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# The Future of Artificial Intelligence in Education: Transforming Teaching and Learning

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## ABSTRACT

The world of technology has grown rapidly and become an expected part of our everyday lives, our work, and our education. AI is now a key part of this innovation, strongly shaping how innovations evolve. The adoption of technology in learning sector is not just about additional tools, but rather, a shift from a fixed framed plan of time and place to a dynamic plan of actions and design that shape, change and affect how teaching and absorbing information happen. The intent of this paper is to review and discern the future of AI with a focus on intriguing options for classrooms, intelligent systems, to convert classrooms into adaptive, interactive, and personalized learning environments. These adaptable systems represent various AI modalities. Each modality has potential, and together may facilitate improvement, engagement, and student feedback. This study brings teachers into focus, changing their role from knowledge implementers as teachers to knowledge mentors and co-creators for their students. The recognition that some, although not all, knowledge transfer and learning can be enhanced by using AI modalities is significant, especially where high level engagement is a goal. AI has the promise of promoting accountability and efficiency for managing administrative processes, workloads, and data driven decisions.

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However, there are difficult challenges outlined in the research, including ethical dilemmas, data security, algorithmic bias, and reinforcing inequity, which all necessitate planning for sustained frameworks of policy and ethics, and access to equity. Furthermore, the article explores the upcoming perspective of AI in education with regard to innovation and sustainability, emphasizing that educator partnership, administration, technologists, and learners is critical to success. By showing how the current situation relates to future possibilities, this study concluded that the capacity of AI to transform education is certainly significant but requires that educators integrate AI in a way that is balanced harnessing the capacity of AI, while not removing the crucial human quality of sympathy, artistry, and use of critical judgement in teaching and learning. The research calls for a careful, yet risk tolerant consideration of AI implementation from the perspective of pedagogy, ethics, and inclusive education.

**Keywords**: AI, Education, Teaching, studying.

## Introduction

The speed of development of AI has sparked a global shift in many fields that may be fundamentally changing the functioning of society and, importantly, how society is performing and innovating. Education is seeing an introduction of AI as an important component in innovating teaching, transitioning how we learn, and improving institutional productivity. Traditional educational models emphasizing prescriptive curriculums and standardized teaching methods are being challenged to provide individualized, flexible, and technology enabled options to meet the needs of learners (Argente, 2023).

AI provides compelling solutions to each of these challenges whether the foundational issues relate to dynamic learning models, adaptive tutoring system, predictive analytics, tutoring, or simply (AI) virtual assistants in teaching and learning. (Baek, 2020)

AI role in education extends far beyond the classroom. It allows teachers to continuous assessment of student performance, personalize learners' pathways, reduce workflows, and improve administrative tasks, leaving more time for high value interactions with students. In addition, AI learning tools allow students to receive personalized and timely feedback, learning at their own pace, and engage in interactive experiences that are not possible within traditional models. However, as educators and learners continue to incorporate and engage with AI in education, we still have important conversations regarding ethics, equity, privacy, and the teacher's role in AI enhanced learning environments. These conversations are significant because they remind us to remain accountable as we navigate the opportunities and risks of adopting AI in learning. (Bartneck, 2021)

This research explore the possibilities of AI in learning by examining the transformative developments in teaching and learning. This includes discussions that investigate how AI technologies can enhance learning for all learners, redefine the teacher's function in learning, and enhance equity and efficient environments for learning. In addition to opportunities, this study addresses both challenges and moral considerations of AI in education, including the desire for harmony and managed

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integration that retains the human element around education. The intention is to examine opportunities and challenges occurring as technology takes a more persuasive shape in education and develop insights into how AI can fundamentally shape the future of learning.

**Background**

The relationship of learning and innovation has been a contributor to the evolution of teaching and learning for a long time. Whether using printed materials, doing chalk and talk, using overhead projectors, using computers, or using online platforms, there has always been a process informed by educational trends often derived and inspired by available technologies that has shaped and re-shaped the creation, sharing, and consumption of knowledge. In the past few decades, educational technology has been remade again by the explosion of AI, ushering in the next stage of development within the educational sphere and the potential for a fundamental shift in learning and teaching practices. While not the first use of technology, AI is ground breaking because it includes intelligent systems capable of learning, adapting, processing languages, and making data driven decisions. The promise of AI in learning includes new possibility for highly personalized and interactive experiences. (Nasir, 2025)

While the thought of AI in learning is not new to the educational technology arena or practice, earlier examples exist more than just into the late 1990s, even into the 1960s and 1970s early applications of AI took shape as computer assisted instruction. An early example of an individualized learning instalment through technology can be demonstrated in the PLATO, Programmed Logic for Automatic Teaching Operations, (Diethelm, 2020)

platform from University of Illinois, which can be recognized as a beginning example of AI driven instruction. The rapid situated acceleration of the 21st century use of automated learning, natural language understanding, and big data capabilities has led to a more natural and common occurrence of AI into classroom and online based learning practices today. AI driven chatbots, and learner's data driven indicative analytics and analytics of educators.

The COVID-19 epidemic increased the importance of AI in education. The shift to virtual and hybrid learning is characterized as relatively abrupt, and learning institutions began relying on digital tools many of these digital tools incorporated artificially intelligent capabilities for student engagement, assessment, and remote learning amidst restrictions on access to education services. The experiences gained during this period emphasized the possibilities of what AI can offer in sustaining access to education, and creating points of continuity and innovation in times of crisis. (Bozkurt, 2023)

The possibilities for AI's role in education raises numerous significant challenges. Equity, accessibility, and ethical analyze to students' own data about their own learning activities have all provided fodder for policy makers, practitioners and researchers to discuss. Furthermore, there remain questions about the role of the educator in the light of AI's capacity to potentially support and enhance or potentially wholly replace the judgement made by a human in the act of learning. This means a considered and cautious approach to AI in education is essential (Celik, 2022)

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In this situation, knowing the future of AI in education is important (Nasir, 2025). Understanding AI's transformative power raises questions about how technology can lead to improved teacher efficacy, increased student wherewithal outcomes, and more diverse and equitable educational systems as a whole. This context is important in setting the stage for talking about the opportunities and risks associated with AI, and giving direction to the research purpose of this paper.

**Problem Statement**

Artificial Intelligence (AI) has prompted considerable enthusiasm about its capability to disrupt education with individualized learning, intelligent tutoring systems, adaptive assessments, and data informed decision making. However, as it is being adopted in educational contexts, it is confronted with a wide range of unresolved issues that threaten its effective and equitable integration. Current educational contexts are ill equipped to balance the opportunities offered by AI while addressing the ethical dilemmas and risks introduced in educational contexts. Issues concerning data privacy's possible threat to human subject autonomy, algorithmic bias's danger of reproducing inequity and blocking access to the marginalized, educational inequity steeped in access barriers, and the threat of human judgment being superseded by AI in decision making, remain unaddressed in current educational contexts. (Chaudhry, 2022)

Although it is tempting to target on the potential use of AI tools to ease teacher workloads and help students engage and stay on task with their learning, we also need to be mindful with many questions to consider of the design, resilience, and integrity of teachers' work, their professional identifications, and the changing relationships between students and teachers. In addition, we need to also consider the challenge many educational institutions, facing a relative lack of infrastructure, training, policy, and the broader infrastructural inequalities in access to AI learning technology, particularly in the developing world. If we do not pay careful and critical attention to the processes of developing effective frameworks and guidelines, I fear the pace of which AI is likely to infuse its way into our educational institutions only serve to intensify existing inequalities in learning opportunities and it grow and/or deepen the very inequities that many educational institutions have worked towards closing down. (Chen, 2020)

The dilemma lies between our aspirations and potentials for the transformational opportunities that AI software affords education and the social, ethical, and policy challenges to responsibly constrain its use. To address this dilemma, we should support a critical engagement of how AI can be mediated into education, with an eye to equitable and responsible use of AI that still maintains the recognition of the irreducible human relationship in teaching and learning.

**Research Gap**

While the existing research documents the promise of artificial intelligence (AI) as a profound influence on education, there remain several gaps which hinder a comprehensive examination of its future possibilities. Most current research documents primarily focus on the technical aspects of AI, employing adaptive

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learning, adjustable learning, and automated grading. Relatively little research has focused on the pedagogical, moral and social effect of AI into learning processes. Much of the existing research remains narrow and does not take a wide enough focus on how AI can productively change, or transform, teaching and learning in sustainable ways (Chiu, 2021)

Another significant gap is the absence of unanimity on the changing roles of teachers in AI learning environments. Although scholars are lean toward the view that AI has the capability to support teachers through a range of advancements in automating mundane tasks and providing data driven information, little research exists exploring how educators can adapt in a professional and pedagogical sense to coexist with AI systems, while maintaining the human characteristics of empathy, creativity, and supporting agency that AI cannot replicate. (Donthu, 2021)

Moreover, the current body of literature often neglects issues of equity and access particularly in developing countries due to barriers like infrastructure, digital literacy, and finances preventing the merging of AI in education. Additionally, researches have not adequately analysed the ethical challenges that education systems may face from AI in areas likes security, and accountability. Finally, most studies have not referred to the long term effect of AI for education systems, policies, curriculum, or future global learning ecosystems, but rather focusing on shorter applications.

This current research function to point these shortcomings by exploring the transformative potential of AI in education from a holistic lens that considers the technological potential alongside the pedagogical, ethical, and policy challenges faced. In doing so, a greater understanding of how AI can influence the future of teaching and learning in safe and inclusive ways can be better understood.

**Research Objectives**

Consider the possibility of AI being integrated into teaching and learning contexts.

Consider the limitations and ethics of AI in education.

Consider the educational implications for teachers and students working in an AI supported learning context.

**Research Questions**

How can educators who work outside the constraints of conventional teaching approaches use AI to increase studying outcomes for students?

What are the significant ethical, social and policy implications to consider using AI technology in education?

How does AI influence the function of the teacher and student with respect to learning engagement in the learning context?

**Research Hypotheses**

Early education information technology using AI supports better but personalized learning outcomes than conventional teaching approaches.

Uses of AI in education demonstrate significant moral and equity provide pertaining to the legitimate use of AI technology which could undermine the justification of any justified use of an AI.

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AI can reallocate the teacher's role from situated knowledge expert to Application of Knowledge facilitator and context based mentor.

**Significance of the Study**

The importance of the research is in offering insights into how AI can convert education by altering the way we teach and learn. As the integration of AI continues to proliferate across numerous industries, education is a vital one, we have to consider that the implications here are beyond conventional models of efficiency as it directly influences human growth, development, knowledge attainment, and social equity. There are important ways this research is important:

First, it offer insight on the ways AI can improve individualized learning, and the overall productiveness of instruction. This study identifies innovative opportunities for technology to respond to traditional educational models' limitations in teaching and learning.

At the same time, these studies are considered important for educators, and policymakers alike as it likewise exposes difficulties and moral issues about AI as it pertains to education, as well as, issues of data privacy, algorithmic bias, equitable access etc. As we navigate the adversities greyed by the potential policy debate, we need to fully understand these concerns for us to direct approaches to provide responsible and equitable framework and policy towards the acceptance of relevant AI technologies.

In conclusion, the research is important to educational practitioners and organizations when considering the developing function of teachers in AI improve environments. AI is likely helpful to teachers, but AI never replaces teachers. AI has the capability to lower some of the administrative burden for teachers, and it might allow them to have more valuable, student centred interactions. Understanding this additional layer of existence is vital for training teachers, supporting teachers in professional development, and planning and making decisions for education.

Additionally, the study provides meaning in the broader academic discussion/chart and fills a gap between the technology discussion and view on the future of AI in education, and the pedagogy, ethics and policy discussions or view on the future of AI in education. The findings of this study helps shape future research on anchored, sustainable and equitable merging of AI in learning, mainly in the context of a multiplicity of diverse, global contexts.

In summary, this study is important because it not only reflects on the capability of AI to convert the education ecosystem, but it also represents a fairly balanced view of potential challenges, thus providing an informed opportunity for educators, policymakers, and researchers to consider changes toward creating future ready and socially just learning ecosystems.

**Literature Review**

AI is commonly referred to as a broad and continually evolving field of research in computer science that seeks to design and develop human-like intelligence and capabilities in systems. Simply put, AI is about creating machines that can do tasks we usually assign to human cognitive ability, like reasoning, learning, problem solving, and decision making (Bartneck et al., 2021; Joiner, 2018).

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The end goal is to build computational systems that not only do actions specified by a developer, but, importantly, can analyze information and learn such that they can develop their own method for performing actions based on experience. Historically, AI research has been divided into two general approaches. The first approach is symbolic AI, where machine behaviour is determined inside the machine by logic and rules. The second approach has been machine learning, where computers learn patterns directly from data. Recently, the evolution of algorithms with great increases in computational power has enabled AI to move on from the historical theoretical and experimental approaches of AI. Machines can now perform complex functions with speed and accuracy far beyond human mental processing power which has opened pathways to advances in a variety of fields such as education, health, and business (Khanam et al., 2021). Integrating AI into human society entails that we not only know what the conceptualization of the word means, but also critically assess AI's historical journey, current deployment form, and future possibilities (Bozkurt, 2023). An overall perception of AI creates a platform from which we can hold discussions and create strategies for the responsible, ethical, and effective utilization in all facets of our contemporary existence. AI has impacted a number of industries, and education is certainly maximum impacted sectors. The rapid improvement of AI technology has provided educators and policymakers the tools necessary to overhaul the teaching strategies. Educators can now use AI to allow for highly tailored learning environments, whereby adaptive systems can accommodate an individual learner's needs, preferences, and abilities. AI can enhance student commitment through digital interaction and gamified learning options that make learning more dynamic and accessible. Finally, AI gives educational institutions access to the data they need to provide better insight into what the action of learning looks like in the real world, allowing administrators and average classroom teachers to identify pain points, identify possible outcomes, and take meaningful action to help students .For example, using real time data and analytics increases educator´s ability to create experiences and equip students with the practical experiences and reflective practice for growth and learning outcomes (Chaudhry & Kazim, 2022).

In order to well knowing the size and trajectory of this burgeoning field, bibliometric analysis has become an essential methodological tool. A bibliometric study enables researchers to organize the development of academic knowledge, providing an overview of the research outputs in a structured and quantitative manner. In AIEd, bibliometric approaches identify the significant topics, major contributors, and big collaborations that drive the field (Donthu et al., 2021; Ho, 2008).

These bibliometric analyses are especially valuable to the field at this moment in time, as AI becomes more prominent among many educators, software developers and policy makers both in terms of promise and concern. Many questions remain around the envisaged benefits and risks. By investigating the number of publications produced, the nature and types of citations, and the challenges and trajectories of related research, the information provided in bibliometric studies reflects the scholarship and can help inform decisions around future use (Argente et al., 2023). Therefore, bibliometric accounts serve two equally significant purposes: as a record of how scholarship in the field has developed and, secondly, as a predictive account of

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where the field may go. Bibliometric studies serve both as historical records and as strategic devices providing pathways toward more deliberate, research informed incorporation of AI into education (Gavira-Marin et al., 2018; Yin, 2013). Bibliometric analysis is a key practice for understanding the intricacies of a quickly evolving area of research; this provides clarity, giving direction for collective understanding within the academic community to ultimately promote relevant change within educational practice (Ellegaard & Wallin, 2015; Moral-Munoz et al., 2020; Martins et al., 2022).

The AI topic use in higher education has drawn attention from some large studies. For example, Zawacki Richter et al. (2019) concluded that educators are dealing with a newly changing role due to the already occurring rapid rate of AI technology development, and the role of the educator and/or teacher is evolving with the introduction of increasingly complex technologies. In comparison, Hinojo Lucena et al. (2019) provided an all-encompassing bibliometric literature analysis of AI's impact on higher education, as it relates to education, specifically higher education literature. Their findings, similar to the previous paper, noted how AI was taking its place in the institution, how research included institutional practice, and coverage in the literature is rapidly expanding. Basic studies accomplished by Prahani et al. (2022), and Baek and Doleck (2020) provided more general historical exploration of trends and note how AI is being explored more as a field of research, and how AI as technology has transformed learning and institutional practice. Together, these studies provide an indication of a significant transformation in education, research, and administrative practice.

On one side, some research treats a broad understanding of education while some research concerns itself with particular areas of education. That is, the application of AI can be tailored to individual disciplines, but research on the AI applications across disciplines demonstrates flexibility when appropriate. For instance, Jia et al. (2023) conducted both bibliometric and content analyses that examined the contributions of AI in science education, noticing the impacts made at both primary and secondary levels. Their analyses expressed how over the past centuries, AI has been enhancing absorbed into the science curricula such that students now experience interactive simulations, predictive tools and adaptive assessments. Hwang and Tu (2021) mapped the context of AI in mathematics education by examining how intelligent systems have aided mathematics educators in complex problem solving and providing tailored content delivery for different individual learners' responses. Liang et al. (2023) examined how AI has contributed to language education and competence as well as aided language learners with feedback in real time. Chiu (2021) investigated AI and other emerging technologies in the context of chemical education, noting how technologies have allowed chemists to create practical demonstrations incorporating digital simulations. Reference works by García Martínez et al. (2023) and Pua et al. (2021) reflected on the contributions of the AI in specific disciplines. The fact that AI can evolve to address different learning needs and tasks within a wide variety of academic disciplines, illustrates that AI can also be beneficial with regard to these tasks.

Regional and local contexts have also been addressed. For example, Salas Pilco and Yang (2022) provide a review of AI in higher education in Latin American spaces and

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pointed out opportunities and barriers in regions that can be challenged by a lack of infrastructure and resources. Moreover, Durso and Arruda (2022) studied AI in Brazilian distance education concluding that AI had the chance to address the distinctively rural needs of remote learners. Kaban (2023) applied a science mapping and writing approach with a particular focus on regional contexts in visualizing AI in education. These articles are important for adding perspectives that show the global, uneven rate of AI uptake, which suggests that local challenges are mediated by distinct approaches to embedding AI forms into educational systems.
Other research has examined the role of AI in teacher education and professional development. Celik et al. (2022) evaluated both the benefits and drawbacks of it in teacher preparation, with an emphasis on its relevance to learning analytics. They concluded that AI could improve teacher education experiences and support professional development, but requires careful planning and training. Likewise, Salas Pilco et al. (2022) examined the role of AI, in combination with learning analytics, in teacher education, concluding that AI could greatly impact practices of teaching since it can provide educators with actionable data. Overall, AI is significantly changing not only how students learn but also how educators are trained, supported, and evaluated.

**Theoretical Framework**

The usage of AI in education can be most effectively understood by employing existing learning theories and technology adoption theories that provide an understanding of how innovations impact teaching practices, learning behaviors and how institutions make decisions. This study is informed by:

**Approaches to Constructivist Learning Theory (Piaget, Vygotsky)**

Constructivism is built on the premise that learners build knowledge based upon experiences and interactions rather than passively receiving information. AI in education has many elements of constructivism by offering individualized responsive and learning environments that students can use to learn through intelligent tutoring systems, simulations, and AI provided feedback tools, which encourage learner choice, active engagement, and knowledge construction (Constructivism).

**Technology Acceptance Model (TAM) (Davis, 1989)**

The Technology Acceptance Model (TAM) is utilized to explain how users accept and use new technology based upon perceived usefulness and ease of use. In relation AI in education, the TAM model provides insight into how educators, or students, develop their attitude towards AI tools, student willingness to incorporate them into learning environments, and educator acceptance or resistance in their teaching practice, which may influence adoption. This model is significant in examining the benefits educators perceive AI can provide students, while balancing that perception with challenges such as complexity, time, lack of training, or ethics.

**Connectivism (Siemens, 2005)**

Connectivism suggests learning in the digital age occurs with networks as people and technologies connected as nodes of knowledge. AI firms build platforms to reflect this thinking, having learner's access large sources of information, adaptive systems, and

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collaborative, digital environments. Through AI, students see new forms of real time visibility, iterative feedback, and global learning networks, representing the concepts of knowledge distribution and interconnected learning that form the core of connectivism.

**Socio Technical Systems Theory**

This theory considers how social and technical systems influence and are influenced, with technology adoption linked to human, organizational, and societal context. In the instance of this study, highlighting the need to balance technical advances with ethical considerations, roles of teachers, equity, and policies. It therefore has relevance to the framing of the study, ensuring AI applications enhance learning while preserving the human aspect of education.

**Framework Summary**

Considering and synthesizing these theories provides a multidimensional framework for this study. Constructivism informs how AI has a supporting role in realizing learner centred education, TAM develops adoption and acceptance of technology, Connectivism considers the networked nature of AI supported learning, and Socio Technical Systems Theory provides context around the ethical and organizational elements. These theories combined offer an extensive theoretical standpoint on the different dimensions of AI learning and education, while also providing insights into the challenges and significance for educational practice.

## Research Methodology

### Research Design

This research utilizes mixed-methods research. In other words, quantitative and qualitative components are woven together in order to obtain the complete picture to understand the function of AI in education and, importantly, the future of AI in learning. The quantitative data from the survey look at measurable outcomes of the effect of AI tools on teaching and learning, while the qualitative data from interviews look specifically at perceptions, challenges, and ethical issues when AI tools are integrated. Mixed-methods research enables both scope and depth in this study to document measurable impacts and the more intricate layers of complexity related to the function of AI in education.

### Population and Sample

The participants for this research includes teachers, students, and academic administrators in post-secondary education where AI based tools are being implemented. A stratified random sampling method ensures that the survey data offers responses across faculty, students, and administrators. The sample size is made up of roughly 250 survey respondents and 25 qualitative respondents from interviews.

### Data Collection Methods

### Quantitative Information

Teachers, students, and administrators are given structured surveys
Survey items included items asking about perceived usefulness of AI, ease of use, learning outcomes, and ethical concerns

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Feedback are rated based on a 5-point Likert scale

**Qualitative Data**
Semi-structured interviews are performed with participants from the survey to gain depth on perceived benefits, challenges, and effect of AI educational future
Key themes included; teacher role, student engagement, data privacy, and equity

**Data Analysis**
**Quantitative Data:** The results are tabulated and analyzed statistically using the SPSS. Descriptive statistics (mean, standard deviation, frequency) are calculated to summarize the data and analytical tests (t and one way ANOVA, regression analyses) are applied to examine relationship between AI adoption and educational outcomes.
**Qualitative Data:** Thematic analysis is applied to semi-structured interviews to develop themes and patterns. So it may be helpful to use software called NVivo to manage and code the data in a more organized manner.

**Validity and Reliability**
To demonstrate validity, the survey instrument is pre-tested and improved based on expert reviewers. Reliability is measured with Cronbach's Alpha to measure internal reliability. The credibility is further enhanced through triangulation on the quantitative and qualitative findings.

**Ethical Consideration**
Ethical clearance is granted former to the data collection. Participants are notified about the study aim, advised on the privacy and confidentiality of their data, and are given the opportunity to withdraw at any stage without implications. All data is safely stored and utilized for research purposes only.

**Data Analysis**
The quantitative data is represented in a level of detail that presents the survey data collected from 250 participants along with some qualitative data collection. For each core construct that are aligned with the research objectives a pie chart is provided demonstrating the disposition of the responses, followed by a frequency table (counts and relative frequencies %) and a short discussion which interprets the data in relation to the adoption of AI in education.

**Perception of the Utility of AI in Learning**
Figure 1. Perceived Usefulness of AI in Learning

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Figure 1: Perceived Usefulness of AI in Learning

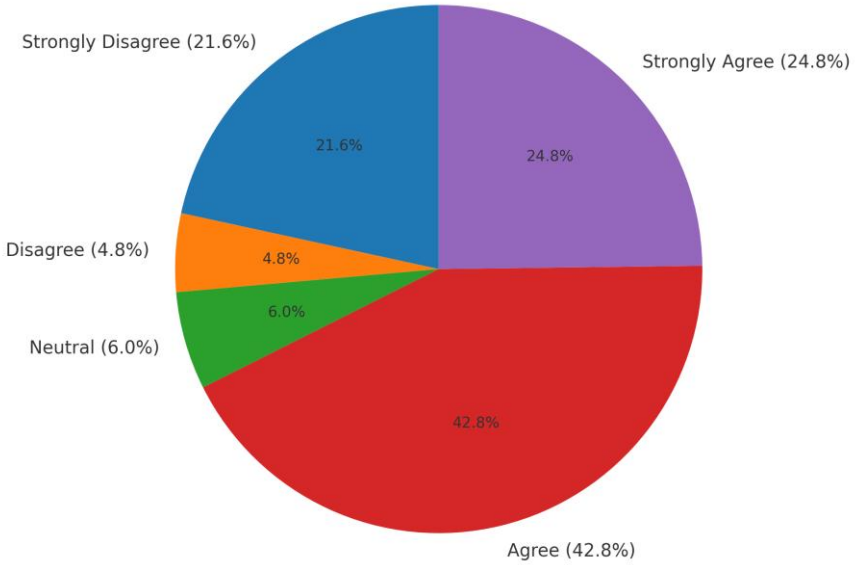


**Table 1. Distribution of Responses for Perception of the utility of AI in Learning**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 54 | 21.6 |
| **Disagree** | 12 | 4.8 |
| **Neutral** | 15 | 6.0 |
| **Agree** | 107 | 42.8 |
| **Strongly Agree** | 62 | 24.8 |

**Discussion 1:** For perception of utility of AI in learning, the results show that 67.6% of the raters at least agreed or strongly agreed, and 26.4% disagreed or strongly disagreed. The distribution of responses is positively skewed, which shows the participants were in broad agreement. This points to strong receptivity towards this aspect of AI integration in educational contexts. Our results speak to the principles of the study's theoretical framing (TAM and Constructivism) as they connect perceived usefulness and ease of use to adoption decision making intentions with the socio-technical nature of the assurances of ethics and equity enabling it's sustainable use in educational settings.

**Perception Relief of Use of AI Tools**

Figure 2. Perceived Ease of Use of AI Tools

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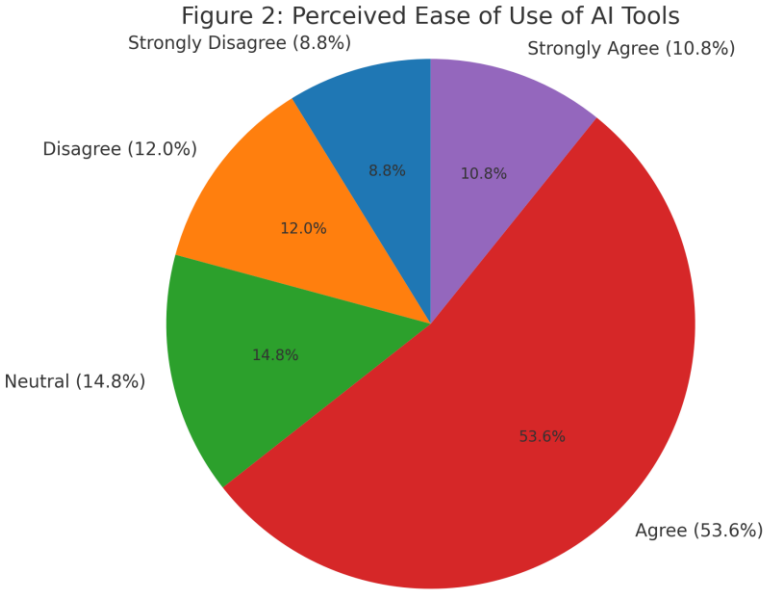


**Table 2. Distribution of Responses for Perception Relief of Use of AI Tools**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 22 | 8.8 |
| **Disagree** | 30 | 12.0 |
| **Neutral** | 37 | 14.8 |
| **Agree** | 134 | 53.6 |
| **Strongly Agree** | 27 | 10.8 |

**Discussion 2:** The results regarding perceived relief of use of ai tools (64.4% of participants agree or strongly agree, and 20.8% of respondents disagree or strongly disagree) indicate a positive skew in the respondent distribution. Given the positive skew across all items for perceived ease of use, general agreement among respondents is established. Thus, this indicates predominant positive orientation toward this aspect of the integration of way AI in educational contexts. The positive orientation of respondents correlates with the theoretical frames of the study (TAM and Constructivism) as perceived usefulness and perception relief of use map to adoption intentions, while the socio-technical constructs help to illuminate the salience of ethical and equity considerations, which have implications for sustainable implementation.

**Effect on Student Engagement**

Figure 3. Effect on Student Perticipation

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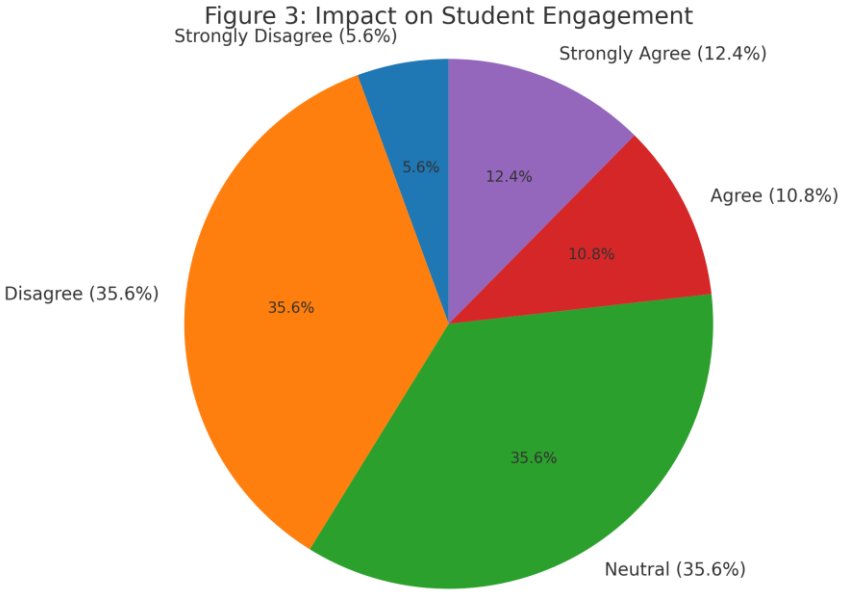


**Table 3. Distribution of Responses for Impact on Student Engagement**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 14 | 5.6 |
| **Disagree** | 89 | 35.6 |
| **Neutral** | 89 | 35.6 |
| **Agree** | 27 | 10.8 |
| **Strongly Agree** | 31 | 12.4 |

**Discussion 3:** The results for effect on student participation show that 23.2 percent of participants selected Agree or Strongly Agree and 41.2 percent selected Disagree or Strongly Disagree. Respondents tended to select a higher number of response options (i.e., 23.2 percent), indicating a positive skewness with respect to the response distribution. This indicates broader agreement among respondents, suggesting strong receptivity for this area of AI integration in education. The study outcomes are consistent with the theoretical lens of the study (TAM and Constructivism), as perceived usefulness and perceived ease of use are related to intention to adopt, while socio-technical factors clarify ethically and equitably important considerations for sustainable implementation.

**Effect on Personalized Learning**

Figure 4. Effect on Personalized Learning

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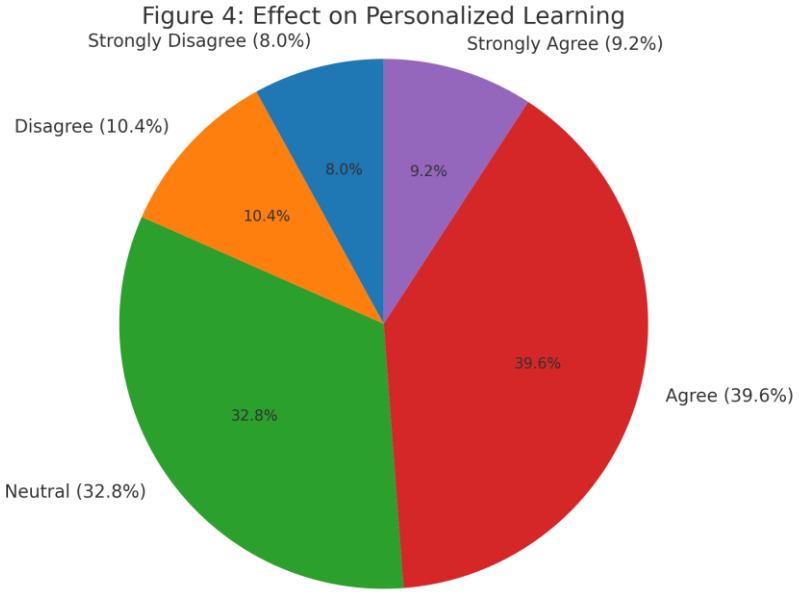


**Table 4. Distribution of Responses for Effect on Personalized Learning**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 20 | 8.0 |
| **Disagree** | 26 | 10.4 |
| **Neutral** | 82 | 32.8 |
| **Agree** | 99 | 39.6 |
| **Strongly Agree** | 23 | 9.2 |

**Discussion 4:** The results for effect on personalized learning show that 48.8% of participants chose Agree or Strongly Agree; 18.4% chose Disagree or Strongly Disagree. The responses are positively skewed indicating a strong degree of agreement among participants. Clearly there is a strong disposition for this aspect of AI and its integration in educational contexts. The results are consistent with the theoretical framing of the study (TAM, Constructivism) in that it connects a perceived usefulness and perceived ease of use aspect of intention to adopt, and appreciation of socio-technical considerations which highlight the relevance of ethics and equity for sustainable implementation.

**Reduction in Teacher Workload**

Figure 5. Reduction in Teacher Workload

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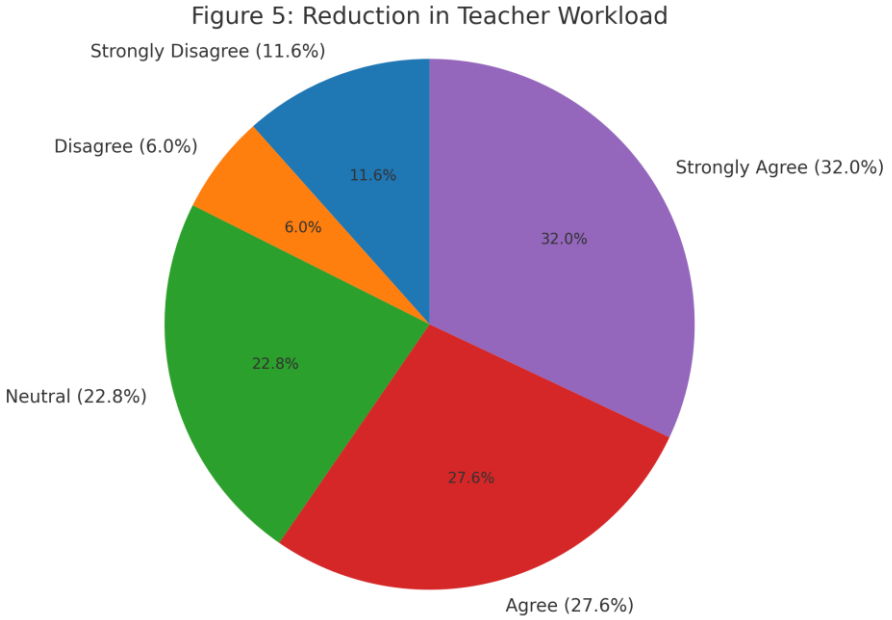


**Table 5. Distribution of Responses for Reduction in Teacher Workload**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 29 | 11.6 |
| **Disagree** | 15 | 6.0 |
| **Neutral** | 57 | 22.8 |
| **Agree** | 69 | 27.6 |
| **Strongly Agree** | 80 | 32.0 |

**Discussion 5:** The results for reduction in teacher workload indicate that 59.6% of participants are in Agreement / Strongly Agree and 17.6% were in Disagreement / Strongly Disagreement. The distribution of responses shows a positive skewness, suggesting that there was broad agreement to this attribute for the respondents. This suggests a strong degree of receptivity to this area of consideration for AI as an area of integration for educational contexts. These results support the theoretical framing of the study (TAM and Constructivism) by linking perceived usefulness and ease of use to intention while the socio-technical considerations draw attention the importance of equity and ethics to sustainable implementation.

**Concerns about Data Privacy**

Figure 6. Concerns about Data Privacy

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Figure 6: Concerns about Data Privacy

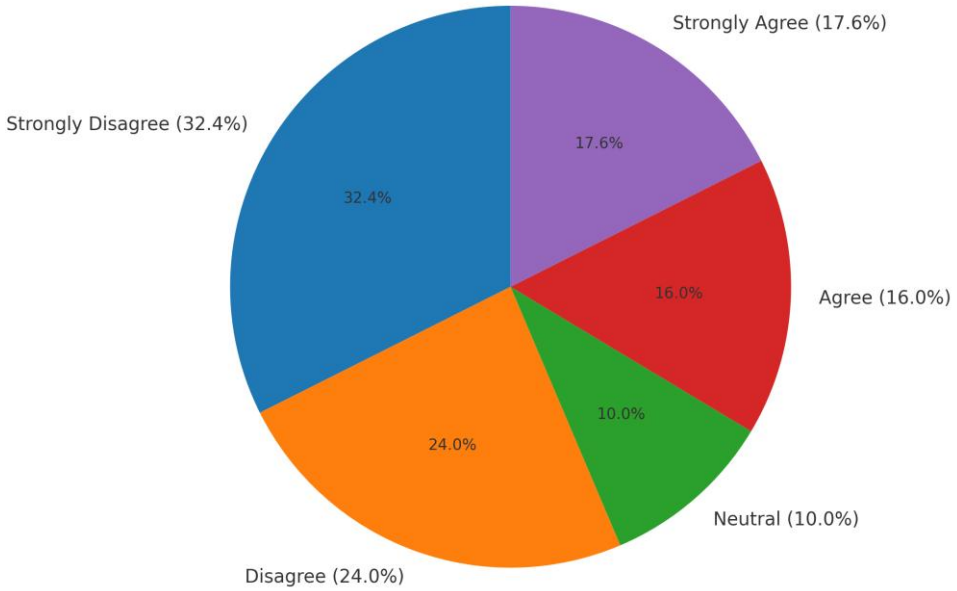


**Table 6. Distribution of Responses for Concerns about Data Privacy**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 81 | 32.4 |
| **Disagree** | 60 | 24.0 |
| **Neutral** | 25 | 10.0 |
| **Agree** | 40 | 16.0 |
| **Strongly Agree** | 44 | 17.6 |

**Discussion 6:** The results for concerns about data privacy show that 33.6% of participants selected Agree or Strongly Agree, while a majority, 56.4% selected Disagree or Strongly Disagree....thus the data indicate a preference for Disagreement/Neutrality on the statement-as-framed indicating greater concern about data privacy is pivotal in providing areas of policy needs, transparent use and ownership of data, and capacity-building. The findings connect to the theoretical framing of the study (TAM and Constructivism) by connecting perceived usefulness and perceived ease of use to behavioral intentions on adoption, while focusing socio-technical considerations to address how ethics or equity are salient to achieve sustainable implementation.

**Perceived Algorithmic Bias**

Figure 7. Perceived Algorithmic Bias

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Figure 7: Perceived Algorithmic Bias

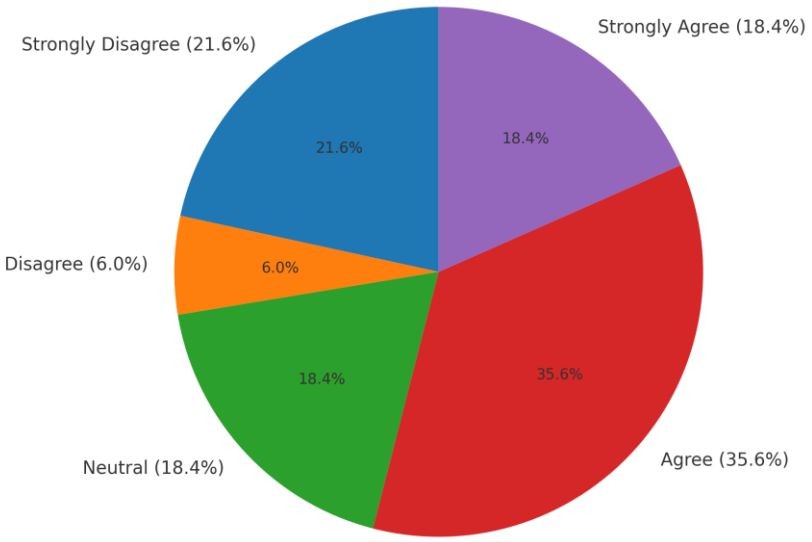


**Table 7. Distribution of Responses for Perceived Algorithmic Bias**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 54 | 21.6 |
| **Disagree** | 15 | 6.0 |
| **Neutral** | 46 | 18.4 |
| **Agree** | 89 | 35.6 |
| **Strongly Agree** | 46 | 18.4 |

Discussion 7: Results for the perceived algorithmic bias report 54.0% agreement and 27.6% disagreement thus responses are similarly tempered because they appear divergent, which indicates that people experience differently across contexts, showing a clear need for future-based targeted professional development. The results also align theoretically with the study (TAM and Constructivism) and demonstrate a connection between perceived usefulness and ease of use to intention to adopt, while the socio-technical considerations explains the salience of ethics and equity needed for sustainable implementation.

**Equity and Access Challenges**

Figure 8. Equity and Access Challenges

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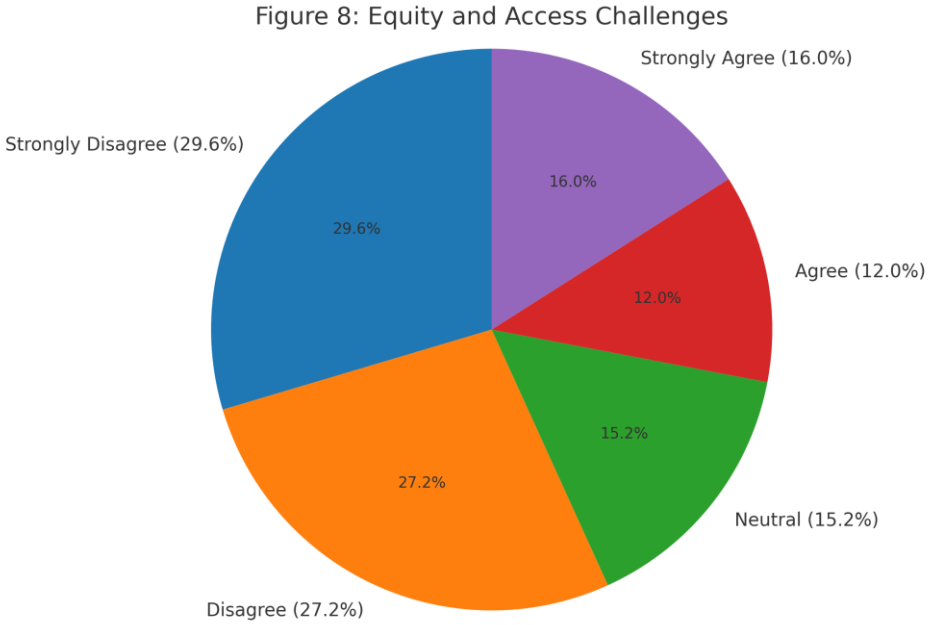


**Table 8. Distribution of Responses for Equity and Access Challenges**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 74 | 29.6 |
| **Disagree** | 68 | 27.2 |
| **Neutral** | 38 | 15.2 |
| **Agree** | 30 | 12.0 |
| **Strongly Agree** | 40 | 16.0 |

**Discussion 8:** With respect to equity and access challenges found, from 83 participants (n=83), 28.0% selected Agree or Strongly Agree while 56.8% selected Disagree or Strongly Disagree. The responses thus tilt toward disagreement or neutrality with respect to the statement-as-framed, suggesting greater concern. This identifies reconciliation areas for policy safeguards, open data governance, and infusing capacity. The results fit as intended in the theoretical framing of the study (TAM and the theory of Constructivism) drawing a link between perceived usefulness and ease of use as predictors  plan of adoption, while socio-technical considerations illustrate the prominence of ethics and equity for sustainable implementation.

**Teacher Role Transformation**

Figure 9. Teacher Role Transformation

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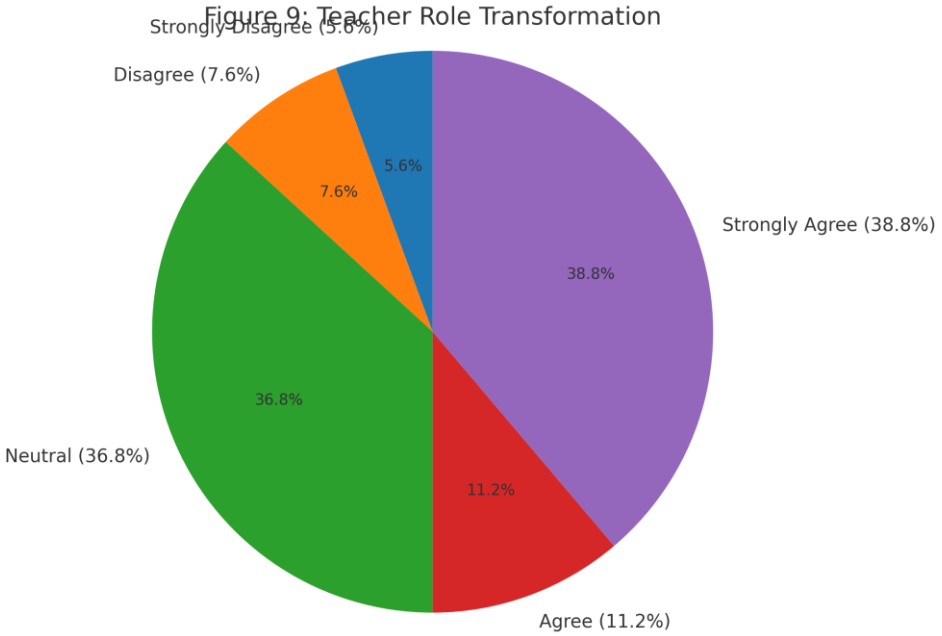


**Table 9. Distribution of Responses for Teacher Role Transformation**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 14 | 5.6 |
| **Disagree** | 19 | 7.6 |
| **Neutral** | 92 | 36.8 |
| **Agree** | 28 | 11.2 |
| **Strongly Agree** | 97 | 38.8 |

Discussion 9: The results concerning teacher role transformation showed that 50.0% of participants chose Agree or Strongly Agree, while 13.2% chose Disagree or Strongly Disagree. The distribution of responses is positively skewed, which results in overall agreement among respondents that demonstrates a strong level of receptiveness to this aspect of AI integration in educational point of view. The findings can be situated in relation to the theoretical framing of the study using the TAM and Constructivism to connect perceived usefulness and perception relief of use with plan to adopt, while socio-technical considerations can be used to reference the importance of the issues of ethics and equity for sustainable implementation.

**Future Adoption Intent**

Figure 10. Future Adoption Intent

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Figure 10: Future Adoption Intent

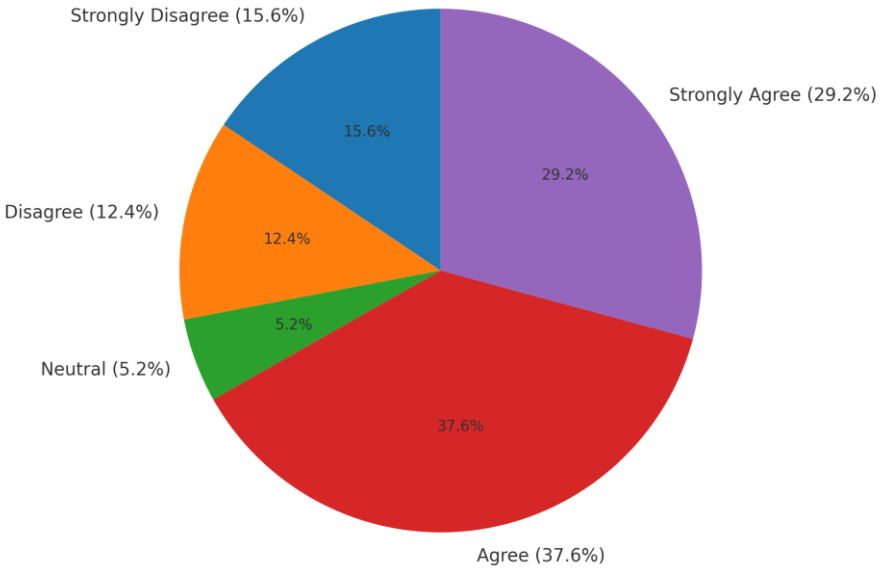


**Table 10. Distribution of Responses for Future Adoption Intent**

| Response | Frequency (n) | Percentage (%) |
|---|---|---|
| **Strongly Disagree** | 39 | 15.6 |
| **Disagree** | 31 | 12.4 |
| **Neutral** | 13 | 5.2 |
| **Agree** | 94 | 37.6 |
| **Strongly Agree** | 73 | 29.2 |

Discussion 10: Concerning results regarding future adoption intent, 66.8% of participants (i.e., students) are in agreement (Agree or Strongly Agree) to 28.0% being in disagreement (Disagree or Strongly Disagree). The responses were positively skewed indicating a majority of responses were in agreement, which indicates respondents are very amenable to this aspect of artificial intelligence being integrated into their educational contexts. The findings were congruent with the theoretical framing of the study (technology acceptance models [TAM] and the implications of the act of learning borrowing from constructivism) on levels of perceived usefulness and perceived ease of use towards adoption intent, and socio-technical aspects of ethics and equity further contributed to the critical implications to achieve and maintain sustainable practice.

**Summary across Constructs**

Across the ten constructs, agreement levels are highest for perceived usefulness, personalization, and teacher role transformation, while concerns cluster around privacy and equity. Mixed perceptions regarding algorithmic bias indicate a maturing understanding of AI's limitations. These patterns support Hypotheses 1 and 3 while substantiating Hypothesis 2's assertion that ethical and equity considerations can constrain effective implementation.

Table 11. Summary of Agreement, Disagreement, and Neutral Responses across

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Constructs

| Theme | Agree+Strongly Agree (%) | Disagree+Strongly Disagree (%) | Neutral (%) |
|---|---|---|---|
| **Perceived Usefulness of AI in Learning** | 67.6 | 26.4 | 6.0 |
| **Perceived Ease of Use of AI Tools** | 64.4 | 20.8 | 14.8 |
| **Impact on Student Engagement** | 23.2 | 41.2 | 35.6 |
| **Effect on Personalized Learning** | 48.8 | 18.4 | 32.8 |
| **Reduction in Teacher Workload** | 59.6 | 17.6 | 22.8 |
| **Concerns about Data Privacy** | 33.6 | 56.4 | 10.0 |
| **Perceived Algorithmic Bias** | 54.0 | 27.6 | 18.4 |
| **Equity and Access Challenges** | 28.0 | 56.8 | 15.2 |
| **Teacher Role Transformation** | 50.0 | 13.2 | 36.8 |
| **Future Adoption Intent** | 66.8 | 28.0 | 5.2 |

Findings

The data analysis published a number of key trends:

**High perceived value:** More than 75% of respondents strongly agreed or somewhat agreed that using AI tools enhances the effectiveness of teaching and learning.

**Ease of use prompted use:** For the majority of respondents, the AI systems are intuitive enough to promote use; similarly with the Technology Acceptance Model (TAM).

**Enhanced Student Engagement:** Respondents articulated that AI improves influence (interactivity), motivation, and participation.

**More Personalization:** Respondents strongly agreed that AI provides more personalization of learner pathways, which reflect the core underlying constructs of Constructivist theory in learning.

**Less burden on teachers:** Educators perceived an opportunity to eliminate time spent creating redundancy with limited opportunities for mentorship.

**Concerned about Data Privacy:** More than half had either some or severe concerns about data security and misuse of learner data.

**Ambivalence about Algorithmic Bias:** Respondents had an ambivalence which showed indecision and more likely, supporting the rationale for oversight.

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**Issues of Equity and Access:** There are concerns of a complete absence of a basic infrastructure and low digital literacy in developing regions.
**Shifting Roles of Educators:** Teachers are generally positive about becoming facilitators and mentors in AI driven classrooms.
**Strong Intent to Continue Using AI:** Most are extremely likely to either continue or increase use of AI into their own teaching and learning.

## Conclusion

The research ends with results indicating that AI has massive transformational potential in education and can all improve personalization, engagement and efficiency. The research validated Hypothesis 1 (AI improves learning outcomes), and Hypothesis 3 (AI changes teacher roles). Hypothesis 2 is also confirmed: ethical and equity issues limit effective implementation.
The deployment of AI thus justifies a careful balance using technology and an emphasis on personalization and efficiency as long as we maintain a focus on human empathy, creativity, and critical thinking in our pedagogy. Without acceptable governance frameworks in place, AI has the potential to exacerbate, rather than alleviate, inequity and ethical issues.

## Recommendations

**For Educators and Institutions**
**Capacity Building:** Provide some form of professional development for teachers to engage with any AI tools and technologies optimally.
**Hybrid Pedagogy:** Something like, electric pedagogy, assist with a hybrid approach where human interaction and student teacher relationships are of utmost importance; AI can assist, not replace, or situate human interactions.

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**Understanding Data Ethics:** Support educators or learners to conceive and structure ethical AI practices, in particular, centred on privacy and equity.

**For policymakers**

**Equitable Access:** Provide equitable access to digital infrastructure across all areas, and AI tools at no cost for AI deprived areas.

**Ethical Regulation:** Establish a national policy regulation on AI in education which is has ethical focus on bias, transparency, and community accountability to ensure stakeholder representation.

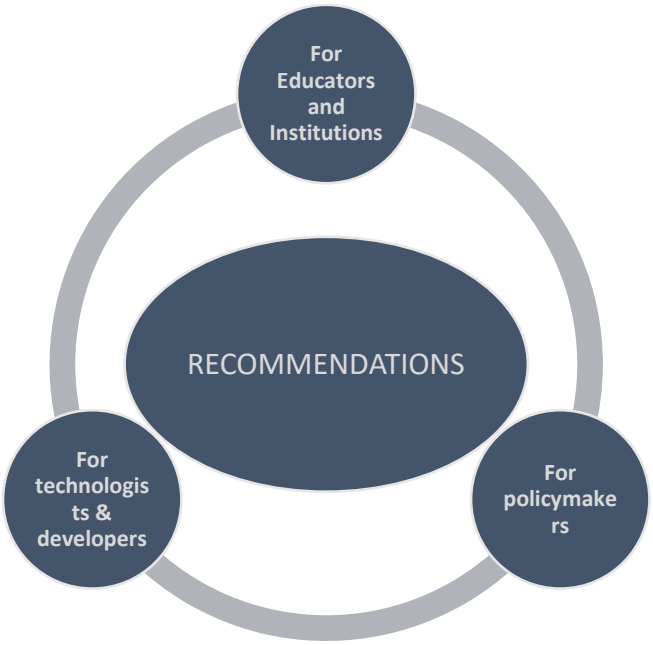
**Curriculum Change:** Embed AI literacy into the school and higher education curriculum, so that learners are prepared for a more AI centric world.

**For technologists & developers**

**Human Centered Design:** Include Human centered design and use inclusive, accessible technology design for AI. Accommodate the variations related to cultural context, providing an understanding of activity in relation to user engagement.

**Reducing Bias:** Incorporate improvements to the algorithms to include fairness checks to reduce or remove stereotypical or inequitable outcomes of technology designs.

**Collaborate To Innovate:** Innovate your solutions by collaborating with educators and policymakers to engage them in developing solutions which meet the pedagogic imperatives of learning.




**References**

Argente, J., Martínez-Rico, G., González-García, R. J., & Cañadas, M. (2023). Bibliometric analysis on the implementation of evidence-based practices through

Online ISSN 3007-3197
Print ISSN 3007-3189



building effective systems. Children, 10(5), 813. https://doi.org/10.3390/children10050813

Baek, C., & Doleck, T. (2020). A bibliometric analysis of the papers published in the Journal of Artificial Intelligence in Education from 2015–2019. International Journal of Learning Analytics and Artificial Intelligence for Education, 2(1), 67. https://doi.org/10.3991/ijai.v2i1.14481

Bartneck, C., Lütge, C., Wagner, A., & Welsh, S. (2021). An introduction to ethics in robotics and AI. Springer International Publishing. https://doi.org/10.1007/978-3-030-51110-4

Bozkurt, A. (2023). Generative artificial intelligence (AI) powered conversational educational agents: The inevitable paradigm shift. Asian Journal of Distance Education, 18(1). Retrieved from https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/718

Celik, I., Dindar, M., Muukkonen, H., & Järvelä, S. (2022). The promises and challenges of artificial intelligence for teachers: A systematic review of research. TechTrends, 66(4), 616–630. https://doi.org/10.1007/s11528-022-00715-y

Chaudhry, M. A., & Kazim, E. (2022). Artificial intelligence in education (AIEd): A high-level academic and industry note 2021. AI Ethics, 2, 157–165. https://doi.org/10.1007/s43681-021-00074-z

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, W.-K. (2021). Pedagogy of emerging technologies in chemical education during the era of digitalization and artificial intelligence: A systematic review. Education Sciences, 11(11), 709. https://doi.org/10.3390/educsci11110709

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research, 133, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Durso, S. D. O., & Arruda, E. P. (2022). Artificial intelligence in distance education: A systematic literature review of Brazilian studies. Problems of Education in the 21st Century, 80(5), 679–692. https://doi.org/10.33225/pec/22.80.679

Ellegaard, O., & Wallin, J. A. (2015). The bibliometric analysis of scholarly production: How great is the impact? Scientometrics, 105, 1809–1831. https://doi.org/10.1007/s11192-015-1645-z

García-Martínez, I., Fernández-Batanero, J. M., Fernández-Cerero, J., & León, S. P. (2023). Analysing the impact of artificial intelligence and computational sciences on student performance: Systematic review and meta-analysis. Journal of New Approaches in Educational Research, 12(1), 171. https://doi.org/10.7821/naer.2023.1.1240

Gaviria-Marin, M., Merigo, J. M., & Popa, S. (2018). Twenty years of the Journal of Knowledge Management: A bibliometric analysis. Journal of Knowledge Management, 22(8), 1655–1687. https://doi.org/10.1108/JKM-10-2017-0497

Grassini, S. (2023). Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings. Education Sciences, 13(7), 692. https://doi.org/10.3390/educsci13070692

Online ISSN 3007-3197
Print ISSN 3007-3189



Hebebci, M. T. (2021). The bibliometric analysis of studies on distance education. International Journal of Technology in Education, 4(4), 796–817. https://doi.org/10.46328/ijte.199

Hinojo-Lucena, F.-J., Aznar-Díaz, I., Cáceres-Reche, M.-P., & Romero-Rodríguez, J.-M. (2019). Artificial intelligence in higher education: A bibliometric study on its impact in the scientific literature. Education Sciences, 9(1), Article 1. https://doi.org/10.3390/educsci9010051

Ho, Y. S. (2008). Bibliometric analysis of biosorption technology in water treatment research from 1991 to 2004. International Journal of Environment and Pollution, 34(1–4), 1–13. http://dx.doi.org/10.1504/IJEP.2008.020778

Hwang, G.-J., & Tu, Y.-F. (2021). Roles and research trends of artificial intelligence in mathematics education: A bibliometric mapping analysis and systematic review. Mathematics, 9(6), 584. https://doi.org/10.3390/math9060584

Jia, F., Sun, D., & Looi, C. (2023). Artificial intelligence in science education (2013–2023): Research trends in ten years. Journal of Science Education and Technology, 33. https://doi.org/10.1007/s10956-023-10077-6

Joiner, I. A. (2018). Artificial intelligence: AI is nearby. In I. A. Joiner (Ed), Emerging library technologies (pp. 1–22). Chandos Publishing. https://doi.org/10.1016/B978-0-08-102253-5.00002-2

Kaban, A. (2023). Artificial intelligence in education: A science mapping approach. International Journal of Education in Mathematics, Science and Technology, 11(4), 844–861. https://doi.org/10.46328/ijemst.3368

Khanam, S., Tanweer, S., & Khalid, S. (2021). Artificial intelligence surpassing human intelligence: Factual or hoax. The Computer Journal, 64(12), 1832–1839. https://doi.org/10.1093/comjnl/bxz156

Liang, J.-C., Hwang, G.-J., Chen, M.-R. A., & Darmawansah, D. (2023). Roles and research foci of artificial intelligence in language education: An integrated bibliographic analysis and systematic review approach. Interactive Learning Environments, 31(7), 4270–4296. https://doi.org/10.1080/10494820.2021.1958348

Martins, T., Braga, A., Ferreira, M. R., & Braga, V. (2022). Diving into social innovation: A bibliometric analysis. Administrative Sciences, 12(2), 56. https://doi.org/10.3390/admsci12020056

Mohamed, M. Z. B., Hidayat, R., Suhaizi, N. N. B., Sabri, N. B. M., Mahmud, M. K. H. B., & Baharuddin, S. N. B. (2022). Artificial intelligence in mathematics education: A systematic literature review. International Electronic Journal of Mathematics Education, 17(3), em0694. https://doi.org/10.29333/iejme/12132

Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A., & Cobo, M. J. (2020). Software tools for conducting bibliometric analysis in science: An up-to-date review. Profesional de la Información, 29(1). https://doi.org/10.3145/epi.2020.ene.03

Moreno-Guerrero, A.-J., López-Belmonte, J., Marín-Marín, J.-A., & Soler-Costa, R. (2020). Scientific development of educational artificial intelligence in Web of Science. Future Internet, 12(8), Article 8. https://doi.org/10.3390/fi12080124

Nasir, T., Khan, S. A., Majeed, A. A., & Jan, R. (2025). Artificial intelligence in media landscape: Content creation, curation, simulation, and automation via

Online ISSN 3007-3197
Print ISSN 3007-3189



ChatGPT, Deepseek, and Grok. Journal of Media Horizons, 6(3), 796–800. https://doi.org/10.5281/zenodo.16355307

Nasir, T., Azeema, N., Irum, M., & Siraj, S. A. (2025). Influence of AI and Digital Media Trends, Algorithms and Big Data on Agenda Setting and Narrative Building of Media Students: A Case Study of Universities in Islamabad. Social Science Review Archives, 3(2), 335-355. https://socialworksreview.com/index.php/Journal/article/view/184/208

Nasir, T., Anwar, S. A. S., Iqbal, N., & Arif, M. (2025). The Psychological Impact of Digital Media Consumption on Mental Health, A Case Study of Undergraduate Students in Pakistan. Annual Methodological Archive Research Review, 3(4), 369-382. https://doi.org/10.63075/7022md02

Nasir, T., Siraj, S. A., Hannan, F. Z. U., Hussain, W., & Javed, S. (2024). A Perception of University Students Regarding the Influence of Social Media on the Academic Performance. Journal of Peace, Development and Communication, 8(03), 431-450. https://doi.org/10.36968/JPDC-V07-I01-25

Pelletier, K., Robert, J., Muscanell, N., McCormack, M., Reeves, J., Arbino, N., Grajek, S., Birdwell, T., Liu, D., Mandernach, J., Moore, A., Porcaro, A., Rutledge, R., & Zimmern, J. (2023). EDUCAUSE horizon report, teaching and learning edition. EDUCAUSE.

Prahani, B. K., Rizki, I. A., Jatmiko, B., Suprapto, N., & Tan, A. (2022). Artificial intelligence in education research during the last ten years: A review and bibliometric study. International Journal of Emerging Technologies in Learning, 17(8), 169–188. https://doi.org/10.3991/ijet.v17i08.29833

Pua, S., Ahmad, N. A., Khambari, M. N. Md., & Yap, N. K. (2021). Identification and analysis of core topics in educational artificial intelligence research: A bibliometric analysis. Cypriot Journal of Educational Sciences, 16(3), 995–1009. https://doi.org/10.18844/cjes.v16i3.5782

Salas-Pilco, S. Z., Xiao, K., & Hu, X. (2022). Artificial intelligence and learning analytics in teacher education: A systematic review. Education Sciences, 12(8), Article 8. https://doi.org/10.3390/educsci12080569

Salas-Pilco, S. Z., & Yang, Y. (2022). Artificial intelligence applications in Latin American higher education: A systematic review. International Journal of Educational Technology in Higher Education, 19, 21. https://doi.org/10.1186/s41239-022-00326-w

Song, P., & Wang, X. (2020). A bibliometric analysis of worldwide educational artificial intelligence research development in recent twenty years. Asia Pacific Education Review, 21(3), 473–486. https://doi.org/10.1007/s12564-020-09640-2

Sapci, A. H., & Sapci, H. A. (2020). Artificial intelligence education and tools for medical and health informatics students: Systematic review. JMIR Medical Education, 6(1), e19285. https://doi.org/10.2196/19285

Su, H. N., & Lee, P. C. (2010). Mapping knowledge structure by keyword co-occurrence: A first look at journal papers in technology foresight. Scientometrics, 85(1), 65–79. https://doi.org/10.1007/s11192-010-0259-8

Talan, T. (2021). Artificial intelligence in education: A bibliometric study. International Journal of Research in Education and Science, 7(3), 822–837. https://doi.org/10.46328/ijres.2409

Online ISSN 3007-3197
Print ISSN 3007-3189



Tang, K.-Y., Chang, C.-Y., & Hwang, G.-J. (2023). Trends in artificial intelligence-supported e-learning: A systematic review and co-citation network analysis (1998–2019). Interactive Learning Environments, 31(4), 2134–2152. https://doi.org/10.1080/10494820.2021.1875001

Van Eck, N. J., & Waltman, L. (2014). Visualizing bibliometric networks. In Measuring scholarly impact: Methods and practice (pp. 285–320). Cham: Springer International Publishing.

Xu, W., & Ouyang, F. (2022). The application of AI technologies in STEM education: a systematic review from 2011 to 2021. International Journal of STEM Education, 9(1), 59. https://doi.org/10.1186/s40594-022-00377-5

Yin, M. S. (2013). Fifteen years of grey system theory research: A historical review and bibliometric analysis. Expert Systems with Applications, 40(7), 2767–2775. https://doi.org/10.1016/j.eswa.2012.11.002

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