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Assessing the Extent of Integration of Artificial Intelligence in Teaching and Learning at Kenyan Universities

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Abstract

Artificial Intelligence (AI) in university teaching is reshaping higher education by enhancing instructional methods, student engagement, and learning outcomes. This study explores the use of AI-driven tools, personalized learning, and adaptive instructional strategies. It establishes the motivation and satisfaction levels in adopting AI over traditional methods in university teaching experience. The study used the Technological Pedagogical Content Knowledge (TPACK) theory (Mishra & Koehler, 2006) and Diffusion of Innovation (DOI) theory (Rogers, 2003) to underscore the role of technology in fostering continuous learning and interaction. Data were collected from students across diverse programs through the Learning Management Systems (LMS) and analyzed using AI-powered learning analytics and natural language processing (NLP) tools. Key metrics included course completion rates, assignment engagement, and assessment performance. The findings reveal that AI facilitates content personalization and real-time feedback and improves student participation, ultimately optimizing the learning experience. This study provides valuable insights into student interactions, preferences, and effectiveness of AI in higher education. It also highlights the need for universities to strategically utilize AI to foster inclusive, adaptive, and efficient teaching environments. The research recommends embracing AI as a transformative tool to maximize its potential in shaping the future of university education in Kenya.

Keywords: AI, technology, higher education, adaptive learning, learning and teaching,

Introduction

Integrating artificial Intelligence (AI) in university teaching is not just about automation but also about enhancing the quality of instruction. AI-driven platforms can tailor educational content to individual students' needs, provide instant feedback, and support lecturers in creating interactive and dynamic learning environments (Zawacki-Richter et al., 2019). Artificial Intelligence applications can also assist in research, curriculum development, and institutional management, fostering innovation within higher education institutions (Selwyn, 2019).

Despite its potential benefits, adopting AI in Kenyan universities faces several challenges, including limited technological infrastructure, concerns about data privacy, resistance to change among educators, and ethical considerations (Mhlanga & Moloi, 2020). This article explores the integration of AI into university teaching, focusing on selected Kenyan universities. It examines the extent of using AI-driven tools, personalized learning, and adaptive instructional strategies, as well as establishing motivation and satisfaction levels in adopting AI over traditional methods in university teaching experience. The findings contribute to the growing discourse on AI in higher education and provide insights for policymakers, educators, and technology developers on optimizing AI for a more inclusive and effective teaching/learning experience.

Literature Review

Artificial Intelligence is increasingly transforming higher education by enhancing teaching methodologies, improving assessment

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techniques, and fostering student engagement. Universities in developed countries, including the United States, the United Kingdom, and China, have successfully integrated AI-powered tools- such as virtual tutors, automated grading systems, and adaptive learning technologies- to enhance teaching effectiveness (Luckin et al., 2018; Selwyn, 2019).

Artificial Intelligence plays a crucial role in personalizing learning, predicting student performance, and providing targeted interventions. These capabilities enable students to progress at an individualized pace while allowing educators to refine their instructional strategies (Luckin et al., 2016). Despite these advancements, the integration of AI in university teaching in developing regions, such as Kenya, remains limited, primarily due to infrastructural constraints, lack of faculty training, and ethical concerns surrounding data privacy and algorithmic bias.

AI-Driven Tools in University Teaching

AI-driven tools have revolutionized university teaching by automating administrative tasks, improving assessment processes, and enhancing student engagement. Intelligent tutoring systems provide real-time, personalized support to students by analyzing responses and adapting explanations to foster a deeper understanding (Doe & Smith, 2023). Similarly, AI-driven virtual assistants such as chatbots enhance student support services by answering academic inquiries, guiding course selection, and streamlining enrollment processes, thereby reducing the administrative workload for faculty and staff (Holmes et al., 2021).

AI-based assessment systems have also gained attention, particularly in automating grading and providing instant feedback on assignments and examinations. These systems improve efficiency and minimize grading biases, especially for structured response assessments (Schmid et al., 2020). However, concerns persist regarding the reliability of AI in evaluating subjective assessments such as essays and research projects, where human interpretation remains essential (Miao & Holmes, 2023).

Beyond assessment, AI contributes significantly to administrative functions in higher education institutions. Universities in Australia and Canada have adopted AI-powered chatbots for academic advising, reducing administrative burdens and ensuring that students receive timely and accurate information about their academic progress (Holmes et al., 2021). However, a study by Matere (2024) that assessed the accessibility and effectiveness of AI-driven tools found that their availability in higher education institutions in Kenya is significantly limited. Most respondents reported that AI tools are not readily accessible, highlighting disparities in access across different departments and projects within institutions. Integrating AI tools into teaching and learning practices remains in its initial phases in most institutions. Even when AI tools are available, they are not always well integrated into existing curricula, leading to limited and uneven adoption across different disciplines. Despite these challenges, those who have begun using AI tools report benefits, such as personalized learning, more efficient assessment processes, and enhanced feedback mechanisms. This suggests that AI has the potential to transform educational practices if it is utilized more effectively.

Matere (2024) further found a significant correlation between AI tools and effective teaching and learning in Kenyan higher education institutions ($r = .781$; $p = .000$). The study noted that, while AI can greatly enhance the educational experience, its current impact is constrained by several factors. Faculty members' unfamiliarity with AI, lack of comprehensive training, and inadequate integration of AI tools into curricula are major barriers to their effective use. However, when AI has been successfully implemented, it has contributed to improved learning outcomes, higher student engagement, and more personalized feedback. Matere (2024) recommended that institutions invest in infrastructure and ongoing professional

development to maximize the benefits of AI in education.

By automating routine processes, AI enables educators to focus on pedagogical strategies, mentorship, and fostering critical thinking skills among students. In addition to its administrative applications, AI plays a fundamental role in personalizing learning experiences through adaptive instructional strategies. AI-powered adaptive learning platforms analyze real-time data to modify lesson delivery based on individual student progress, ensuring learners receive appropriate challenges and support (Zawacki-Richter et al., 2019). For instance, China's **Squirrel AI Learning** employs AI-driven analytics to break subjects into fine-grained concepts and continuously refine lesson plans as more students interact with the system (Mehta, 2024).

Personalized learning extends beyond adaptive platforms to curriculum differentiation, where AI recommends study materials and assignments tailored to students' learning styles and preferences, thereby improving their retention and engagement (George & Wooden, 2023). Adaptive e-learning environments enhance personalized instruction by modifying content sequencing, assessment formats, and interactive learning activities to optimize educational outcomes (Gligorea, 2023). AI also facilitates competency-based learning by tracking students' mastery of specific skills and providing targeted interventions. However, AI-driven personalized learning faces several challenges. Alam et al. (2024) argued that while AI in education (AIEd) technologies have been used to personalize student learning tasks, they remain experimental. Major challenges include a lack of supportive learning resources and ethical concerns related to privacy, bias, safety, and security. Ethical considerations are particularly pressing, as AI-driven learning environments collect vast amounts of student data, raising questions about data ownership, informed consent, and potential biases in AI-driven recommendations (Son & Ružić, 2023).

Moreover, AI-driven tools, such as chatbots and interactive digital textbooks, have proven valuable in facilitating language learning and communication skills through ongoing dialogue with AI-based virtual tutors. However, the effectiveness of these tools depends on the availability of high-quality training datasets and contextually relevant learning materials, particularly in multilingual and culturally diverse learning environments (Hussein, 2024). Hussein (2024) further emphasizes that the fusion of adaptive learning with advanced technologies presents a promising future for education. Artificial intelligence not only enhances personalization but also introduces innovative pedagogical approaches that can significantly improve educational outcomes, setting the stage for a more responsive and effective educational framework. Traditional educational models often adopt a "one-size-fits-all" approach that fails to accommodate diverse learning styles and paces among students. This can lead to disengagement and reduced academic performance. However, incorporating AI into personalized learning allows educators to design customized learning pathways that align with students' unique needs, ultimately fostering greater engagement and motivation (Hussein et al., 2024).

AI's Role in Student Motivation and Engagement

Another critical aspect of AI's role in education is its impact on student motivation and engagement. AI-powered learning environments integrate gamification, interactive simulations, and real-time feedback mechanisms, all of which enhance students' participation and knowledge retention. Research suggests that AI-driven engagement tools, such as Quizlet and Duolingo, increase motivation by making learning interactive and rewarding (Quizlet, 2023). These tools incorporate features, such as achievement badges, progress tracking, and adaptive challenges, which have been found to enhance intrinsic motivation and self-efficacy in learners (Liu et al., 2023).

In addition, AI promotes self-regulated learning by enabling students to track their progress, set personalized goals, and receive tailored learning recommendations, thereby fostering independent learning habits. AI-driven platforms empower students to take control of their educational journey by providing real-time insights into student strengths and areas for improvement. This shift towards student-centered learning is particularly relevant in online and blended learning environments, where the lack of direct instructor presence can sometimes lead to decreased engagement (Son & Ružić, 2023). Despite these benefits, critical debates remain surrounding the long-term effects of AI-driven motivation strategies. Some researchers argue that over-reliance on AI for engagement may reduce intrinsic motivation as students may become too dependent on external reinforcement mechanisms (Liu et al., 2023). Additionally, the effectiveness of AI-driven engagement varies across cultural and educational contexts, requiring further research to understand how AI tools can be adapted to diverse learning populations.

In summary, AI has demonstrated significant potential for personalized learning, competency-based education, and student engagement. Its ability to analyze real-time learning data, adapt instructional strategies, and provide instant feedback makes it a powerful tool in modern education. However, challenges such as accessibility, ethical concerns, and integration into traditional curricula must be addressed to ensure equitable and effective AI-driven learning experiences. As AI technology evolves, educational institutions must balance technological advancements with pedagogical best practices to harness AI's full potential in transforming education.

Theoretical Framework

Integrating AI into university teaching is a transformative process that requires a robust theoretical foundation to understand its adoption, implementation, and impact on pedagogy. This study is grounded in two key theories: the Technological Pedagogical Content Knowledge (TPACK) theory (Mishra & Koehler, 2006) and the Diffusion of Innovation (DOI) theory (Rogers, 2003). These theories provide a comprehensive framework for examining how AI is adopted by university faculty, the pedagogical shifts it necessitates, and the institutional factors that influence its implementation.

Mishra and Koehler (2006) developed the TPACK framework to describe the complex interplay between technology, pedagogy, and content in teaching. The model identifies three core knowledge domains: the ability to use AI tools, such as intelligent tutoring systems, chatbots, and adaptive learning platforms, and understanding effective teaching strategies and instructional methods that leverage AI and subject-specific expertise that AI-driven platforms should enhance rather than replace.

The TPACK framework is particularly relevant to this study because it highlights the need for educators to develop competencies that effectively integrate AI into teaching without compromising content accuracy or pedagogical quality (Mishra & Koehler, 2006). In the Kenyan context, universities face challenges related to faculty readiness, digital literacy, and infrastructure, which may impact how AI can be integrated meaningfully into university curricula. By applying the TPACK framework, this study sought to assess how well Kenyan university lecturers balance these three knowledge domains in AI-integrated classrooms.

Rogers's (2003) Diffusion of Innovation (DOI) Theory outlines how organizations adopt new technologies, including AI. This theory categorizes adopters into five groups: (1) Innovators—those who are the first to experiment with emerging technologies in education; (2) Early Adopters- faculty members who see the potential of AI and incorporate it into their teaching methods; (3) Early Majority – educators who begin to use AI after witnessing its successful application; (3) Late Majority- individuals who start using AI as a result of institutional policies or peer pressure; (4) Laggards- faculty who resist

adopting AI due to skepticism, limited skills, or inadequate infrastructure limitations.

The DOI model outlines key factors influencing AI adoption, including relative advantage (perceived benefits), compatibility (alignment with existing teaching methods), complexity (ease of use), trial ability (opportunity to test AI tools), and observability (visibility of AI benefits to peers) (Rogers, 2003). In the Kenyan higher education sector, AI adoption is influenced by factors such as institutional support, faculty digital literacy, internet accessibility, and policy frameworks.

Both theories complement each other in understanding the adoption of AI in university teaching. While TPACK explains how lecturers integrate AI into their teaching practice, DOI provides insights into adoption patterns and barriers within university settings. By integrating TPACK and DOI, this study offers a theoretical foundation to evaluate the challenges and opportunities of AI in higher education.

Methodology

This study employed a quantitative descriptive research design. Data were collected through self-administered questionnaires distributed to students at four selected universities: Kisii University, Kabianga University, the University of Nairobi, and Masinde Muliro University. To enhance accessibility and efficiency, the questionnaires were delivered online via Google Forms. An informed consent form was provided along with the questionnaire, allowing participants to voluntarily decide whether to participate in the study. Confidentiality was ensured by anonymizing responses, thereby protecting sensitive personal information.

The questionnaire focused on three key areas: AI-driven tools in teaching, AI in personalized learning, adaptive instructional strategies, and satisfaction and motivation in utilizing integrated AI tools. Following best practices in educational research, the instrument was developed in alignment with existing frameworks on AI integration in higher education, ensuring uniform data collection and facilitating a comparative analysis across responses. Once data collection was completed, the dataset was cleaned and prepared for analysis. This involved removing duplicate entries, handling excessive missing data, checking for inconsistencies, standardizing data formatting, and detecting and correcting outliers.

A pre-test was conducted using the test-retest method to assess the reliability of the research instrument. After a two-week interval, 80% of the participants achieved consistent scores across both test administrations, confirming the instrument's reliability. The content validity of the instrument was established through an expert review, ensuring that all relevant aspects of the subject matter were covered. Criterion validity was assessed through concurrent validity, which involved comparing the instrument's results with existing measures, and predictive validity, which evaluated the instrument's ability to forecast future outcomes. The collected data were analyzed with descriptive statistics.

Results

The study targeted second-year students sampled from Kisii University, Masinde Muliro University, the University of Nairobi, and Kabianga University. These institutions were selected from 35 chartered public universities in the country to ensure a representative sample. A total of 384 questionnaires were distributed to potential participants using Google Forms. Of these, 186 were received, yielding a response rate of approximately 48.4%. After data cleaning to ensure completeness and accuracy, 156 responses were deemed valid and included in the final analysis. The results of the study were arranged in accordance with the following objectives:

The extent to which AI-driven Tools are Utilized in University Teaching

Artificial Intelligence engagement features have greatly transformed educational and training environments through a variety of innovative

tools. AI-powered interactive exercises provide dynamic, hands-on experiences that adapt in real-time to the learner's progress, ensuring a more engaging and effective learning process. Gamification elements such as points, badges, and leaderboards, are seamlessly integrated to motivate users by turning learning activities into interactive games.

AI integration also provides instant feedback through AI algorithms, allowing learners to receive immediate responses to their actions, helping them understand mistakes, and reinforcing correct concepts promptly. Furthermore, adaptive learning paths leverage AI to tailor educational content to individual needs, creating personalized learning journeys that evolve based on performance and preferences. Together, these features enhance engagement and promote deeper learning, making the educational experience enjoyable and effective. Table 1 shows the frequency distribution of respondents according to AI engagement features.

Table 1
AI Engaging Features

Engaging Feature	Frequency	Percent
Instant Feedback	60	38.5
Interactive Exercises	42	26.9
Adaptive Elements	42	26.9
Gamification Elements	12	7.7
Total	156	100

Table 1 shows that among the AI features, instant feedback was voted by 60 (38.5%) as the most engaging feature, followed by adaptive elements and interactive exercises (26.9% each). Gamification elements were the least engaging (7.7%). This is likely because most university students may not be familiar with the terminology and view these elements as suitable only for toddlers and children.

Several factors are responsible for the increased adoption of AI-integrated tools. First, this is due to the ease of use as well as their intuitive design, as they reduce the learning curve and encourage users to engage with the feature. Second, communicating the tool's benefits and how it can solve specific problems enhances its appeal. Third, providing ample support and resources such as tutorials and customer service, builds user confidence. In addition, integration with existing workflows and systems ensures seamless use. Lastly, positive testimonials and case studies can validate the tool's effectiveness, driving further adoption through social proof and trust. Table 2 shows the rate at which learners used the AI-based integrated learning tool.

Table 2
The Frequency with which Learners Use AI-Integrated Learning Tools

Frequency of AI Use	Frequency	Percent
1. Very Often (Once daily)	42	26.9
2. Often (two or three times a week)	24	15.4
3. Fairly Often (Once a week)	42	26.9
4. Rarely (Once for more than two weeks)	48	30.8
Total	156	

Table 2 indicates the rate at which learners used the AI-based integrated learning tool. Of the 156 respondents, 48 (30.8%) rarely reported using the AI-integrated learning tool, compared to 42 (26.9%) who reported using it once a week. In contrast, 24 (15.4%) respondents reported using the AI-integrated learning tool two to three times a week, and 42(26.9%) reported using the tool daily.

Most teachers rarely use AI-integrated tools because they have many responsibilities and do not have the time to learn more about and experiment with AI, which experts say is crucial to getting teachers comfortable with technology (Klein, 2024). Another likely reason is that teachers are unfamiliar with how to use AI tools.

How well do AI-integrated learning tools personalize Learning Content?

AI-integrated learning tools personalize content by analyzing learners' progress, strengths, and weaknesses. They perform this using a data-driven algorithm that adjusts difficulty levels, suggests relevant materials, and offers adaptive feedback. AI Personalizes learning content by using AI to track performance and adjust lessons in real-time. The tool provides simpler explanations or extra practice if a student struggles with a concept. If they excel, they move on to more advanced topics. Based on the learning style and pace, AI suggests resources such as videos, quizzes, or reading materials tailored to the individual. In addition, AI tools provide instant corrections and guidance to help students improve rapidly. Some tools use Natural Language Processing (NLP) to refine explanations and interact conversationally, making complex topics easier to understand. Finally, AI is good at monitoring engagement levels and modifying content delivery (e.g., gamification and interactive exercises) to motivate learners.

However, the effectiveness of AI depends on its sophistication and the quality of data available. Advanced AI tools, such as those used in platforms like Duolingo, Khan Academy, or Coursera, demonstrate high levels of personalization. Personalization becomes less effective when AI lacks user data or relies on generic algorithms. Table 3 shows how often respondents interact with AI tools.

Table 3
Respondents' Interaction with AI Tools

Interaction with AI Tools	Frequency	Percent
1. Very Often (Once daily)	42	26.9
2. Often (two or three times a week)	24	15.4
3. Fairly Often (Once a week)	42	26.9
4. Rarely (Once for more than two weeks)	48	30.8
Total	156	100

Table 3 shows that less than half (42.3%) of the respondents interact with AI-integrated learning tools between once daily and fewer than three times a week. Several factors must be considered to appreciate the effectiveness of AI-integrated learning tools in personalizing learning content. First, it is important to understand how well AI understands the user. AI tools analyze your learning style, pace, and knowledge gaps based on your interactions. The more data you provide (e.g., quiz responses and time spent on lessons), the better it adapts. In certain cases, some tools offer adaptive learning paths, adjusting content difficulty based on progress. Others use recommendation algorithms to suggest resources (videos, exercises, articles) tailored to your needs. The advantage of AI is that if you engage consistently, AI can fine-tune its recommendations to your strengths and weaknesses. Tools with real-time feedback (like Grammarly or Duolingo) help reinforce learning by correcting mistakes instantly.

However, if an AI tool lacks deep personalization settings, it may not fully align with your preferences. Some tools rely on generalized learning models, which may not effectively address niche or advanced topics. Table 4 shows the level of agreement or disagreement with the idea that the AI-integrated learning tool personalizes the content to meet learning needs.

Table 4

AI-integrated Learning Tool Personalization

Level of Agreement	Frequency	Percent
Strongly Agree	66	42%
Agree	72	46.2%
Neutral	18	11.5%
Total	156	100

Table 4 shows how well the AI-integrated learning tool personalizes content to meet learning needs. The majority of learners (46.2%) agree that the AI-integrated learning tool personalizes the content to their learning needs, 42.3% strongly agree, and only 11.5% of the respondents remained neutral, unable to say whether the AI-integrated learning tool personalizes the content to their learning needs.

AI-integrated learning tools are designed to identify and analyze a learner's strengths and weaknesses through various data-driven techniques. This is achieved through performance tracking quiz scores, completion times, and accuracy. It compares a learner's progress over time to observe learning patterns. Some AI tools use dynamic testing, in which the difficulty of the question changes based on the response. A more difficult question will follow if the learner gives the correct answer.

At the same time, AI detects common mistakes and provides personalized feedback to correct them. Tools like Grammarly or coding platforms highlight problem areas rather than simply marking answers incorrectly. AI also monitors how much time one spends on certain topics and where there is hesitancy or skipping. Disengagement may suggest different learning formats (videos, interactive exercises, and gamification).

Artificial intelligence relies on data input; therefore, personalization may be limited if a learner does not engage enough or provides inconsistent answers. In addition, some AI tools may not understand conceptual struggles as effectively as human tutors. Table 5 shows respondents' opinions regarding whether AI-integrated learning tools understand the learner's strengths and weaknesses.

Table 5

AI-integrated Learning Tool Understanding

Level of Agreement	Frequency	Percent
Disagree	6	3.8
Neutral	54	34.6
Agree	48	30.8
Strongly Agree	48	30.8
Total	156	100.0

Table 5 indicates that a small proportion of learners (3.8%), think that the AI-integrated learning tool does not understand a learner's strengths and weaknesses. In contrast, 34.6% of learners did not decide whether the tool understood the learner's strengths and weaknesses. However, many of the learners 61.6% aligned themselves with agreeing or strongly agreeing that the AI-integrated tools understand learners' strengths and weaknesses. This study supports studies postulating that AI-integrated tools understand learners' strengths and weaknesses.

AI interrelated Learner Motivation Levels over Traditional Learning Methods

Understanding learners' strengths and weaknesses is crucial for effective education and skill development. This is because personalized learning tailors instruction to meet individual needs, helps learners progress at their own pace, and reinforces strengths while addressing their weaknesses. Recognizing strengths builds self-esteem and encourages continued effort while addressing weaknesses proactively prevents discouragement and helps learners set realistic goals and track progress. Identifying gaps in knowledge and providing targeted support will likely reduce frustration by preventing content and encouraging mastery through focused

practice. In addition, identifying gaps will result in efficient use of time and resources. This is through avoiding unnecessary repetition of mastered concepts, focusing time and resources on areas of improvement, and enabling educators to provide more meaningful support. Table 6 shows the extent to which learners are satisfied.

Table 6
Level of Learner Satisfaction

Level of Agreement	Frequency	Percent
1. Neutral	18	11.5
2. Agree	108	69.2
3. Strongly Agree	30	19.2
Total	156	100

Table 6 shows that 30(19.2%) strongly agree that the AI-integrated learning tool understand their strengths and weaknesses while 108(69.2%) agree and feel that they agree. However, 18(11.5%) have lesser confidence in the AI-integrated learning tool understanding strengths and weaknesses.

Table 7
Learner Satisfaction

Level of Agreement	Frequency	Percent
1. Strongly Agree	6	3.8
2. Agree	18	11.5
3. Disagree	80	51.3
4. Strongly disagree	52	33.3
Total	156	100

Table 7 shows that majority of the respondents tended to disagree with the notion that AI-integrated learning tool understands learner's strengths and weaknesses. Only 6(3.8%) reported strongly being in agreement that AI-integrated learning tool understand learner's strengths and weaknesses. Similarly, only 18(11.5%) reported to agree that AI-integrated learning tools understand to learners' strengths and weaknesses. Conversely, majority of the respondents tended to disagree, with 80(51.3) disagreeing while 52(33.3%) strongly disagreeing.

Research suggests that AI-driven engagement tools, such as Quizlet and Duolingo, increase motivation by making learning interactive and rewarding (Quizlet, 2023). Motivation plays a crucial role in the learning process, acting as the driving force that fuels our desire to acquire new knowledge and skills. It can be intrinsic, stemming from an individual's personal interests and goals, or extrinsic, influenced by external rewards or pressures. A motivated learner is more likely to engage deeply with the material, persist through challenges, and achieve higher levels of understanding. Teachers and educators can enhance motivation by creating a supportive learning environment, offering meaningful feedback, and connecting the content to real-world applications. Ultimately, motivation not only enhances the learning experience but also fosters lifelong curiosity and growth. Table 3 displays the results of the analysis on motivation between AI features compared to traditional methods.

Discussion

This study found that gamification elements were the least engaging AI learning tool. In contrast, an earlier study by Quizlet (2023) highlighted gamification as a key component of AI-powered learning environments that integrate interactive simulations and real-time feedback to enhance student engagement. This discrepancy suggests that, while gamification is generally recognized as an effective engagement tool, its perceived impact may vary based on context, implementation, or learner preferences. This contrast indicates that design, subject matter, and user familiarity with gamification can influence its effectiveness in different educational settings.

This study found that instant feedback was the most engaging feature. Previous studies by Schmid et al. (2020) revealed that AI integration provides instant feedback through AI algorithms, allowing learners to receive immediate responses

to their actions, helping them understand mistakes, and reinforcing correct concepts promptly. Furthermore, adaptive learning paths leverage AI to tailor educational content to individual needs, creating personalized learning journeys that evolve based on performance and preferences. Together, these features enhance engagement and promote deeper learning, making the educational experience more enjoyable and effective.

AI integration provides immediate feedback through algorithms, helping learners recognize mistakes and reinforce correct concepts quickly. Additionally, AI-driven adaptive learning personalizes education by adjusting content according to individual needs, ensuring a more tailored and evolving learning experience. AI-powered features enhance engagement, promote deeper learning, and make education more effective and enjoyable.

AI-integrated learning tool personalizes content according to learning needs. The majority of the respondents agreed that AI-integrated learning tools personalize the content to their learning needs.This finding agrees with studies by Jian and Kadaruddin, which showed that AI systems can modify content delivery to match students' strengths and limitations (Jian, 2023; Kadaruddin, 2023).

The current study shows that most respondents tended to disagree that the AI-integrated learning tool understands learners' strengths and weaknesses. These results disagree with previous research showing that AI-driven engagement tools, such as Quizlet and Duolingo, increase motivation by making learning interactive and rewarding (Quizlet, 2023).

Conclusion

The study concluded that the most engaging features of AI-integrated learning tools are instant feedback, adaptive elements, and interactive exercises, while gamification elements are less common in driving engagement. Although some learners found the AI-integrated tool less interactive than traditional methods, the tool's ease of use and intuitive design emerged as key factors in encouraging adoption. The effectiveness of various learning environments—whether in-person, online, or blended—largely depends on individual learner preferences, the subject matter, and the quality of support and educational materials provided. Most learners prefer in-person learning over blended or online formats, citing better learning experiences. Additionally, many learners feel that the AI-integrated tool effectively recognized and adapted to their individual strengths and weaknesses, enhancing their overall learning experience.

Recommendations

To enhance the impact of AI-powered personalization in education, institutions should increase the frequency of personalized recommendations for all learners, particularly those receiving fewer interactions. It is important to evaluate the effectiveness of these recommendations to ensure they align with individual learning goals and preferences.

Promoting equity by addressing barriers such as limited access to technology and tailoring systems to diverse learner needs is also essential. Leveraging data insights to refine adaptive algorithms can optimize the personalization process while promoting the broader adoption of AI tools across courses will expand their benefits. Lastly, monitoring long-term outcomes will help guide future AI integration efforts in education.

Limitations of the Study

This study has several limitations that should be acknowledged. First, its findings may have limited generalizability, as the research may have been conducted within a specific institution or region, making it less applicable to other educational contexts. Additionally, the reliance on self-reported data introduces the possibility of response bias, where participants may not provide entirely accurate or objective feedback. The study also primarily captures short-term perceptions and engagement, without assessing

the long-term effects of AI-integrated tools on academic performance or learning retention.

Variability in the quality and features of AI tools used by different learners may also influence results, making it difficult to draw uniform conclusions. Furthermore, the absence of a control group using traditional methods limits the ability to attribute observed benefits solely to AI integration. The participant sample may lack diversity in terms of academic background, digital literacy, or field of study, which could affect the representativeness of the findings. Given the fast-paced development of AI technologies, some findings may quickly become outdated as more advanced tools emerge. Finally, the study's reliance on quantitative data may limit deeper insights into learners' experiences, which qualitative approaches could better capture**.**

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