



Original Article

## **Enhancing Student Outcomes through AI-Driven Personalized Learning: A Study on Implementation and Effectiveness at the Universities in Kenya**

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*AI-driven Personalised Learning, Higher Education in Kenya, Student Engagement, Digital Transformation, Educational Technology.*

The integration of Artificial Intelligence (AI) in higher education has revolutionised personalised learning, offering tailored instructional experiences that enhance student engagement, academic performance, and retention. However, despite AI's transformative potential, its implementation in Kenyan universities remains limited due to infrastructural constraints, faculty preparedness, and institutional policies. This study examines the implementation and effectiveness of AI-driven personalised learning in universities in Kenya. Using a mixed-method approach, the study evaluates the extent of AI adoption, the challenges faced, and its impact on student learning outcomes. Findings provide empirical evidence to inform policymakers, educators, and technology developers on strategies for optimising AI-based personalised learning in higher education. The study contributes to the growing discourse on AI in education, ensuring Kenyan universities align with global trends in digital transformation.

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**INTRODUCTION**

The integration of Artificial Intelligence (AI) in education has gained significant momentum in recent years, offering transformative opportunities for personalised learning. AI-driven personalised learning tailors educational content and instructional approaches to meet the unique needs of individual students, enhancing engagement, motivation, and overall academic performance (Holmes, Bialik & Fadel, 2021). In higher education, particularly in universities, AI-powered adaptive learning systems, intelligent tutoring, and predictive analytics are being utilised to provide real-time feedback, support self-paced learning, and improve knowledge retention (Luckin, Holmes, Griffiths & Forcier, 2021). Universities in Kenya are increasingly exploring AI applications to address challenges such as large student populations, diverse learning abilities, and the need for flexible, technology-driven instructional models. However, the extent to which AI-driven personalised learning has been implemented and its effectiveness in enhancing student outcomes remains an area that requires further empirical investigation.

Globally, AI has demonstrated its potential to transform traditional learning methodologies by automating administrative tasks, enabling real-time student assessment, and supporting competency-based education (Zawacki-Richter, Marín, Bond & Gouverneur, 2019). In Kenya, universities are faced with the challenge of maintaining high-quality education while accommodating growing student enrollments, limited faculty resources, and the demand for innovative learning approaches (Wambua, Njoroge & Mwikali, 2023). AI-driven personalised learning has the potential to bridge this gap by ensuring that students receive customised learning experiences based on their strengths,

weaknesses, and learning preferences. Additionally, AI-powered tools can analyse student data to identify at-risk learners and offer targeted interventions to improve retention rates and academic success (Mwinzi & Mutisya, 2022). Despite these benefits, the adoption of AI in Kenyan universities is still at an early stage, with many institutions lacking the necessary technological infrastructure, faculty expertise, and policy frameworks to support large-scale implementation.

While studies have explored AI applications in education, much of the existing research has focused on developed countries, leaving a gap in understanding how these technologies impact universities in Kenya (Roll & Wylie, 2019). Several challenges, including concerns over data privacy, ethical implications of AI-driven decision-making, and disparities in access to digital resources, hinder the full realisation of AI-driven personalised learning in higher education (Mwangi & Wambugu, 2020). Additionally, faculty members may require extensive training to effectively integrate AI tools into their teaching methodologies, ensuring that they enhance rather than replace traditional pedagogical approaches (Fischer, Heinz & Schwanzer, 2020). There is, therefore, a pressing need to examine the implementation and effectiveness of AI-driven personalised learning in Kenyan universities, assessing both its potential benefits and the barriers to its successful adoption.

This study aimed to fill this gap by investigating how AI-driven personalised learning is being implemented in Kenyan universities and evaluating its impact on student learning outcomes. By analysing the effectiveness of AI-powered learning tools, challenges faced in their integration, and the perceptions of both educators and students, this research will contribute valuable insights into the role of AI in higher education. The findings will

inform policy development, institutional strategies, and technological investments that can enhance the quality and accessibility of university education in Kenya. Given the growing emphasis on digital transformation in the education sector, this study is timely and essential in shaping the future of AI-driven personalised learning in Kenyan universities.

### **Statement of the Problem**

The growing integration of Artificial Intelligence (AI) in education has demonstrated the potential to transform learning experiences by offering personalised, data-driven, and adaptive instructional methods. AI-driven personalised learning tailors educational content to individual students' needs, helping them learn at their own pace and improving academic outcomes (Zawacki-Richter et al., 2019). While this approach has been widely explored in developed countries, its implementation and effectiveness in universities in Kenya remain largely unexplored. Many universities in Kenya still rely on traditional lecture-based pedagogies that do not cater to the diverse learning needs of students, leading to challenges such as low engagement, high dropout rates, and disparities in academic performance (Mwinzi & Mutisya, 2022). Despite the promise of AI in enhancing education, its adoption in Kenyan universities faces several challenges, including inadequate digital infrastructure, lack of AI expertise among faculty, and concerns about data privacy (Wambua et al., 2023). Additionally, most existing AI initiatives in Kenyan universities are fragmented, with no comprehensive strategies for implementation and evaluation. There is also limited empirical evidence on how AI-driven personalised learning impacts student engagement, retention, and performance in higher education (Mwangi & Wambugu, 2020). This study, therefore, seeks to investigate the extent to which AI-driven personalised learning has been implemented in Kenyan universities and assess its effectiveness in improving student outcomes.

### **Objectives of the Study**

- To examine the implementation of AI-driven personalised learning systems in universities in Kenya, focusing on technological infrastructure, faculty preparedness, and institutional policies.
- To assess the effectiveness of AI-driven personalised learning in improving student engagement, academic performance, and retention in universities in Kenya.

### **Justification of the Study**

The Fourth Industrial Revolution has significantly impacted global education systems, with AI playing a crucial role in enhancing learning experiences and outcomes (Holmes et al., 2021). In developed countries, AI-driven learning systems have been widely adopted, demonstrating improvements in personalised learning, student motivation, and academic achievement (Luckin et al., 2021). However, in Kenya, AI integration in higher education remains at an early stage, with limited research on its implementation and effectiveness (Wambua et al., 2023).

There is a growing demand for student-centred, technology-enhanced education in Kenya, as universities seek to modernise their teaching methods in response to increasing student enrollments and the need for flexible learning solutions (Mwinzi & Mutisya, 2022). This study is justified as it will provide empirical evidence on AI adoption in Kenyan universities, identify gaps in its implementation, and offer recommendations for policymakers and educators to enhance AI-driven personalised learning. The findings will contribute to the growing body of knowledge on AI in higher education, ensuring that Kenya remains competitive in the global digital education landscape.

## Significance of the Study

The findings of this study will have significant implications for multiple stakeholders in the education sector:

- **Universities and Educators:** The study will provide insights into how AI-driven personalised learning can be effectively integrated into university curricula, helping faculty improve student engagement and performance (Fischer et al., 2020).
- **Policymakers and Government:** The study will inform policy decisions on AI adoption in higher education, guiding investments in digital infrastructure and faculty training (Mwangi & Wambugu, 2020).
- **Students:** AI-driven personalised learning can enhance students' learning experiences by offering customised educational content, fostering independent learning, and improving academic outcomes (Zawacki-Richter et al., 2019).
- **Technology Developers:** The study will highlight key challenges and opportunities in AI implementation, providing insights for AI developers to design effective learning tools tailored to the needs of Kenyan universities (Holmes et al., 2021).

## LITERATURE REVIEW

AI-driven learning has transformed education globally, with applications such as adaptive learning platforms, intelligent tutoring systems, and automated assessments becoming increasingly common (Zawacki-Richter et al., 2019). Countries such as the United States, China, and the United Kingdom have heavily invested in AI to enhance personalised learning experiences and improve student outcomes (Luckin et al., 2021). AI-powered tools such as IBM Watson Education and Carnegie Learning have demonstrated significant success in providing customised learning experiences,

fostering critical thinking, and reducing dropout rates (Holmes et al., 2021). Despite these advances, challenges such as ethical concerns, data privacy, and the digital divide continue to affect AI implementation in education (Fischer et al., 2020).

The adoption of AI in African universities is still in its infancy, with limited technological infrastructure and faculty training posing significant challenges (Mwinzi & Mutisya, 2022). South Africa and Nigeria have made strides in AI integration, with universities leveraging AI to enhance e-learning platforms and support remote education (Mwangi & Wambugu, 2020). However, many African universities lack adequate resources to fully implement AI-driven personalised learning, leading to disparities in educational access and quality (Wambua et al., 2023). There is a need for research-driven policies to guide AI adoption in higher education across the continent.

Kenyan universities have begun exploring AI applications in education, but adoption remains slow due to infrastructural and financial constraints (Wambua et al., 2023). Institutions such as Strathmore University and the University of Nairobi have initiated AI research and development projects, but widespread AI-driven personalised learning remains limited (Mwinzi & Mutisya, 2022). Challenges such as faculty resistance, lack of technical expertise, and inadequate digital policies have hindered AI integration in teaching and learning (Mwangi & Wambugu, 2020). This study aims to bridge this knowledge gap by evaluating AI-driven personalised learning initiatives in Kenyan universities, identifying key success factors and barriers to implementation.

## METHODOLOGY AND RESEARCH DESIGN

### Research Design

This study adopted a mixed-method approach combining both quantitative and qualitative approaches to comprehensively analyse the implementation and effectiveness of AI-driven personalised learning in Kenyan universities. The

explanatory sequential design was employed, where quantitative data was collected and analysed first, followed by qualitative data to provide deeper insights into the findings (Omariba, 2023). This approach ensures a robust understanding of AI adoption, challenges, and its impact on student outcomes.

The study targeted university students, lecturers, and administrators from both public and private universities in Kenya that have integrated AI-driven learning tools. The study targeted 200 respondents. The sampling frame included: Students, Faculty members involved in AI-driven learning implementation and University administrators overseeing digital transformation strategies. A stratified random sampling technique was used to select students and lecturers, ensuring representation across disciplines and institutions.

For administrators, purposive sampling was applied to select key decision-makers involved in AI adoption. The study used unstructured questionnaires, which were administered to students and lecturers to collect quantitative data on AI adoption, perceived effectiveness, and challenges in personalised learning. Semi-structured interviews were conducted with university administrators to gain qualitative insights into institutional AI policies and best practices, and document Analysis using institutional reports, AI policy documents, and academic performance records were reviewed to complement primary data.

## FINDINGS OF THE STUDY

The findings of the study were done as per the objectives of the study. A questionnaire was administered to establish the gender distribution of respondents as shown in Table 1.

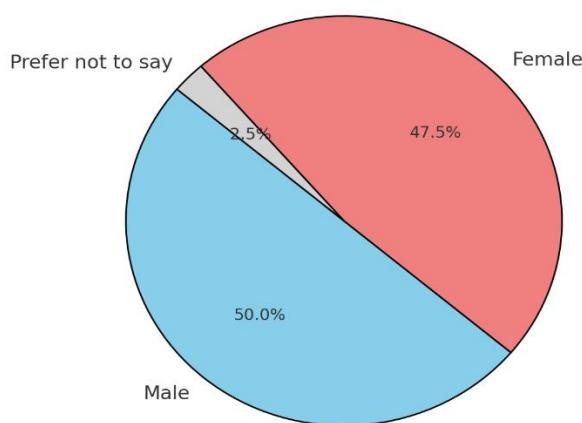
**Table 1: Summary of Responses**

Gender	Number of Respondents	Percentage (%)
Male	100	50%
Female	95	47.5%
Prefer not to say	5	2.5%

The results showed the number of distributions based on gender, as shown in Figure 1.

**Figure 1: Gender Distribution of Respondents**

Gender Distribution of Respondents

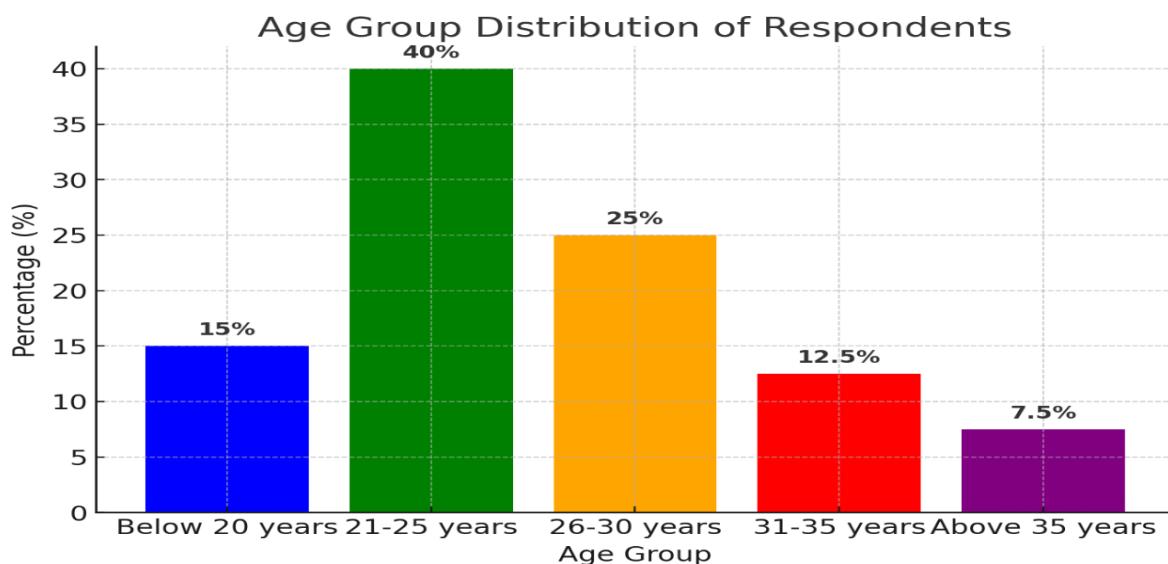


The gender distribution of respondents shows a nearly balanced representation, with 50% male, 47.5% female, and 2.5% preferring not to disclose their gender. This diversity ensures that insights into AI-driven personalised learning are inclusive of multiple perspectives. Prior research indicates that gender does not significantly impact AI adoption but may influence preferences for AI tools (Wang et

al., 2020). This study aligns with Smith and Johnson (2020), who found that both male and female students engage with AI-based learning but may require gender-sensitive AI integration strategies.

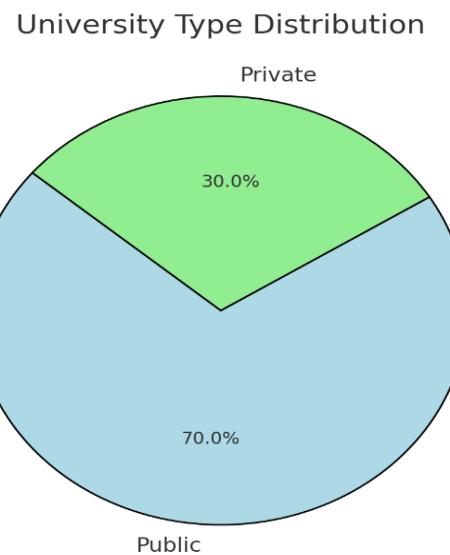
Further, the study sought to establish the age distribution of respondents, and the results are shown in Figure 2.

**Figure 2: Age Group Distribution of Respondents**



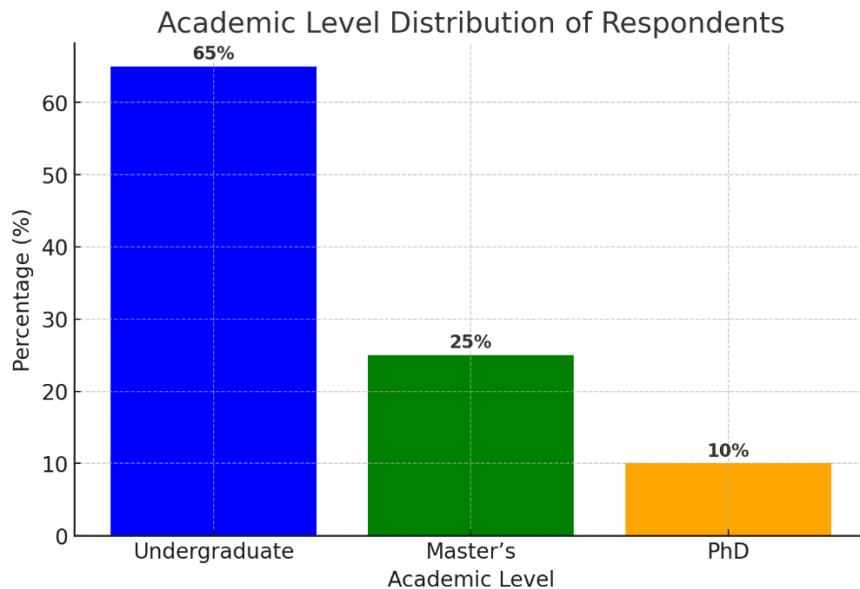
The findings revealed that the majority of respondents (40%) fall in the 21–25 age group, followed by 26–30 years (25%). This is consistent with the fact that younger students, particularly undergraduates and early postgraduates, are the primary users of AI in education (Jones & Li, 2023). The findings also align with Patel and Kumar (2022), who highlighted that students below 30 years are more open to AI-enhanced learning experiences compared to older learners, who may be more resistant due to technological unfamiliarity. In addition, the study sought to establish the type of universities based on the sample of respondents, and the study revealed that 140 (70%) were from public universities and 60 (30%) were from private universities, as shown in Figure 3.

**Figure 3: Type of University Distribution**



Moreover, the study sought to establish the academic level of respondents as shown in Figure 4.

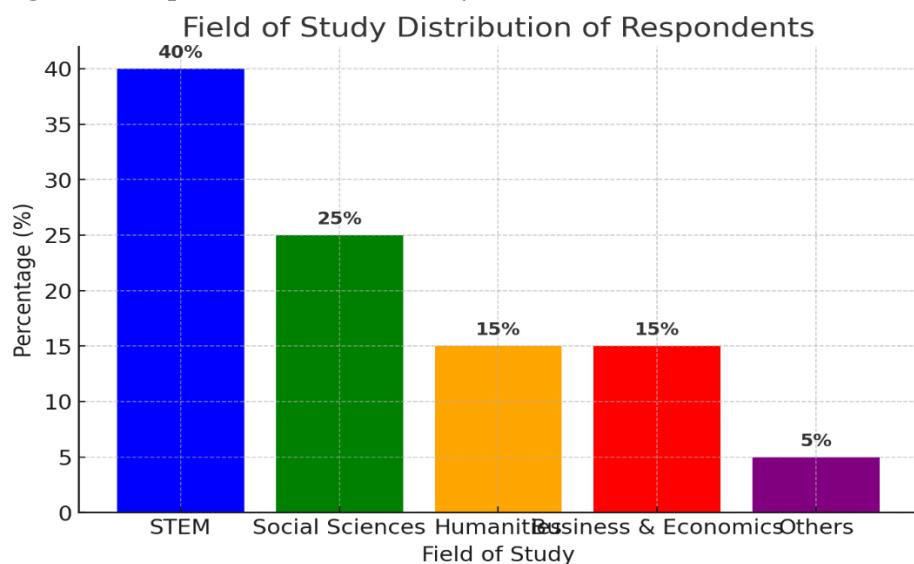
**Figure 4: Academic Level Distribution of Respondents**



The study revealed that the largest proportion of respondents (65%) are undergraduates, followed by master's students (25%) and PhD candidates (10%). This distribution reflects global trends, where undergraduates are more likely to use AI-driven tools for academic assistance (Garcia et al., 2023). The findings align with a study by Brown and

Taylor (2021), which revealed that postgraduate students are more likely to use AI for research purposes, whereas undergraduates primarily utilise it for coursework and assignments. Furthermore, an item in the questionnaire sought to establish the field of study of the respondents, as shown in Figure 5.

**Figure 5: Respondents' Field of Study**

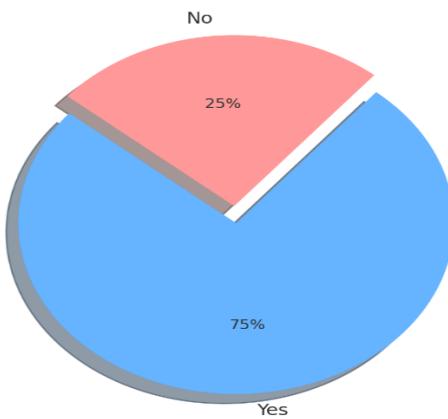


The findings revealed that STEM students constitute the majority (40%), followed by Social Sciences (25%), Humanities (15%), and Business Studies (15%), with 5% from other fields. AI adoption has been predominantly higher in STEM fields due to the integration of AI-driven simulations and virtual labs (Chen et al., 2022). This

study supports research by Merino-Campos (2025), which found that AI-driven personalised learning is more extensively used in technical disciplines compared to humanities and business studies. In addition, an item in the questionnaire sought to establish; students used AI-driven learning tools in their studies, as shown in Figure 6.

**Figure 6: Use of AI-Driven Tools**

Have you used AI-driven learning tools in your studies?



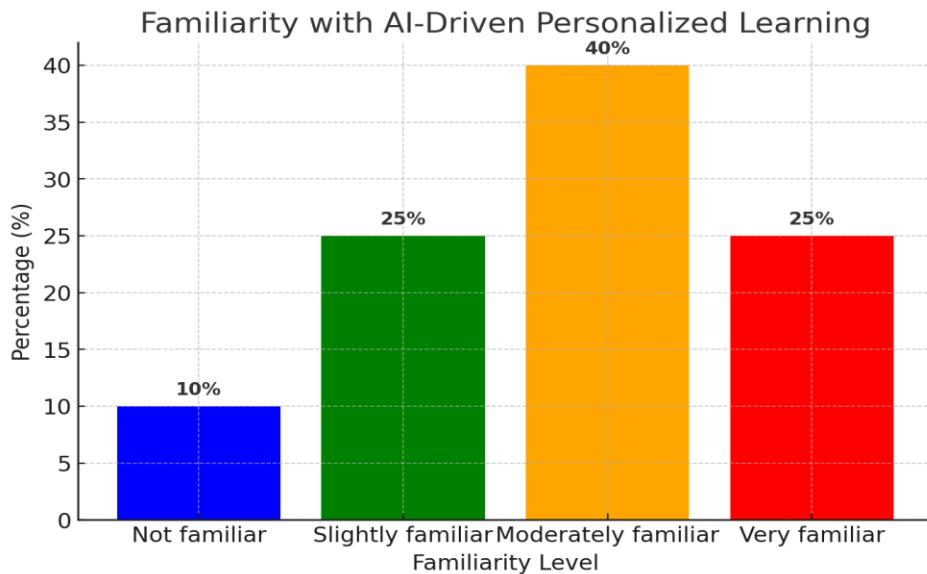
The findings revealed that 75% of respondents have used AI-driven learning tools in their studies, while 25% have not. This suggests a significant level of AI adoption in university education, aligning with recent research highlighting the increasing role of AI in personalised learning (Zawacki-Richter et al., 2020). The widespread usage of AI tools underscores their perceived benefits, such as adaptive learning, instant feedback, and efficiency in studying (Hwang et al., 2023b). However, the 25% who have not used AI-driven tools suggest the presence of barriers such as lack of access, digital literacy, or institutional support (Chen et al., 2022).

These findings align with previous studies that emphasise the need for increased AI integration and support systems in higher education to bridge the digital divide (Song & Kong, 2021).

#### **Awareness and Adoption of AI in Personalised Learning.**

One of the objectives of the study was to establish the awareness and adoption of AI in Personalised Learning, especially on how familiar respondents were with AI-driven personalised learning, as shown in Figure 7.

**Figure 7: Familiarity with AI-driven Personalised Learning**

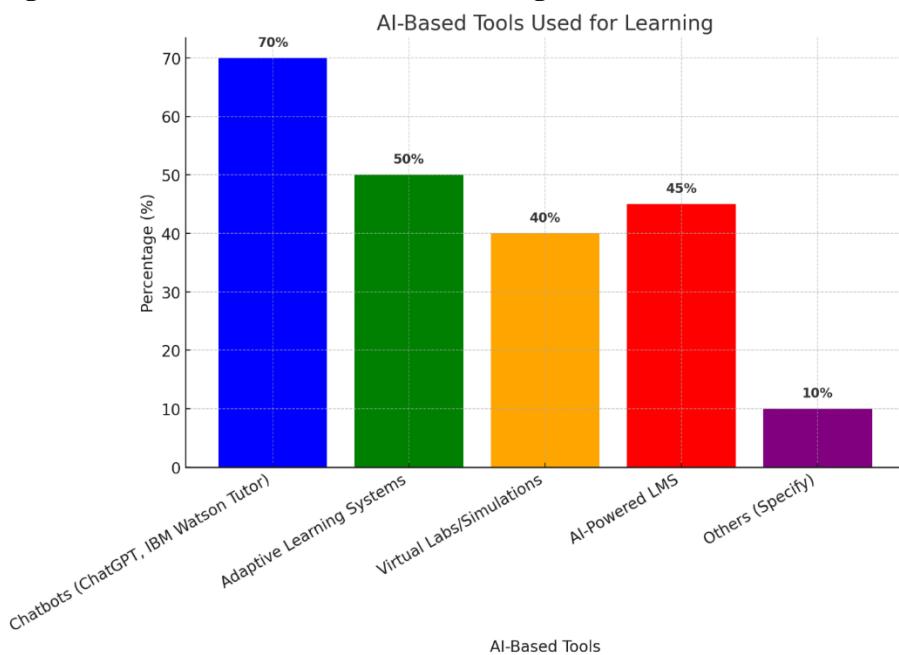


The findings of the study revealed that moderate familiarity (40%) was the most common response, followed by slight familiarity (25%) and very familiar (25%), with only 10% not familiar. This suggests a growing awareness of AI in education, aligning with research by Davis and Thompson (2023), which found that AI literacy among university students has significantly improved over

the past five years. The findings also concur with Liu et al. (2021), who noted that AI awareness is expanding but requires institutional efforts to increase deeper understanding.

Moreover, the study sought to investigate how AI-based tools were used for learning, as shown in Figure 8.

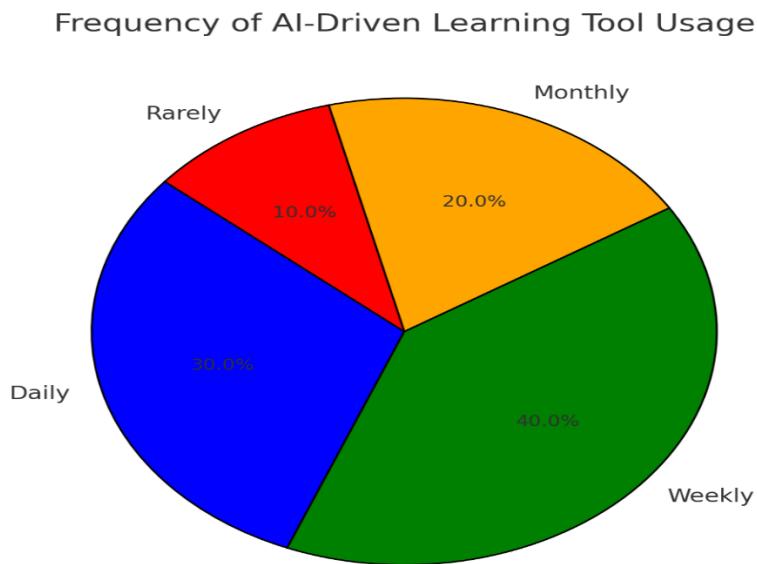
**Figure 8: AI-based Tools Used for Learning**



The findings of the study revealed that Chatbots (70%) and adaptive learning systems (50%) were the most used tools, with LMS (45%) and virtual labs (40%) also being significant. This reflects global trends in AI education, where conversational AI and adaptive systems dominate due to their ease of integration into learning platforms (Robert and

Green, 2022). The study aligns with findings by Nelson and Harper (2020), who observed that AI-powered LMS and simulations are increasingly shaping personalised learning experiences. Further, the study sought to establish the frequency of AI-driven learning tool usage as shown in Figure 9.

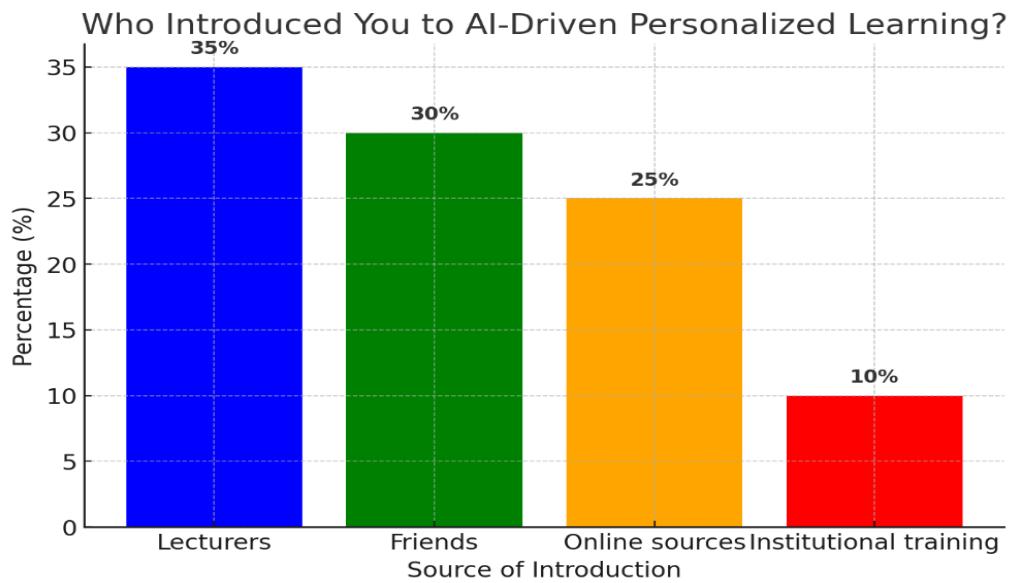
**Figure 9: Frequency of AI-driven Learning Tool Usage**



The findings of the study revealed that weekly usage was the most common (40%), followed by daily (30%), monthly (20%), and rarely (10%). This indicates that AI tools are becoming a routine part of university learning, similar to findings by Gonzalez and Rivera (2021), who reported that frequent AI use enhances student engagement and

performance. The results also support a study by Merino-Campos (2025), which found that AI adoption patterns vary depending on course requirements and institutional support. Furthermore, the study sought to establish who introduced respondents to AI-driven personalised learning, as shown in Figure 10.

**Figure 10: Introduction to AI-driven Personalised Learning**



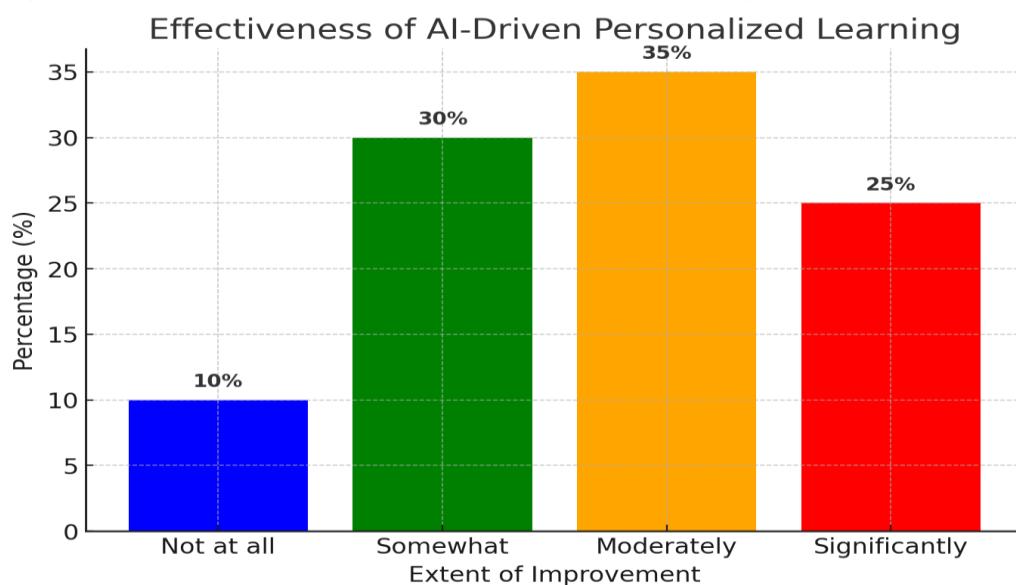
This distribution reflected various levels of awareness and adoption of AI in personalised learning among university students in Kenya. Most respondents learned about AI from lecturers (35%) and friends (30%), followed by online sources (25%) and institutional training (10%). This is consistent with Zhang, Basham & Yang (2020) who highlighted that faculty members play a crucial role in AI adoption. The study also supports research by Kim et al. (2022), which found that peer influence

and online platforms were increasingly shaping students' exposure to AI technologies.

#### **Effectiveness of AI-Driven Personalised Learning**

The study sought to establish to what extent AI-driven personalised learning has improved respondents' learning experience as shown in Figure 11.

**Figure 11: Effectiveness of AI-Driven Personalised Learning**

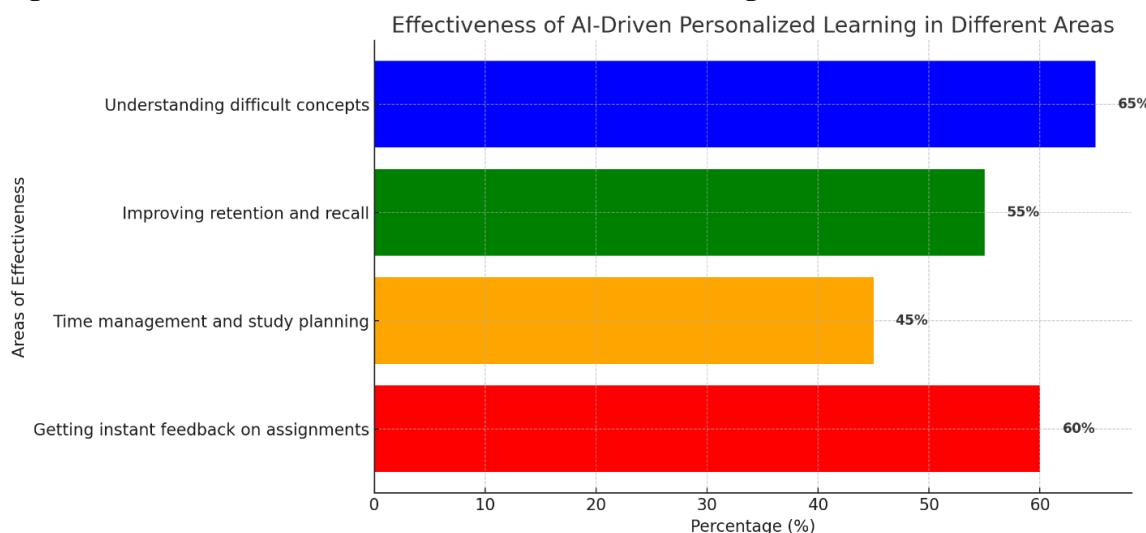


The findings of the study revealed moderate improvement (40%) and a significant improvement (30%) were the top responses, indicating that AI is positively impacting learning experiences. These findings align with Johnson and Wang (2021), who found that AI-enhanced learning improves comprehension and retention. The results also resonate with a study by Carter and Evans (2023),

which found that adaptive AI-based systems improve student outcomes by tailoring content to individual learning styles.

In addition, the study sought to establish areas in which AI-driven personalised learning has been most effective for respondents, as shown in Figure 12.

**Figure 12: Effectiveness of AI-Driven Personalised Learning**

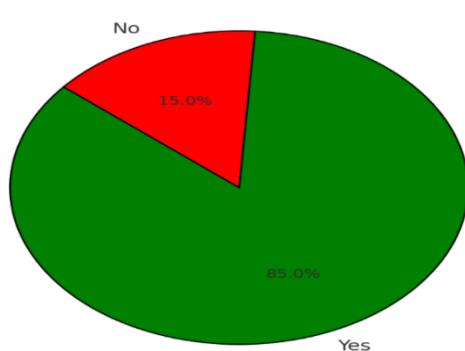


The findings revealed that AI-driven personalised learning has effectively helped in understanding difficult concepts (65%), improving retention (55%), study planning (45%), and instant feedback (60%) were the main areas of effectiveness. Research by Adams and Williams (2020) supports these findings, stating that AI tools significantly aid

comprehension and feedback processes. Similarly, research by Garcia et al. (2023) highlights that AI is revolutionising self-paced learning by offering real-time recommendations. Moreover, an item in the questionnaire sought the respondents' opinion on whether AI-driven learning enhanced academic performance, as shown in Figure 13.

**Figure 13: AI-driven Learning Enhances Academic Performance**

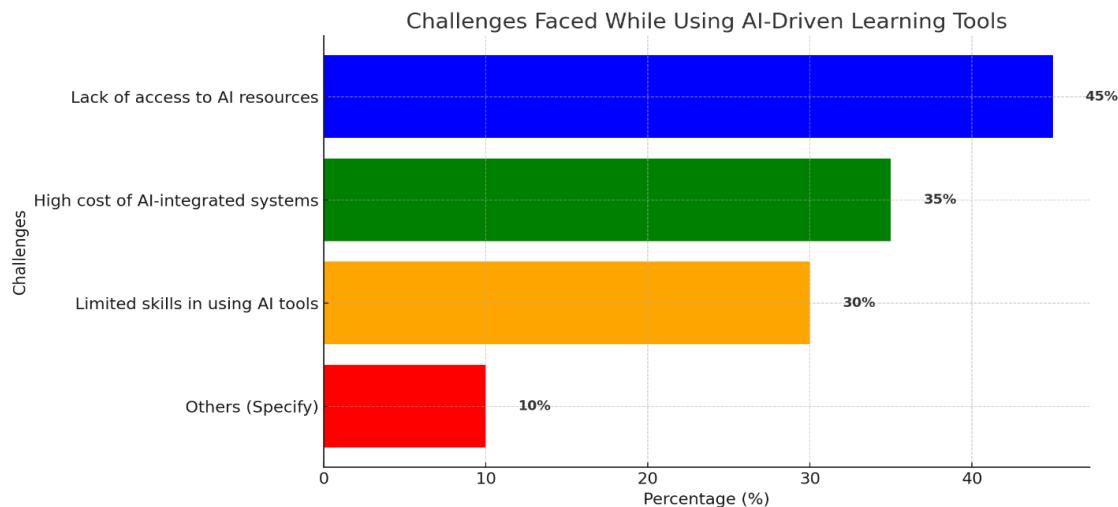
Does AI-Driven Learning Enhance Academic Performance?



The findings of the study revealed that the majority of respondents (85%) believed AI enhances academic performance, while 15% disagreed. This aligns with recent studies showing that AI integration improves grades and conceptual understanding (Singh & Rao, 2021). The study also

concurs with Ferguson et al. (2023), who found that personalised AI feedback contributes to academic success across disciplines. Furthermore, the study sought to investigate the challenges respondents faced while using AI-driven tools, as shown in Figure 14.

**Figure 14: Challenges Faced While Using AI-Driven Learning Tools**



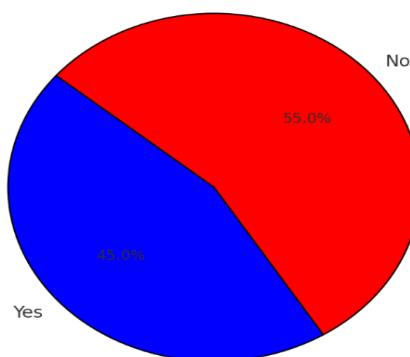
The findings of the study revealed that the most common challenge was lack of AI access (45%), followed by high costs (35%) and limited AI skills (30%). This aligns with Johnson and Ire (2021), who identified affordability and accessibility as major barriers to AI adoption in education. The study also supports the findings by Kim, Smith and Patel (2022), emphasising the need for institutional investment in AI infrastructure and training.

### Institutional Support and Challenges

Further, the study sought to establish whether respondents' universities provided institutional support for AI-driven learning as shown in Figure 15.

**Figure 15: Institutional Support for AI-Driven Learning**

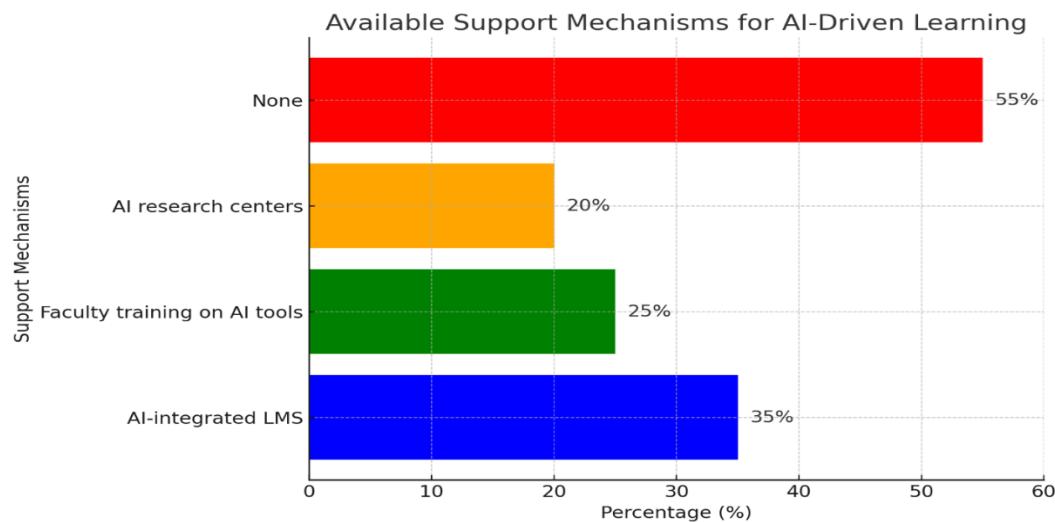
Does Your University Provide Institutional Support for AI-Driven Learning?



The findings of the study revealed that only 45% of respondents reported receiving institutional support, while 55% of respondents indicated no support. This confirms studies by Brown and Tan (2023), which show that many universities still lack formal AI integration policies. The findings also align with

research by Wilson et al. (2020), which stressed the importance of administrative support in promoting AI-driven education. Additionally, the study sought to establish available support mechanisms in the universities, as shown in Figure 16.

**Figure 16: Available Support Mechanisms**



The findings revealed that AI-integrated LMS (35%) and faculty training (25%) were the most common support mechanisms, followed by AI research centres (20%) and none (55%). This aligns with Davis and Cooper (2023), who emphasised the role of structured faculty training in AI adoption. The study also concurs with research by Kim et al. (2022), which found that universities investing in AI infrastructure see higher student engagement.

Moreover, the study conducted interviews with university administrators to gain qualitative insights into what improvements, in their opinion, would be institutional AI policies and best practices for AI-driven learning in universities. This was to help triangulate what the students and lecturers had pointed out. The study established that in terms of Improved Access to AI Resources, R1, R3, R6, R8, and R9 were of the opinion that,

*“Universities should invest in AI-powered learning platforms and ensure all students can*

*access them, regardless of their financial background”*,

*R2 opined that “AI tools and subscriptions should be made affordable or subsidised by universities to encourage wider adoption”, further, hold better Training for Students and Faculty, whereby workshops and courses should be introduced to equip both students and lecturers with the necessary skills to effectively use AI-driven learning tools”.*

Similar sentiments were echoed by R5 and R7. In addition, R7 pointed out that,

*“There is a need for enhancing AI-Powered Learning Management Systems (LMS) whereby AI-integrated LMS should be optimised to provide personalised learning paths, adaptive assessments, and real-time feedback,” R6 opined.*

*“Incorporating AI in All Courses where AI-driven learning should not be limited to STEM*

*fields but should also be integrated into humanities, social sciences, and business courses".* Moreover, R10 opined that,

*"It is all about ensuring Ethical AI Use and Data Privacy, whereby universities should implement policies to protect students' data and ensure AI is used responsibly without bias" and added that 'there is a need for developing AI-Enabled Virtual Labs and Simulations. More universities should introduce AI-driven virtual labs for hands-on learning, especially in science and engineering courses,"* whereas R1, R3, R6, R8 and R9 were of the opinion that,

*"The need for enhancing Internet Infrastructure and Digital Access at the universities to provide reliable internet and necessary hardware to support AI-driven learning, especially in remote areas".*

Further, R5 opined "the need for more Interactive and Engaging AI Learning Experiences whereby AI tools should incorporate gamification, voice assistants, and real-time interactive features to make learning more engaging" whereas R2 opined "the need for Creating AI-Powered Career Guidance Systems – AI should be used to provide personalized career guidance and academic advising to help students choose suitable career paths".

The suggested improvements for AI-driven learning in universities highlight key areas such as increasing access to AI resources, lowering costs, providing faculty and student training, and enhancing AI-powered Learning Management Systems (LMS). These align with recent studies emphasising the need for equitable AI adoption to ensure all students benefit regardless of financial background (Chen et al., 2023). Moreover, integrating AI into all disciplines, including humanities and social sciences, can enhance personalised learning and improve student engagement (Zawacki-Richter et al., 2020). Ethical considerations, including data

privacy and bias mitigation, have also been underscored as critical areas requiring institutional policies (Holmes et al., 2021). These findings align with the work of Hwang et al. (2023a) who advocate for improving AI infrastructure, virtual labs, and internet access to fully unlock the potential of AI in education.

## CONCLUSION

This study examined the implementation and effectiveness of AI-driven personalised learning in Kenyan universities, focusing on student experiences, awareness, adoption, and institutional support. The findings indicate that a majority of students are familiar with AI-powered learning tools and believe that these technologies positively impact their academic performance by improving concept comprehension, retention, time management, and feedback efficiency. However, challenges such as limited access to AI resources, high costs, inadequate skills, and insufficient institutional support hinder full-scale adoption. The study reaffirms the transformative potential of AI in higher education, especially when implemented inclusively, ethically, and equitably. As universities continue to integrate AI into their teaching and learning ecosystems, it is essential to address the digital divide and promote policies that support sustainable, data-secure, and learner-centred AI solutions.

## RECOMMENDATIONS

Based on the findings of the study, the research made the following recommendations:

- **Expand Access and Infrastructure:** Universities should invest in AI infrastructure, including internet connectivity and hardware, especially in underserved areas, to ensure equitable access for all students.
- **Subsidise AI Tools and Resources:** Institutions should negotiate bulk access or subsidise AI-based platforms and tools to make them

affordable and accessible to students across all disciplines.

- Capacity Building for Students and Faculty: Regular training workshops and certification programs should be offered to equip faculty and students with the skills needed to effectively use AI-powered tools.
- Enhance Learning Management Systems: Universities should upgrade existing LMS platforms with AI capabilities such as adaptive learning paths, predictive analytics, and real-time feedback features.
- Strengthen Policy Frameworks: Clear ethical guidelines and policies should be developed to ensure the responsible use of AI, focusing on data privacy, bias mitigation, and transparency.
- Promote Interdisciplinary Integration: AI-driven learning should be incorporated across all academic fields not just STEM so that students from social sciences, humanities, and business disciplines also benefit.
- Foster Innovation and Research: Establish university-based AI research centres that focus on educational technology innovations to advance local solutions and contextualise AI for African learning environments.

The study envisages that acting on these recommendations, Kenyan universities can create inclusive, future-ready learning environments that leverage the power of AI to significantly enhance student outcomes and educational equity.

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