential of logistic thinking supplemented by technology, ethical issues occurring within this process, or how they feared to be left behind with traditional approaches (Chung, 2024). Therefore, to accomplishments of a goal of enhancing the role of AI in education practice, the following have been said to be the way forward; Reliable capacity building activities must be undertaken to enhance the capacity of the individuals involved (Jabeen et al., 2024) in the AI education project; Practice must be provided in the form of continued professional development so that the education practice can improve on space to allow for development of more deeper and more defined ethical policies that will shape the AI education practice. This will assist in the enhanced enhancement of the use of AI in an aim of increasing the positive aspects of the teaching and learning processes (Alshehri, 2023).

A. Theoretical frameworks for technology integration in education

In recent years, numerous educational technologies have emerged, with artificial intelligence (AI) being one of them (Bonk & Wiley, 2020). The term "artificial intelligence" was coined by John McCarthy in 1956, as noted by Russell and Norvig (2010). Baker and Smith (2019) concisely describe AI as a computer science subfield focused on creating systems that mimic human cognitive abilities (Jabeen, G., et al., 2024), such as learning and problem-solving (p. 10). AI encompasses a wide range of analytical methods that are classified as machine learning, neural networks, and deep learning (Aggarwal, 2018). Phoenicia and Kerr (2017) defined machine learning as the ability of a computer algorithm to extract information from data and make autonomous decisions. Machine learning includes various models, with supervised and unsupervised models being the most prevalent (Alloghani et al., 2020). There is a distinction between the supervised and unsupervised machine learning algorithms. While supervised learning algorithms create models using labeled training datasets, unsupervised methods identify hidden patterns in data without human guidance.

Artificial Intelligence (AI) is widely utilized in various aspects of education. Many educational tools incorporate AI technology, including intelligent tutoring systems, chatbots (Clark, 2020), and automated grading systems (Heffernan and Heffernan, 2014). AI-powered innovative solutions show great promise for everyone involved in teaching and learning processes (Chen et al., 2020). Studies have identified numerous applications of AI in education, such as improving student collaboration, customizing learning experiences, organizing learning activity schedules, delivering adaptive feedback on learning progress, easing teacher workload in collaborative knowledge building, predicting student dropout or admissions, Assessing students' backgrounds, tracking their academic progress, and performing final evaluations, such as computer-

based essay grading.

B. Understanding Teacher Perceptions of AI in Teaching

It is important to determine what educators think about the use of AI in several ways figure-2 represented below:

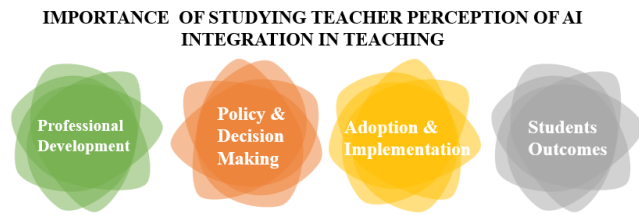


Fig. 2. Importance of studying teacher perceptions of AI Integration in Teaching (Source: Author)

1) Adoption and Implementation:

1. According to the topics discussed, the major consumer of the artificial intelligence, commonly referred to as AI products is teachers. This means that the extent to which it is accepted and willingness to implement these technologies determines the extent to which AI is implemented in learning environments. As such, members of faculty who have a positive perception of artificial intelligence will use technology well in delivering instruction (Beyer, L. E. 2001). On the other hand negative attitude towards may cause resistance which may hinder the implementation of AI technology.

2. Professional Development:

Identification of educators' perspectives can form a foundation for developing the specific programs in the area of professional skills improvement. Understanding of what they fear and lack confidence in exposes the areas that can be tackled in training courses that would enhance the use of AI products among them.

3. Student Outcomes:

Significant relationship between teachers' perceptions of AI and students performance and achievements was discovered. Promising AI imageries of both adoption and usefulness. It is true that technology used in the classroom can create more effective learning environment and cause positive changes in students' performance. In the other extreme, when perceptions are negative they can lead to unsatisfactory application of AI, thus failing to achieve the optimum that is possible for the student's benefit.

4. Policy and Decision-Making:

It will be beneficial for the lawmakers and other leaders in education to use the findings regarding the resources that are required to facilitate the integration of AI in teaching and learning to inform their activities. This entails providing the appropriate equipment, education, and ongoing support to ensure fair and effective implementation of AI solutions across various learning contexts.

C. The role of teacher in AI based education

The transition from traditional to digital education does not necessarily imply a reduced need for instructors (Dillenbourg 2016). Rather than contemplating the potential replacement of teachers by AI, it is more productive to explore how AI can enhance teaching and potentially transform educators' classroom roles (Hrastinski et al., 2019). During the early phases of educational technology development, Salomon (1996) emphasized the significance of examining the learning process in relation to computer use. Holstein, K., & Doroudi, S. (2019, March) proposed that educators should align with Dillenbourg et al., (2013) emphasis on the orchestrator role in teaching and learning through the utilization of AI-enabled devices.

To effectively support educators, artificial intelligence must initially learn to organize teaching and learning processes using instructor-provided data. The effectiveness of education relies on teachers' ability to implement appropriate pedagogical approaches (Tondeur et al., 2020). Moreover, their pedagogically relevant and effective teaching experiences can act as templates for AI-driven educational systems (Prieto et al., 2018). Teacher-supervised classroom data forms the crucial basis for AI-powered training. This data can help researchers identify specific periods and techniques that effectively promote learning (Luckin & Cukurova, 2019; Luckin et al., 2016). To illustrate the importance of teachers' contributions on effective learning characteristics for improving AI algorithms, we analyzed the data supplied by instructors and their participation in developing AI algorithms.

TABLE I
THE ROLE AND THEIR DESCRIPTION ARE PRESENTED

Role of teachers	Description	Source
Being model for AI training	Teacher acts as a source of data from an effective teaching process or moment	Su, Y. (2014). Kelly, N. (2019).
Feeding AI systems and their data are their professional development.	Teachers participated in research for more accurate protection of teacher related variables. (Example, teaching quality and teacher performance and engagement)	Alzahrani, M. (2020). ; Yoo, J. E., & Rho, M. (2020).
Feeding AI controlling terms with a student information and behaviour	Teachers provided information on students characteristics for the ai implementation (or intervention)	Bonneton-Botté, et al., (2020); Nikiforos, S., et al., (2020)
Checking in the accuracy of assessment	Teachers examined coursework and examinations to evaluate the accuracy of AI-powered grading platforms.	Yuan, et al., (2020)

Determining the assessment criteria	Teachers defended criteria for assessment	who the ai based	Huang, et al., (2010)
Providing pedagogical guidance for the selection of material	Provided pedological guidance by the selection of materials for AI based implementation (intervention)		Dalvean, M., (2018) ; Fitzgerald, R. J. (2015).
Providing feedback on technical issues	Teachers feedback advised review technical (Example in ai based education.)	gave and their on issues. ai design are usability	Burstein, J., et al., (2004)

III.OBJECTIVES

- To assess educators' views on the potential benefits and obstacles associated with incorporating artificial intelligence technologies into the classroom environment.
- To determine the necessary knowledge, skills, and beliefs that teachers require to effectively implementing AI-based systems in their instructional practices.
- To propose strategies to equip teachers with relevant skills and address technological concerns through professional development, emphasizing ethical and privacy considerations for successful AI use in education.

IV. RESEARCH METHODOLOGY

This study utilizes qualitative methodologies, primarily focusing on a comprehensive literature analysis to assess the importance of incorporating innovation into educational techniques. The study underscores the advantages that AI offers in this field, including personalized educational experiences, improved administrative productivity, and greater student engagement. The study's objective is to investigate how these advantages contribute to improved educational results and teacher satisfaction. Additionally, the research aims to explore the constructive effects of AI in the educational domain. Two significant obstacles in implementing AI in education are recognized: teachers' restricted technological proficiency and the inadequate technical infrastructure within educational institutions. It has also been observed that AI-generated feedback may sometimes be delayed, potentially diminishing teachers' enthusiasm for adopting AI. Although AI systems play a crucial role in reducing teachers' workloads by providing personalized and adaptive feedback, they often lack the capability to offer a wide range of feedback types that address the unique requirements of individual students.

The methodology seeks to offer valuable insights into the application of AI in education by drawing on robust academic knowledge. Through an examination of these aspects, the paper strives to present a comprehensive overview of the current impact of artificial intelligence in education, offering guidance and suggestions for decision-makers, teachers, and those developing educational technology to enhance AI's contribution to teaching and learning processes.

V. FINDINGS

A. Outcomes of AI Integration in Education

1) Improvement in the outcomes of instructions provided and their utility. Adaptive Learning Platforms: Transformation of the classroom through the use of AI by development of learning platforms that adapted course for individual learners and the aid in the supervision and alteration of their lessons by the educators. Elsa, J., & Miles, J. (2024). Experimental Research. AI in Vocational Education: By so doing, it has been proven that the incorporation of AI in training and vocational education enhances instructional effectiveness and effectiveness of learning resources. (Heil, J., et al.,2024)

2) Different learning experiences for the student. AI is able to deliver customized techniques of learning that improves the learning completion by modifying the content to suit the learner's need and preference. To enumerate, Kaur, S., et al. , 2024

3)Students Outcome and Involvement AI and Student Engagement: Teaching involving the incorporation of the AI instruments means better outcomes in the learning process and more attentiveness due to effective use of flexibility in the learning environments. (KALAISELVI, K., & KRISHNAN, A. (2024).

4)Pupils, useful tools AI and its use in a class figure -3 represented below.

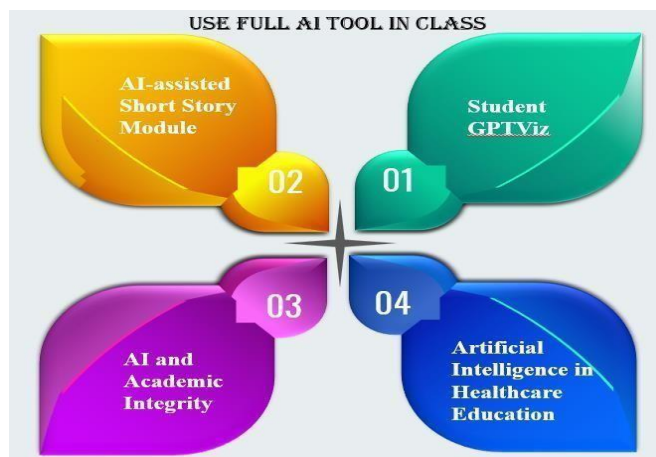


Fig. 3. Pupils, useful tools AI and its use in a class (Source: Author)

1. **Student GPT Viz:** A dynamic decision support system

aimed to describe the relationship between students and AI to improve the AI's application for instruction. (Hefernan, N. T., & Hefernan, C. L. 2014).

2. AI-assisted Short Story Module: Studie comparing how the item can be integrated into the teaching of short stories and advocating its capacity to strengthen problematics. Hezam, A.M. M., & Alkhateeb, A. (2024).

3. Artificial Intelligence in Healthcare Education: The fourth part is dedicated to the integration of AI in the processes of medical education and concerned with the creation of individualized health education materials and refined course plans for continual professional development of physicians and students. Tolentino, R. B., & Asiri, M. S. (2024).

4. AI and Academic Integrity: This study investigates the application of generative AI for evaluating students in higher education institutions while maintaining academic standards and preserving the authenticity of student work. Goli, G et al., (2023).

VI. THE CHALLENGES OF AI IN EDUCATION

Particular, Table- II gives a detailed list of the issues that teachers face when using AI. The first limitation is the rudimentary ideas of the technological framework of AI systems. For instance, Braille would have issues with comprehension of text based documents containing aspects of graphics (Goli, G., 2022). The other primary issue that was highlighted is that of volatility of AI algorithms. Consequently, there is the need to enhance . AI-based, automated writing assessment technologies to provide the teachers performance feedback that is accurate. Validity seem to have a stronger link with the limitations of the AI system in assessment as compared to reliability. However, in specific cases, AI-based evaluations may be damaging and erroneous in terms of delivering a living's performance assessment (Lu, 2019). We also found out that the high context-dependency of AI systems becomes a challenge in multiple facilities within education sector. For instance, an AI system designed to identify specific behaviors when learning on one online platform will not be feasible in others when translated into different languages (Nikiforos et al., 2020). This constraint could be as a result of culture barriers.

Some of the barriers that have been realized include inadequate technological support in schools (McCarthy et al., 2016), and accommodation of the technical skills by the trainers (Chiu, T. K. , & Chai, C. S. (2020). Furthermore, it is equally appalling that research has established the fact that even though similar to human generated feedback, occasional delays in AI generated feedback can cause educators to lose interest on AI technologies (McCarthy et al., 2016). While it is essential for these systems to be customized and individualized to help reduce teacher's load, AI is nevertheless capable of providing feedback of certain types customized to a certain student (Burstein et al., 2004). Right now, feedback solutions for teachers is something that AI systems cannot provide effectively and adequately.

A. Scarce Resources and Technical Issues

1. Technical Challenges in AI Integration: Implementation of AI in learning institutions poses several technological challenges; first, AI tools requires constant update and back up, second, there are couple of advanced technologies that can be afforded, third, there are poor infrastructure. Hezam, A. M. M. , & Alkhateeb, A. (2024).

2. Prevalent obstacles that hinder the effective implementation of AI technology in schools and other educational institutions are financial limits and a scarcity of technical resources. (Elsa and J. Miles in the year 2024).

TABLE II
CHALLENGES IN PERSPECTIVE OF TEACHERS
(SOURCE CELIK ET AL., 2022)

Challenge in AI use	Description	Source
Limited reliability of AI algorithms	Educators cannot rely on AI systems to provide dependable and pertinent information.	Schwarz et al. (2018)
Limited technical capacity of AI	Artificial intelligence may struggle to handle certain elements, such as text combined with images or	Ma et al. (2020)
Limited technical infrastructure in schools for AI	Schools have limited technical infrastructure for instruction that is based on artificial intelligence.	Ozdemir and Tekin (2016)
Inapplicability of the AI system to multiple settings	An AI system is unable to function in multiple learning environments.	Nikiforos et al. (2020)
Lack of technological knowledge of teachers on AI use	Teachers may not possess the necessary technical proficiency for instructing using AI technology.	Chiu and Chai (2020)
Lack of interest of teachers in ai	Teachers perceive AI as an intriguing and enjoyable tool for instruction.	McCarthy et al. (2016)
Slow feedback.	The AI feedback processing may surpass the expected timeframe.	McCarthy et al. (2016)

Lack AI adaptive feedback	Artificial intelligence may not provide comprehensive, flexible, and personalized feedback.	Burstein et al. (2004)
Inefficiency of AI for assessment and evaluation	Artificial intelligence is unable to effectively evaluate the organisation and coherence of textual content.	Lu (2019)

B) The Requirements for Teacher Training and Professional Development

1. Teacher Training Requirements: To proficiently integrate AI into teaching methodologies, educators must participate in professional development initiatives and undergo thorough training. As a result, individuals will acquire the necessary skills to effectively employ AI technology in educational settings. Bowen, J. A., & Watson, C. E. authored a book in 2024.
2. Challenges in Professional Development: To keep up with the fast-paced advancements in AI methodologies and technology, educators must continuously participate in professional development. S. Kaur and colleagues, 2024.

C) Inadequate Acceptance and Resistance to Change

1. Academic Institutions and instructors' Resistance to Change: The main factors contributing to the opposition of institutions and instructors towards change are concerns regarding potential job displacement and a limited understanding of AI technology. Tsarkos, A. (2024).

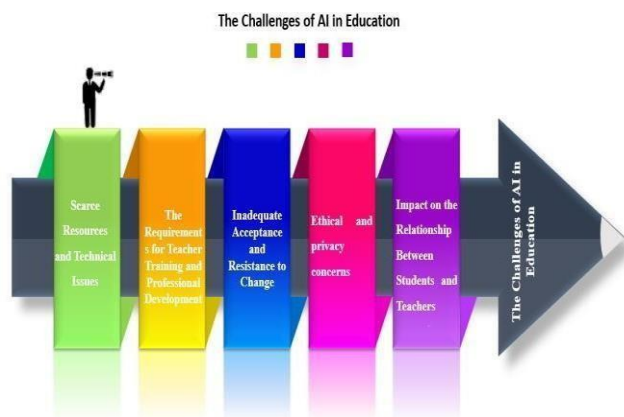


Fig. 4. The Challenges of AI in Education

(Source: Author)

B) The Requirements for Teacher Training and Professional Development

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skills to effectively employ AI technology in educational settings. Bowen, J. A., & Watson, C. E. authored a book in 2024.

2. Professional Development Hurdles: Educators must engage in ongoing training to stay current with the rapid evolution of AI techniques and technologies. S. Kaur and colleagues, 2024

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2. Acceptance Challenges: The adoption of AI in education may face obstacles due to the lack of confidence that teachers and students have in the effectiveness and reliability of AI technology. Orimolade, O. (2024).

D) Ethical and privacy concerns

Privacy considerations in the context of AI in education encompass the use, retention, and collection of student data. These concerns are part of the broader ethical and privacy issues that arise in the field, as stated by Casadomet, A. G. (2024). Mobo, F. D. (2024) emphasises the importance of addressing ethical concerns such as transparency, accountability, and prejudice in AI systems to guarantee fair and equitable usage of AI in education.

E) Impact on the Relationship Between Students and Teachers

1. Evolution of Teacher-Student Dynamics: The incorporation of AI has the capacity to modify the conventional teacher-student relationship by reducing the interpersonal interaction and emotional connection that are crucial elements of successful teaching and learning. (Chen, D., et al., 2024).
2. Striking the Optimal Equilibrium Between AI and Human Interaction: Roshdy Elsakhry, A. (2024). Suggests that maintaining educational standards and fostering students' social and emotional skills depend on achieving an optimal equilibrium between AI and human contact.

VII. DISCUSSION

A. The implications of AI integration for teachers, students, and educational institutions

The integration of AI into educational systems is revolutionizing the landscape, with far-reaching effects on educators, learners, and academic institutions alike. The benefits of AI technology include improved learning environments, automated grading systems, and personalized learning platforms (Almasri, 2024). Nevertheless, it is crucial to acknowledge and tackle issues like as algorithmic bias, privacy problems, and the possibility of undermining the educational process (Gupta et al., 2024). The effects of AI encompass the optimization of administrative activities, enhancement of educational outcomes for pupils, and revolutionization of knowledge dissemination through the utilization of technologies like chatbots and virtual reality

(Xuan Vu and Vietnam, 2024).

The use of AI technologies like ChatGPT streamlines content creation and class organization. However, this advancement also raises ethical concerns, including potential over-dependence on technology and the need to maintain academic honesty (Maita et al., 2024). To optimise the potential of AI, lawmakers should integrate diverse AI disciplines into educational institutions, with a focus on promoting diversity, guaranteeing resource availability, and delivering tailored instruction, all while addressing ethical considerations. Figure 5 below illustrates the roles of students, teachers, and educational institutions.

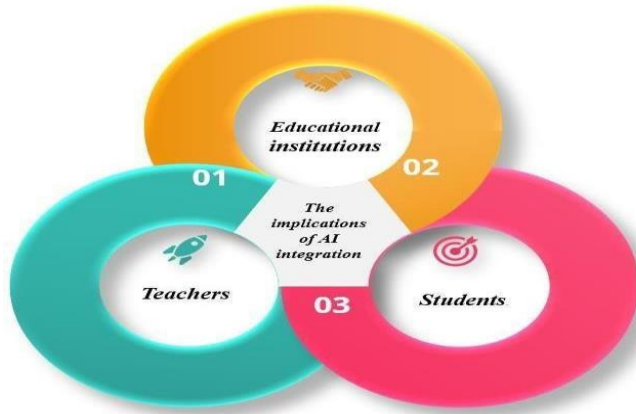


Fig. 5. The implications of AI integration for teachers, students, and educational institutions (Source: Author)

Artificial intelligence (AI) integration has both broad and highly complex implications.

For teachers: More so, professional development is important so as to effectively incorporate and apply AI technology. They Perhaps by outsourcing fairly routine activities in favor of artificial intelligence, educators will be able to devote more time to striking, fresh aspects of learning. Collaboration: Perhaps, to solve these and several other problems effectively, educators may need a better-coordinated partnership with IT specialists.

For students: Customized learning: The use of artificial intelligence also works hand in hand by providing customized learning that meets the individual needs and thus increases the level of comprehension and participation. Each student has to acquire the necessary skills to learn and use AI systems so it is crucial for the student to be digitally literate. Equity, issues come about because of the potential increase in inequity of skill in AI across pupils.

Academic establishments: Infrastructure Investment: Best internet technologies need to be adopted for the organization. Policy and Ethics: There are certain ethical pitfalls associated with the use of AI, these include protection of data privacy as well as the use of algorithms, to eliminate bias. Resource Allocation: The integration of AI may increase the need of restructuring, hence the shifting of funds for expenditure in technology and in training of personnel.

B. Future direction of Studies

- 1) Examining the continuing impact of AI on students' outcomes, teaching practices, and organizational reforms in education organizations.
- 2) Assessing the feasibility of implementing intelligent technologies that enhance equity and non-recurrence of existing and emerging discriminations.
- 3) Developing and assessing innovative approaches to learning which safely and effectively incorporate AI technology into learning.
- 4) Merging the education technology, ethics, policy research professionals to develop effective solutions to ensuring the right integration of the AI in the educational industry.

All these recommendations will help everyone to understand better how the circulation of AI concepts can help folks in acquiring a deep understanding of how this technology may be used in enhancing schooling and the challenges that come with it.

CONCLUSION

This study sought to evaluate the potential of artificial intelligence in education and examine its relationship with the educational field. Findings indicate that AI positively impacts learning by enabling personalized instruction, reducing administrative burdens, and facilitating data collection. Nevertheless, the research also identified obstacles, including inadequate AI training for educators, ethical concerns, and data privacy issues. As AI technologies gain prominence in contemporary education, further research is necessary to comprehend how teachers incorporate AI into their instructional practices. Furthermore, the authors' literature review revealed a scarcity of studies investigating the integration of AI in preservice teacher education programs. Hence, we recommend conducting further empirical studies with a focus on the application of AI by pre-service teachers. Teacher education programs that improve on the knowledge of AI among pre-service teachers will improve on their preparedness to adopt AI based teaching practices in future.

A. Key findings

The several characteristics of artificial intelligence as well as the present applications of AI to education settings is explored while providing useful insights about how AI can enhance education and learning. The research also points out where to look for barriers and premised areas of development for future work. In addition, it examines the challenges and possible consequences of the incorporation of AI to educational systems and gives pedagogical guidelines for educators and technology. The examination also covers potential research topics and directions for future studies and ways to foster innovation in the context of the relations between AI and education.

B. Final thought on Future of AI

The potential for AI's continued advancement suggests that education cannot be a passive process. Instead, it must be tailored to each individual to maximize outcomes for both

educators and students. This insight is derived from examining AI's impact on the educational field. Teachers should increase their capability to meet children's diverse requirements while teaching them also using AI in controlling organizational tasks. This paper has also brought out the fact that data privacy is an area that needs to be discussed in relation to education and the ethical considerations that are required into practice.

Preparing educators with regards to how to deal with all the changes and developments that AI can bring into the schooling systems is essential. The application of artificial intelligence in education is a big advancement in the field because current research seeks to fine-tune the approach to deliver better educational outcomes. This has been made possible by a very important aspect which has seen improvement as a result of the progress; the ability to instill in pupils the ability to handle complex and hard situations in the future.

REFERENCES

- Aggarwal, C. C. (2018). *Neural networks and deep learning*. Springer, 10, 978-3. <https://doi.org/10.1007/978-3-319-94463-0>
- Alloghani, M., Al-Jumeily, D., Mustafna, J., Hussain, A., & Aljaaf, A. J. (2020). A systematic review on supervised and unsupervised machine learning algorithms for data science. In *Supervised and Unsupervised Learning for Data Science* (pp. 3–21). Springer, Cham. https://doi.org/10.1007/978-3-030-22475-2_1
- Almasri, F. (2024). Exploring the impact of Artificial Intelligence in teaching and learning of science: A systematic review of empirical research. *Research in Science Education*. <https://doi.org/10.1007/s11165-024-10176-3>
- Alshehri, B. (2023). Pedagogical paradigms in the AI era: Insights from Saudi educators on the long-term implications of AI integration in classroom teaching. *International Journal of Educational Sciences and Arts*, 2(8), 159–180.
- Alzahrani, M. (2020). Saudi EFL Teachers' Attitudes towards Professional Development. *International Journal of Learning, Teaching and Educational Research*, 19(11), 242-258.
- Baker, T., & Smith, L. (2019). *Educ-AI-tion rebooted? Exploring the future of artificial intelligence in schools and colleges*. Retrieved from Nesta Foundation website: https://media.nesta.org.uk/documents/Future_of_AI_and_education_v5_WEB.pdf
- Beyer, L. E. (2001). The value of critical perspectives in teacher education. *Journal of teacher education*, 52(2), 151-163.
- Bonk, C. J., & Wiley, D. A. (2020). Preface: Reflections on the waves of emerging learning technologies. *Educational Technology Research and Development*, 68(4), 1595–1612. <https://doi.org/10.1007/s11423-020-09809-x>
- Bonneton-Botté, N., Fleury, S., Girard, N., Le Magadou, M., Cherbonnier, A., Renault, M., ... & Jamet, E. (2020). Can tablet apps support the learning of handwriting? An investigation of learning outcomes in kindergarten classroom. *Computers & Education*, 151, 103831.
- Bowen, J. A., & Watson, C. E. (2024). *Teaching with AI: A Practical Guide to a New Era of Human Learning*. American Association of Colleges and Universities. 1818 R Street NW, Washington, DC 20009.
- Burstein, J., Chodorow, M., & Leacock, C. (2004). Automated essay evaluation: The Criterion online writing service. *Ai Magazine*, 25(3), 27–27. <https://doi.org/10.1609/aimag.v25i3.1774>
- Casadomet, A. G. (2024). Digital Skills Through the Prism of European and Spanish Supranational Frameworks. In *Teaching and Assessment in the Era of Education 5.0* (pp. 70-82). IGI Global.
- Celik, I., Dindar, M., Muukkonen, H., & Järvelä, S. (2022). The promises and challenges of artificial intelligence for teachers: A systematic review of research. *TechTrends : For Leaders in Education & Training*, 66(4), 616–630. <https://doi.org/10.1007/s11528-022-00715-y>
- Chen, D., Chen, Y., & Chi, J. (2024). Early childhood teachers amid China's curriculum reforms: from a literature review. *International Journal of Child Care and Education Policy*, 18(1), 8.
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278. <https://doi.org/10.1109/ACCESS.2020.2988510>
- Chiu, T. K., & Chai, C. S. (2020). Sustainable curriculum planning for artificial intelligence education: A self-determination theory perspective. *Sustainability*, 12(14), 5568. <https://doi.org/10.3390/su12145568>
- Chung, C.-J. (2024). Preservice teachers' perceptions of AI in education. *AI-EDU Arxiv*, 1–5. <https://doi.org/10.36851/ai-edu.vi0.4155>
- Clark, D. (2020). *Artificial intelligence for learning: How to use AI to support employee development*. Kogan Page Publishers.
- Cope, B., Kalantzis, M., & Sears, D. (2020). Artificial intelligence for education: Knowledge and assessment in AI-enabled learning ecologies. *Educational Philosophy and Theory*, 1–17.
- Dalvean, M., & Enkhbayar, G. (2018). Assessing the readability of fiction: A corpus analysis and readability ranking of 200 English fiction texts. *Linguistic Research*, 35, 137-170.
- Deep learning in environmental remote sensing: Achievements and challenges. *Remote sensing of Environment*, 241, 111716.
- Dillenbourg, P. (2013). Design for classroom orchestration. *Computers & education*, 69, 485-492.
- Dillenbourg, P. (2016). The evolution of research on digital education. *International Journal of Artificial Intelligence in Education*, 26(2), 544–560. <https://doi.org/10.1007/s40593-016-0106-z>

- Elsa, J., & Miles, J. (2024). Adaptive Learning Platforms: AI Integration and Pedagogical Implications (No. 14029). EasyChair.
- F. J. (2020). Assessed by machines: Development of a TAM-based tool to measure ai-based assessment acceptance among students. *International Journal of Interactive Multimedia and Artificial Intelligence*, 6(4), 80–86. <https://doi.org/10.9781/ijimai.2020.11.009>
- Fitzgerald, R. J. (2015). Becoming Leo: Servant Leadership as a Pedagogical Philosophy. *Critical Questions in Education*, 6(2), 75-85.
- Goli, G., & Babu, D. R. (2023). Cultivating a Culture of Innovation Nurturing Entrepreneurial Spirit and Startup Mindset in Engineering Education.
- Goli, G., Babu, D. R., Laxmi, M. R., Kafila, K., & Rao, N. S. (2022, May). Image capturing and audio-video production to make five- shot and short film projects. In *AIP Conference Proceedings* (Vol. 2418, No. 1). AIP Publishing
- Gupta, D. P., Sreelatha, D. C., Latha, A., Raj, D. S., & Singh, D. A. (2024). Navigating the future of education: The impact of artificial intelligence on teacher-student dynamics. *Educational Administration: Theory and Practice*, 6006–6013. <https://doi.org/10.53555/kuvey.v30i4.2332>
- Hefernan, N. T., & Hefernan, C. L. (2014). The ASSISTments ecosystem: Building a platform that brings scientists and teachers together for minimally invasive research on human learning and teaching. *International Journal of Artificial Intelligence in Education*, 24(4), 470–497. <https://doi.org/10.1007/s40593-014-0024-x>
- Heil, J., Egloffstein, M., & Ifenthaler, D. (2024). Student perspectives on online assessment in higher education.
- Hezam, A. M. M., & Alkhateeb, A. (2024). Short Stories and AI Tools: An Exploratory Study. *Theory and Practice in Language Studies*, 14(7), 2053-2062.
- Holstein, K., & Doroudi, S. (2019, March). Fairness and equity in learning analytics systems (FairLAK). In *Companion proceedings of the ninth international learning analytics & knowledge conference (LAK 2019)* (pp. 1-2).
- Hrastinski, S., Olofsson, A. D., Arkenback, C., Ekström, S., Ericsson, E., Fransson, G., ... & Utterberg, M. (2019). Critical imaginaries and reflections on artificial intelligence and robots in post digital K-12 education. *Post digital Science and Education*, 1(2), 427- 445. <https://doi.org/10.1007/s42438-019-00046-x>
- <https://doi.org/10.52866/ijcsm.2024.05.01.004>
- Huang, S., Eslami, Z., & Hu, R. J. S. (2010). The Relationship between Teacher and Peer Support and English-Language Learners' Anxiety. *English Language Teaching*, 3(1), 32-40.
- Jabeen, G., Goli, G., & Kafila. (2024). Building trust: The foundations of reliability in healthcare. In *Engineering Cyber-Physical Systems and Critical Infrastructures* (pp. 43–65). Springer Nature Switzerland.
- Jabeen, G., Goli, G., Kafila, & Gobinath, R. (2024). A bibliometric review on gender equity in human resource management. *Future Business Journal*, 10(1). <https://doi.org/10.1186/s43093-024-00381-x>
- KALAISELVI, K., & KRISHNAN, A. (2024). CASHLESS TRANSACTIONS IN RURAL AREAS: A STUDY WITH SPECIAL REFERENCE TO SALEM DISTRICT.
- Kaur, S., Kaur, K., Rani, P., Kaur, R., Kaur, G., & Poonia, V. (2024, February). Catalyzing Educational Transformation: A Comprehensive Exploration of High-Performance Computing Integration and Future Trajectories. In *2024 11th International Conference on Computing for Sustainable Global Development (INDIACom)* (pp. 1207-1213). IEEE.
- Kelly, N. (2019). Online networks in teacher education. *Oxford research encyclopedia of education*, 1-21.
- Learning, 13(2), 189–211. <https://doi.org/10.1007/s11412-018-9276-z>
- Lima, L. A. de O., Fonseca, J. F. V. da, Oliveira, V. B. de, Fontes, C. P. M., Oliveira, L. B. de, Garcia, M. E. de D., Silva Junior, A. P. da, Gomes, R. D., Alves, F. E. F., & Silvestre, M. A. (2024). The use of artificial intelligence (AI) in the school environment: Implications for the teaching and learning process. In *Navigating through the knowledge of education*. Seven Editora.
- Lu, X. (2019). An empirical study on the artificial intelligence writing evaluation system in China CET. *Big Data*, 7(2), 121–129. <https://doi.org/10.1089/big.2018.0151>
- Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI: A learning sciences-driven approach. *British Journal of Educational Technology*, 50(6), 2824–2838. <https://doi.org/10.1111/bjet.12861>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence Unleashed: An Argument for AI in Education*. Pearson.
- Ma, Z. H., Hwang, W. Y., & Shih, T. K. (2020). Effects of a peer tutor recommender system (PTRS) with machine learning and automated assessment on vocational high school students' computer application operating skills. *Journal of Computers in Education*, 7(3), 435–462. <https://doi.org/10.1007/s40692-020->
- Maita, I., Saide, S., Putri, A. M., & Muwardi, D. (2024). Pros and cons of artificial intelligence–ChatGPT adoption in education settings: A literature review and future research agendas. *IEEE Engineering Management Review*, 52(3), 27–42. <https://doi.org/10.1109/emr.2024.3394540>
- Makridakis, S. (2017). The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. *Futures*, 90, 46-60.
- McCarthy, T., Rosenblum, L. P., Johnson, B. G., Dittel, J., & Kearns, D. M. (2016). An artificial intelligence tutor: A supplementary tool for teaching and practicing braille. *Journal of Visual Impairment & Blindness*,

- 110(5), 309–322. <https://doi.org/10.1177/0145482X1611000503>
- Mobo, F. D. (2024). Education 5.0: Navigating the Future of Learning. In *Preconceptions of Policies, Strategies, and Challenges in Education 5.0* (pp. 268-274). IGI Global.
- Nikiforos, S., Tzanavaris, S., & Kermanidis, K. L. (2020). Virtual learning communities (VLCs) rethinking: Collaboration between learning communities. *Education and Information Technologies*, 25, 3659-3675.
- Nikiforos, S., Tzanavaris, S., & Kermanidis, K. L. (2020). Virtual learning communities (VLCs) rethinking: Influence on behavior modification—bullying detection through machine learning and natural language processing. *Journal of Computers in Education*, 7, 531–551. <https://doi.org/10.1007/s40692-020-00166-5>
- Orimolade, O. (2024). Teaching Perception of Visual Culture in Nigeria. 1001 Ways of Seeing, 109.
- Ozdemir, O., & Tekin, A. (2016). Evaluation of the presentation skills of the pre-service teachers via fuzzy logic. *Computers in Human Behavior*, 61, 288–299. <https://doi.org/10.1016/j.chb.2016.03.013>
- Pearson Education
- Popenici, S. A., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(1), 1–13. <https://doi.org/10.1186/s41039-017-0062-8>
- Prieto, L. P., Sharma, K., Kidzinski, Ł, Rodríguez-Triana, M. J., & Dillenbourg, P. (2018). Multimodal teaching analytics: Automated extraction of orchestration graphs from wearable sensor data. *Journal of Computer Assisted Learning*, 34(2), 193–203. <https://doi.org/10.1111/jcal.12232>
- Qian, L., Zhao, Y., & Cheng, Y. (2020). Evaluating China's automated essay scoring system iWrite. *Journal of Educational Computing Research*, 58(4), 771-790.
- Roshdy Elsakhy, A. (2024). Employing Digital Programs in Displaying and Preserving Museum CollectiblesAppliedonOne of the Showcases at Kafr El-Sheikh Museum. 15 مجلة كلية الآثار جامعة القاهرة, 27(203- 219).
- Russel, S., & Norvig, P. (2010). Artificial intelligence - a modern approach.
- Salomon, G. (1996). Studying novel learning environments as patterns of change. In S. Vosiniadou, E. De Corte, R. Glaser & H. Mandl (Eds.). *International Perspectives on the design of Technology Supported Learning*. NJ: Lawrence Erlbaum Associates.
- Sánchez-Prieto, J. C., Cruz-Benito, J., Therón Sánchez, R., & García Peñalvo,
- Schwarz, B. B., Prusak, N., Swidan, O., Livny, A., Gal, K., & Segal, A. (2018). Orchestrating the emergence of conceptual learning: A case study in a geometry class. *International Journal of TechTrends* (2022) 66:616–630 629 1 3 Computer-Supported Collaborative
- Su, Y. (2014). Lifelong learning in tourism education. In *The Routledge handbook of tourism and hospitality education* (pp. 322-334). Routledge.
- Tolentino, R. B., & Asiri, M. S. (2024). Awareness and implementation confidence of free higher education program under UNIFAST among HEIs in Sulu, Philippines. *Environment and Social Psychology*, 9(7).
- Tondeur, J., Scherer, R., Siddiq, F., & Baran, E. (2020). Enhancing pre- service teachers' technological pedagogical content knowledge (TPACK): A mixed-method study. *Educational Technology Research and Development*, 68(1), 319–343. <https://doi.org/10.1007/s11423-019-09692-1>
- Tsarkos, A. (2024). Enhancing Teacher Readiness and Retention in STEM Education Through PCK Development. In *Transforming Teacher Preparation Through Identity, Development, and Effective Technologies* (pp. 320-347). IGI Global.
- Wardat, Y., Tashtoush, M., Alali, R., & Saleh, S. (2024). Artificial intelligence in education: Mathematics teachers' perspectives, practices and challenges. *Iraqi Journal For Computer Science and Mathematics*, 5(1),6077.
- Xuan Vu, H., & (Phd), Faculty Of Educational Sciences, Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam. (2024). The implications of Artificial Intelligence for educational systems: Challenges, opportunities, and transformative potential. *The American Journal of Social Science and Education Innovations*, 06(03), 101–111. <https://doi.org/10.37547/tajssei/volume06issue03-17>
- Yoo, J. E., & Rho, M. (2020). Exploration of predictors for Korean teacher job satisfaction via a machine learning technique, Group Mnet. *Frontiers in psychology*, 11, 441.
- Yuan, Q., Shen, H., Li, T., Li, Z., Li, S., Jiang, Y., ... & Zhang, L. (2020). <https://doi.org/10.59992/ijesa.2023.v2n8p7>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 39. <https://doi.org/10.1186/s41239-019-0171-0>
- Zhai, X., Chu, X., Chai, C. S., Jong, M. S. Y., Istenic, A., Spector, M., ... & Li, Y. (2021). A Review of Artificial Intelligence (AI) in Education from 2010 to 2020. *Complexity*, 2021(1), 8812542.