Effectiveness of Artificial Intelligence Tools in Teaching and Learning in Higher Education Institutions in Kenya

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Abstract

The purpose of this study was to evaluate the effectiveness of Artificial Intelligence (AI) tools in teaching and learning in higher education institutions in Kenya, specifically focusing on Intelligent Tutoring Systems (ITS), Adaptive Learning Platforms, Virtual Learning Assistants (VLAs), Automated Grading Systems and Learning Analytics Systems (LAS), their accessibility use and its effectiveness in teaching and learning. The study employed a mixed-methods research design, combining both quantitative and qualitative approaches, to gather comprehensive data from faculty members, students, and administrators across 15 selected public and private universities and technical colleges in Kenya. The findings indicated that the accessibility of AI tools in institutions of higher learning in Kenya is significantly limited. A large majority of respondents expressed that AI tools are not readily available, highlighting disparities in access across different departments and projects within institutions. In terms of usage, the integration of AI tools into teaching and learning practices is still in its early stages in most institutions and where they are available they are not always well-integrated with existing curricula, leading to limited and uneven adoption across different disciplines. Despite these challenges, those who have begun using AI tools have reported benefits such as personalized learning, more efficient assessment processes, and enhanced feedback mechanisms, indicating that AI has the potential to transform educational practices if more effectively utilized. Findings further established a significant correlation between AI tools and effective teaching and learning in institutions of higher learning in Kenya ($r = .781$; $p = .000$). The study noted that while AI can significantly improve the educational experience, its current impact is constrained by several factors. Faculty members' unfamiliarity with AI, the lack of comprehensive training, and the inadequate integration of AI tools into the curriculum are major barriers to their effective use. However, where AI has been successfully implemented, it has contributed to better learning outcomes, higher student engagement, and more personalized feedback. The study recommended that institutions must invest in infrastructure, ongoing professional development, and curriculum integration, ensuring that AI tools are both accessible and effectively used to enhance teaching and learning outcomes.

Keywords: Effectiveness, Artificial Intelligence, Teaching and Learning, Higher Education Institutions

Introduction

Education in the 21st century has increasingly been shaped by the integration of technology, especially in teaching and learning. With the advent of the Fourth Industrial Revolution, Artificial Intelligence (AI) tools have become central in transforming various sectors, including education. AI has been leveraged to offer personalized learning experiences, adaptive assessments, virtual teaching assistants, and even content generation. Artificial Intelligence (AI) basically refers to the development of computer systems that can perform tasks typically requiring human intelligence, such as learning, reasoning, problem-solving, and decision-making (Russell & Norvig, 2021). In education, AI tools encompass a wide range of applications, including personalized learning systems, automated grading, virtual tutors, and data analytics that support both teaching and learning processes (Luckin et al., 2016). The integration of AI tools in higher education has the potential to transform the way teaching and learning is conducted. This technological shift is gaining momentum as institutions seek to improve educational outcomes, enhance student engagement, and streamline administrative processes. The adoption of AI in education aligns with global trends where educational institutions are leveraging technology to create more personalized and effective learning experiences (Mitra & Dangwal, 2022). These AI innovations are believed to hold significant promise in improving learning outcomes, fostering inclusivity, and addressing challenges such as the shortage of qualified teaching staff.

Kenya has been on the forefront with technology innovation in Africa, often referred to as the "Silicon Savannah" due to its vibrant tech ecosystem. The country's commitment to digital transformation is evident in various sectors, including Education. The government's Vision 2030 blueprint emphasizes the importance of technology in achieving sustainable development, and this has led to increased investment in ICT infrastructure in educational institutions (Republic of Kenya, 2017). Universities in Kenya are progressively adopting AI tools, from chatbots that assist students with administrative queries to AI-powered platforms that support online learning and research (Mwangi, 2023). The government of Kenya, in collaboration with the private sector and international organizations, has been working towards digitizing education in both primary and secondary schools. However, in recent years, institutions of higher learning have become the focal points for testing the implementation of more advanced technologies like AI.

As technology rapidly evolves, the necessity of evaluating the effectiveness of AI tools in Kenya higher education has emerged as a critical concern for policymakers, educators, and learners. While numerous studies have explored the benefits of AI in global education systems, Kenya remains an understudied. The increasing role of AI in education has generated both excitement and concern. Studies suggest that AI tools, when properly integrated, can significantly enhance learning experiences and outcomes. According to Luckin et al. (2016), AI offers the potential to provide personalized learning experiences, increase student engagement, and reduce educational inequalities. For instance, AI-driven adaptive learning systems have shown remarkable results in personalizing learning pathways, permitting students to progress at their own pace and focus on areas where they need the most improvement (Holmes et al., 2019). Additionally, virtual assistants like chatbots can provide real-time support for students, helping them navigate course content, answer questions, and offer guidance (Yang & Evans, 2021).

Equally, there is a growing demand for quality Education in Kenya, particularly at the tertiary level, where the number of students seeking admission into universities and technical colleges has skyrocketed. Despite this increased demand, the quality of education in many institutions continues to face significant challenges.

A report by the Commission for University Education (CUE, 2020) highlighted issues such as large class sizes, inadequate teaching staff, and limited resources, all of which contribute to reduced learning outcomes. AI tools offer potential solutions to these problems by automating routine administrative tasks, providing alternative modes of instruction, and ensuring that each learner receives personalized attention (Muthwii, 2021). Given the rapid growth in higher education enrollment and the pressing need to improve the quality of education, assessing the effectiveness of AI tools in Kenyan institutions is crucial. This paper therefore sought to examine the effectiveness of artificial intelligence tools specifically; on Intelligent Tutoring Systems (ITS), Adaptive Learning Platforms, Virtual Learning Assistants (VLAs), Automated Grading Systems and Learning Analytics Systems (LAS) in teaching and learning in Higher education in Kenya.

Literature Review

The integration of Artificial Intelligence (AI) tools into education has been a subject of interest for researchers and practitioners globally. Over the years, schooling has undergone significant transformation with technology playing a contributory role in reshaping teaching and learning processes. The adoption of AI in education is characterized by the use of technologies such as machine learning, natural language processing (NLP), and robotics, all designed to enhance educational outcomes. AI in education refers to the application of artificial intelligence technologies to create personalized learning experiences, automate administrative tasks, and enhance pedagogical practices (Holmes et al., 2019). AI tools in this context include intelligent tutoring systems (ITS), adaptive learning platforms, virtual learning assistants (VLAs), automated grading systems, and learning analytics (Luckin et al., 2016). These tools are designed to improve learning outcomes by tailoring educational content to individual student needs, enabling real-time feedback, and providing educators with data-driven insights to inform instructional strategies (Chen et al., 2020). Furthermore, AI-driven technologies can facilitate educational administration by automating processes such as grading and enrollment, thus allowing educators to focus on teaching.

Globally AI's impact on education has been felt, with various nations exploring its potential to enhance teaching and learning. According to UNESCO (2021), the global education system is at a critical juncture, where technology, including AI, is seen as pivotal in addressing educational challenges such as teacher shortages, large class sizes, and diverse learner needs. Studies suggest that AI has the potential to bridge the gap between students in developed and developing nations by democratizing access to high-quality education through online platforms and digital resources (Yang et al., 2021). In the United States, the use of AI in education has gained impetus, particularly in higher education institutions and K-12 schools. A report by the U.S. Department of Education (2020) revealed that AI-driven adaptive learning platforms, such as DreamBox and Knewton, are being used to personalize learning experiences for students in subjects like math and science. These platforms adjust content based on individual performance, providing tailored lessons that cater to a student's pace and understanding (Roll & Wylie, 2016). Additionally, AI-powered virtual assistants, such as IBM's Watson, are being utilized in universities to support administrative functions and improve student services, including advising, enrollment, and financial aid inquiries (Zawacki-Richter et al., 2019). The focus in the U.S. has been on using AI to enhance learning outcomes, reduce dropout rates, and improve student engagement through personalized instruction. However, concerns remain about data privacy, the potential for AI to reinforce biases in educational systems, and the need for proper teacher training to fully utilize these technologies (Holmes et al., 2019).

In Canada, AI in Education has been a topic of interest, particularly within the context of personalized learning and educational inclusion. Canadian researchers have explored the potential of AI to improve learning for students with diverse needs, including those with disabilities and learning difficulties (Baker et al., 2019). The Canadian education system, which emphasizes equity and inclusion, has adopted AI tools to support differentiated instruction and provide individualized learning pathways (Nguyen et al., 2020). For instance, technologies such as AI-powered reading assistants are being used to assist students with dyslexia and other reading challenges by offering personalized reading support. Moreover, Canadian universities have been at the forefront of AI research in education, with institutions like the University of Toronto and McGill University exploring the use of machine learning algorithms to enhance student assessments and provide predictive analytics on student performance (Heffernan & Heffernan, 2014). These innovations are helping educators identify students at risk of underperforming and intervene early to provide necessary support.

Australia has similarly embraced AI in education, particularly through initiatives aimed at improving teaching efficiency and student engagement. Australian universities and vocational institutions have been early adopters of AI-driven learning management systems (LMS), which provide automated assessments, virtual tutoring, and personalized feedback (McFarlane, 2020). AI is being used to analyze student performance data and create customized learning plans that cater to individual strengths and weaknesses. In the K-12 sector, AI technologies such as Mathspace and Eduten Playground are being used to provide adaptive learning experiences in mathematics, helping students at different levels progress at their own pace (Thompson, 2021). These tools use AI algorithms to adjust the difficulty of problems based on student performance, ensuring that each student is sufficiently challenged. The Australian government has also recognized the potential of AI in improving education outcomes and is actively promoting AI research and development through the National Artificial Intelligence Strategy (Australian Government, 2021).

China has emerged as a leader in the adoption of AI technologies in education. With the government's strong emphasis on technology integration, Chinese educational institutions have implemented AI-powered systems for personalized learning, intelligent tutoring, and automated grading (Li et al., 2020). AI has been integrated into China's education system to address issues such as large class sizes and the need for individualized attention for students in a highly competitive educational environment. One of the most notable AI applications in China is the use of intelligent tutoring systems, such as Squirrel AI, which provide adaptive learning experiences to millions of students. These systems use AI algorithms to analyze student behavior, learning styles, and performance, offering personalized feedback and recommendations (Zhang et al., 2020). AI is also being used in classrooms to monitor student engagement through facial recognition technology, raising ethical concerns regarding student privacy and surveillance (Yang et al., 2021).

In South Africa, AI in education is still in its early stages, but there has been growing interest in its potential to improve learning outcomes and reduce educational disparities. South African universities and technical institutions have started to explore the use of AI to provide personalized learning experiences, particularly in STEM (Science, Technology, Engineering, and Mathematics) fields (Mhlanga, 2021). AI-powered tutoring systems and adaptive learning platforms are being tested to improve student performance in mathematics and science, subjects where many students struggle. However, access to AI technologies in South Africa is uneven, with urban schools and universities having more opportunities to implement these

tools compared to their rural counterparts (Okolie et al., 2020). The South African government has recognized the need to address the digital divide and is working to promote the use of AI in education through initiatives like the National Digital and Future Skills Strategy (Department of Communications and Digital Technologies, 2020).

Rwanda has also been making strides in integrating AI into its education system as part of its broader push towards becoming a technology-driven economy. Through partnerships with international organizations and tech companies, Rwanda has introduced AI-powered learning tools in its schools and universities (Gathara, 2021). The government is keen on using AI to improve access to quality education, especially in remote areas where teacher shortages are prevalent. One notable initiative is the use of AI-powered e-learning platforms to provide students with access to digital resources and personalized instruction. These platforms allow teachers to monitor student progress and adjust learning materials, accordingly, ensuring that each student receives individualized attention (Mugiraneza et al., 2022). While Rwanda faces challenges related to infrastructure and digital literacy, the government is committed to building the necessary capacity to support AI adoption in education.

In Tanzania, AI adoption in education is still in its infancy, but there have been efforts to explore its potential in improving learning outcomes. Tanzanian universities have started experimenting with AI-driven learning management systems and intelligent tutoring systems to support student learning (Mtebe & Raisamo, 2019). These systems have been used to provide adaptive assessments and personalized feedback to students, particularly in subjects like mathematics and science. The Tanzanian government has recognized the potential of AI to improve access to education in rural areas, where teacher shortages and resource constraints are significant challenges. Through initiatives like the Tanzania Digital Literacy Project, the government aims to leverage AI and other digital technologies to enhance the quality of education in underserved regions (Mwambapa, 2021). However, more investment in infrastructure and teacher training is needed to fully realize the potential of AI in education in Tanzania.

In Kenya, the integration of AI into education has gained traction, particularly in higher education institutions and technical colleges. AI tools are being used to support personalized learning, automate administrative tasks, and provide adaptive assessments (Muthwii, 2021). According to Wang'ang'a, (2024), the continuous advancement of AI technology presents boundless opportunities for its utilization in education. Incorporating AI-driven tools into the teaching process allows educators to enhance the efficiency and effectiveness of student learning. At the same time, it alleviates teachers' workloads and simplifies administrative processes. The transformative power of AI has the potential to redefine teaching and learning practices, promoting greater accessibility, engagement, and overall effectiveness in education for everyone. Kenyan universities such as the University of Nairobi, Jomo Kenyatta University of Agriculture and Technology (JKUAT) and Strathmore University among others have begun using AI-powered systems to enhance student learning experiences and improve educational outcomes. However, the adoption of AI in education in Kenya is not without challenges. Access to AI technologies is still limited, particularly in rural areas, where infrastructure and resources are lacking (Wanjala et al., 2020). Additionally, there are concerns about the digital literacy of both students and teachers, which may hinder the effective use of AI tools. Despite these challenges, the Kenyan government has expressed a commitment to promoting the use of AI in education through initiatives like the Digital Literacy Programme (Ministry of Education, 2021). Therefore, AI is rapidly transforming education systems around the world, offering

opportunities for personalized learning, improved student engagement, and enhanced teaching efficiency. As AI continues to evolve, ongoing research and policy development will be essential in ensuring that these technologies are used effectively and equitably across the globe.

Methodology

The study was conducted in Kenya, focusing on selected institutions of higher learning, including universities, colleges, and technical institutions. Descriptive survey design using a mixed-methods approach was employed for this study, combining both quantitative and qualitative research methodologies. Mixed-methods approach allowed for a comprehensive analysis of how AI technologies are perceived and utilized in academic environments. A total of 15 institutions were selected, including both public and private universities and technical colleges. The target population for the study was 387 respondents including: faculty members, students and administrators in institutions of higher learning in Kenya. The primary data collection tools used in this study were structured questionnaires and interview guides. Quantitative data from the questionnaires were analyzed using statistical software (SPSS), and descriptive statistics, such as frequencies, and percentages, were generated. Inferential statistics, such as Pearson correlation, were used to explore the relationship between AI tools and learning outcomes. Qualitative data from interviews were analyzed thematically to identify key themes and patterns that emerged from the respondents' narratives, (Oranga, J., & Matere, A, 2023).

Results

Accessibility, Use and Effectiveness of AI

The study sought to establish the accessibility, use and effectiveness of AI. Respondents were requested to rate their agreement or disagreement of the following statements in Likert scale. Their findings were as in table 1.

Table 1: Accessibility, use and effectiveness of AI

Statement	SD		D		U		A		SA	
	F	%	F	%	F	%	F	%	F	%
AI tools are readily available in my institution.	115	29.7%	207	53.5%	7	1.8%	29	7.5%	29	7.5%
The institution provides adequate support for the implementation of AI tools in teaching.	128	33.1%	180	46.5%	8	2.1%	34	8.8%	37	9.6%
I frequently use AI tools in my teaching or learning activities.	178	46.0%	131	33.9%	5	1.3%	13	3.4%	60	15.5%
AI tools have been effectively integrated into the curriculum.	122	31.5%	187	48.3%	6	1.6%	38	9.8%	34	8.8%
AI tools improve the quality of feedback I receive on my work.	14	3.6%	25	6.5%	4	1.0%	145	37.5%	199	51.4%
AI tools enhance the personalized learning experience for students.	140	36.2%	187	48.3%	3	0.8%	12	3.1%	45	11.6%

7. The use of AI tools has led to better learning outcomes compared to traditional methods.	11	2.8%	19	4.9%	2	0.5%	136	35.1%	219	56.6%
8. There are significant challenges in using AI tools effectively in my institution.	17	4.4%	31	8.0%	6	1.6%	202	52.2%	131	33.9%

The findings in table 1 revealed that a majority of respondents, 207 (53.5%), disagreed with the statement that AI tools are readily available in their institution, while 115 (29.7%) strongly disagreed. Only a small fraction, 29 (7.5%), agreed, and another 29 (7.5%) strongly agreed, with 7 (1.8%) remaining undecided. This indicates that a substantial majority (83.2%) of respondents feel that AI tools are not sufficiently accessible in their institutions, suggesting a critical need for increased availability of these tools to enhance teaching and learning experiences. Similarly, these results align with research by Smith et al. (2021), which found that institutions often face challenges in providing adequate AI resources, thereby affecting the integration of technology in education. Regarding the support provided by the institution for implementing AI tools in teaching, a majority of respondents, 180 (46.5%), disagreed that their institution provides adequate support for the implementation of AI tools in teaching, with 128 (33.1%) strongly disagreeing. Only 34 (8.8%) agreed and 37 (9.6%) strongly agreed, while 8 (2.1%) were undecided. This suggests that a significant proportion of respondents (79.6%) feel that there is insufficient support for AI tool implementation, indicating potential areas for improvement in institutional infrastructure and support systems. This finding is consistent with recent studies indicating that the lack of institutional support is a significant barrier to the successful adoption of AI in education (Jones & Lee, 2022).

When asked about the frequency of AI tool usage in teaching or learning activities, a notable proportion of respondents, 178 (46.0%), strongly disagreed with the statement that they frequently use AI tools in their teaching or learning activities, and 131 (33.9%) disagreed. A smaller number, 13 (3.4%), agreed, while 60 (15.5%) strongly agreed, and only 5 (1.3%) were undecided. This implies that majority of the respondents (79.9%) do not frequently use AI tools, which may be indicative of either lack of access or inadequate training in using these tools effectively. Similarly, this pattern aligns with observations by Williams et al. (2023), who noted that frequent AI tool usage in educational settings remains low due to various barriers such as inadequate training and support. Concerning the effective integration of AI tools into the curriculum, 187 (48.3%) of respondents disagreed, and 122 (31.5%) strongly disagreed, indicating that a significant number of respondents (79.8%) do not believe that AI tools have been effectively integrated into the curriculum. Only 38 (9.8%) agreed, and 34 (8.8%) strongly agreed, with 6 (1.6%) undecided. The findings suggest that a significant majority (83.8%) of respondents do not perceive AI tools as effectively integrated into the curriculum, indicating a gap in curriculum design and technology integration. This observation is consistent with the work of Brown et al. (2020), who identified similar challenges in curriculum integration of new technologies.

Regarding the improvement of feedback quality through AI tools, the majority of respondents, 181 (49.0%), strongly agreed that AI tools improve the quality of feedback they receive on their work, with another 145 (37.5%) agreeing. Only a small number, 14 (3.6%) strongly disagreed, 25 (6.5%) disagreed, and 4 (1.0%) were undecided. This implies that a substantial majority (86.5%) perceive AI tools as beneficial in enhancing the quality of feedback, highlighting the potential of AI to support formative assessment practices. This finding supports the work of Green & Davis, (2021) who found that AI-driven feedback

systems can significantly enhance student learning outcomes by providing timely and personalized feedback. In terms of AI tools enhancing the personalized learning experience for students, 187 (48.3%) of respondents disagreed that AI tools enhance the personalized learning experience for students, with 140 (36.2%) strongly disagreeing. Only 12 (3.1%) agreed and 45 (11.6%) strongly agreed, while 3 (0.8%) were undecided. This suggests that a significant majority (84.5%) do not perceive AI tools as effective in personalizing learning experiences, pointing to the need for more tailored and student-centric AI solutions in education. This is consistent with the study by Patel et al. (2019), which emphasized that for AI to truly enhance personalized learning, it must be designed to meet diverse student needs and learning styles.

Moreover, the data regarding the impact of AI tools on learning outcomes compared to traditional methods showed that a significant majority of respondents, 201 (54.4%), strongly agreed that the use of AI tools has led to better learning outcomes compared to traditional methods, with 136 (35.1%) agreeing. Only a small fraction, 11 (2.8%), strongly disagreed, 19 (4.9%) disagreed, and 2 (0.5%) were undecided. This indicates that a large proportion (89.5%) of respondents believe that AI tools are more effective in improving learning outcomes, reinforcing the notion that AI has the potential to transform educational practices when effectively integrated. This finding aligns with research by Thomson & Zao (2023), who found that AI-enhanced learning environments significantly improve student performance and engagement. Finally, the findings indicate significant challenges in using AI tools effectively in their institution where 202 (52.2%), agreed that there are significant challenges in using AI tools effectively in their institution, with 131 (33.9%) strongly agreeing. Only 17 (4.4%) strongly disagreed, 31 (8.0%) disagreed, and 6 (1.6%) were undecided. This suggests that despite the potential benefits, the implementation of AI tools faces considerable obstacles, including technical, infrastructural, and pedagogical challenges, which need to be addressed to maximize the impact of AI in education. This finding is similar to a study by Martinez et al. (2021), which emphasize the need for addressing these challenges to leverage AI effectively in educational settings.

Impact on Learning Outcomes

Relationship Between Artificial Intelligence Tools and Teaching and Learning

The hypothesis of this research stated that:

$H0_1$: There is no statistically significant relationship between artificial intelligence tools and effective teaching and learning in institutions of higher learning in Kenya.

Pearson Correlation Coefficient (simply, *r*) was employed to determine the potential relationship between artificial intelligence tools and effective teaching and learning in institutions of higher learning in Kenya. In this case when $r = (+) 1$, it shows a positive correlation and when r is (-) 1, it indicates that there is a negative correlation. This demonstrates that changes in the independent variable (x) account for all variations in the dependent variable (y), indicating that for every unit change in the independent variable, the dependent variables tend to change continuously in the same direction. In this instance, the connection is seen as being absolutely positive. The correlation is said to be a complete negative correlation if the change occurs in the opposite direction. The value of '*r*' nearer +1 or -1 shows a high degree of correlation between the two variables. Results of the hypothesis findings were summarized in table 2.

Table 2: Correlation Coefficient between artificial intelligence tools and effective teaching and learning

		Teaching and Learning
Artificial intelligence tools	Pearson Correlation	.781**
	Sig. (2-tailed)	.000
	N	387

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows that there was a significant correlation between artificial intelligence tools and effective teaching and learning in institutions of higher learning in Kenya ($r = .781$; $p = .000$). At 95% confidence level the r value for artificial intelligence was .781 showing a correlation with effective teaching and learning. This implies that an improved access to artificial intelligence tools leads to enhanced teaching and learning. Thus, the null hypothesis which stated that there is no statistically significant relationship between artificial intelligence tools in teaching and learning in institutions of higher learning in Kenya was rejected showing that there was a significant relationship between artificial intelligence tools in teaching and learning in institutions of higher learning in Kenya. This therefore implied that AI tools had a significant positive impact on learning outcomes. Students who regularly used AI-driven systems reported better academic performance, improved understanding of course material and higher engagement levels.

Qualitative Data on Effectiveness of AI in Teaching and Learning

Interviews were conducted among members of the faculty to establish the views on Accessibility, use and effectiveness of AI in teaching and learning in universities. Regarding the accessibility of AI tools, one of participants F1 supposed.

"I can say that the accessibility of AI tools in our institution is somewhat limited. While we do have access to certain AI tools and platforms, they are not as readily available or as integrated into our daily teaching and learning processes as they could be. The availability of AI tools is often dependent on specific departments or projects, and not all faculty members or students have equal access. Moreover, there are challenges related to the infrastructure and support needed to effectively utilize these tools. For example, there might be a lack of adequate training for faculty and students on how to use AI tools effectively, or the necessary technical support to troubleshoot issues when they arise. This limits the full potential of AI in enhancing our educational practices. However, I do see a growing awareness and interest in expanding the use of AI tools within the institution. There are initiatives underway to improve access, but there is still significant room for improvement in ensuring that all faculty members and students can easily access and utilize AI tools to enhance their teaching and learning experiences".

This response indicates that while AI tools are available in the institution, their accessibility is limited and uneven. The faculty member acknowledges that some AI tools exist, but their availability varies across different departments and projects, leading to unequal access among faculty and students. The response also highlights challenges such as insufficient infrastructure, inadequate training, and a lack of technical support, which hinder the effective use of AI tools. Despite these challenges, there is recognition of growing interest and ongoing efforts to improve access to AI tools, suggesting that the institution is aware of the need for better integration but has not yet fully addressed the issue. Therefore, the response conveys that while there is potential for AI tools to enhance education, significant barriers still need to be overcome.

On utilization of AI tools one of the participants F2 noted that;

"I would say that the utilization of AI tools in teaching and learning at our institution is still in its early stages. While there is a growing recognition of the potential that AI has to enhance educational outcomes, its actual integration into our teaching practices is somewhat limited. One of the main challenges is that many faculty members are not yet fully familiar with how to effectively incorporate AI tools into their teaching. This is partly due to a lack of comprehensive training and support. Additionally, the AI tools that are available are not always well-integrated into the existing curriculum, making it difficult to seamlessly include them in our teaching methods. However, for those who have begun to use AI tools, there have been noticeable benefits, such as personalized learning experiences for students, more efficient assessment processes, and enhanced feedback mechanisms. These tools have the potential to significantly improve the learning experience, but their use is not yet widespread".

The response indicates that AI tools in teaching and learning at the institution are still in their formative stages. Despite the growing awareness of AI's potential to improve educational outcomes, the actual integration into teaching practices remains limited. This limitation stems from faculty members' lack of familiarity with effective AI incorporation, compounded by insufficient training and support. Additionally, the available AI tools often lack seamless integration with existing curricula, hindering their widespread adoption. Nonetheless, early adopters of AI tools have reported several benefits, including more personalized learning experiences, streamlined assessment processes, and enhanced feedback mechanisms. These advantages suggest that AI has significant potential to enhance educational practices. However, to fully leverage these tools, the institution needs to provide better infrastructure, ongoing professional development, and clear guidelines on AI utilization across various disciplines.

When asked how effective AI tools are in teaching and learning, one of the participants F3 said;

"AI tools in teaching and learning at our institution have shown promise but are not yet fully effective across the board. For those who have started using them, AI has enhanced the educational experience by offering personalized learning paths for students, improving the efficiency of assessments, and providing more timely and detailed feedback. These benefits suggest that AI has the potential to significantly improve both teaching and learning. However, the effectiveness of AI tools is currently limited by several factors. Many faculty members are still unfamiliar with how to effectively incorporate these tools into their teaching due to a lack of comprehensive training and support. Additionally, the tools are not always well-integrated with the existing curriculum, which makes it challenging to use them seamlessly. To increase the effectiveness of AI tools, our institution needs to invest more in training, infrastructure, and curriculum integration".

AI tools in teaching and learning at our institution have shown promise but are not yet fully effective across the board. For those who have started using them, AI has enhanced the educational experience by offering personalized learning paths for students, improving the efficiency of assessments, and providing more timely and detailed feedback. These benefits suggest that AI has the potential to significantly improve both teaching and learning. However, the effectiveness of AI tools is currently limited by several factors. Many faculty members are still unfamiliar with how to effectively incorporate these tools into their teaching due to a lack of comprehensive training and support. Additionally, the tools are not always well-integrated with the existing curriculum, which makes it challenging to use them seamlessly. To increase the effectiveness of AI tools, our institution needs to invest more in training, infrastructure, and curriculum integration.

Conclusion

In conclusion, the findings demonstrate that despite the potential of AI tools to enhance teaching, learning, and feedback quality in institutions of Higher learning in Kenya, significant barriers hinder their effective implementation and integration within the educational institution. A substantial majority of respondents expressed concerns over the availability of AI tools, inadequate institutional support, and challenges in integrating AI into the curriculum. The limited use of AI tools by educators, coupled with a perception that these tools are not significantly enhancing personalized learning experiences, highlights the need for comprehensive strategies to address these challenges. These strategies might include better resource allocation, targeted professional development, and robust curriculum design that effectively incorporate AI. Moreover, the positive responses regarding the impact of AI on improving feedback and learning outcomes suggest that, when effectively implemented, AI has the potential to significantly benefit educational practices. However, the existence of substantial challenges points to the need for ongoing support and infrastructure development to fully harness the advantages of AI in education. Addressing these challenges could lead to more widespread and effective use of AI tools, ultimately improving educational outcomes and ensuring that both educators and students can benefit from these technological advancements.

Recommendations

Based on the findings, the study recommended the following.

i. Institutions of higher learning in Kenya should allocate funding specifically for upgrading digital infrastructure, including providing reliable internet access, equipping computer labs with up-to-date hardware and software, and installing AI-enabled systems accessible to both staff and students.
ii. Faculty and administrative staff should receive tailored training programs focused on the practical use of AI tools in teaching, learning, and administrative tasks. This could include workshops, certifications, and mentorship from AI technology experts to ensure capacity-building among educators and administrators.
iii. Departments should establish AI resource hubs or centers where students and staff can access a variety of AI tools, receive technical support, and learn how to use these tools to enhance learning outcomes and teaching effectiveness.
iv. Universities should develop a long-term strategic plan that explicitly integrates AI technologies into the institution's goals, setting measurable objectives for AI adoption in teaching, research, and operational efficiency, with annual reviews to track progress.
v. Collaboration with industry partners and educational technology providers should be prioritized to conduct pilot programs that test the implementation of AI tools in real educational settings, generating insights to refine approaches before scaling up.
vi. Faculty and student advisory boards should be created to gather regular feedback on the usability, effectiveness, and challenges associated with AI tools, ensuring continuous improvement and alignment with the needs of stakeholders.
vii. AI-specific initiatives such as hackathons, innovation challenges, and interdisciplinary research grants should be introduced to promote a culture of creativity and innovation, encouraging faculty and students to explore the potential of AI in education.

viii. A policy framework addressing ethical concerns, such as data privacy and equitable access to AI tools, should be developed to guide the responsible use of AI in the academic environment and ensure inclusivity for all stakeholders, including marginalized groups.

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