Artificial Intelligence in Education: Changing the Future of Learning (A Case Study of Schools in Taita-Taveta County in Kenya)

Asmini Baraka., Kahu Wachira

University of Nairobi, Kenya

DOI: https://doi.org/10.47772/IJRISS.2025.91200094

Received: 14 December 2025; Accepted: 22 December 2025; Published: 01 January 2026

ABSTRACT

The purpose of this study was to examine the influence of Artificial Intelligence (AI) on the future of learning with a specific focus on secondary schools in Taita-Taveta County. The research was guided by three key objectives: to determine how AI is influencing teachers' pedagogical practices, to examine the benefits of AI integration in the teaching and learning process, and to identify the challenges hindering effective adoption of AI in education. The study adopted a descriptive survey research design. The target population comprised of 1200 public secondary school teachers,80 administrators (principals and deputies) and all County ICT champions. Both stratified sampling and purposive sampling were used to obtain a sample size of 80 teachers and 20 school administrators (principals, deputies and ICT champions).data was collected through questionnaires and interviews and analyzed using descriptive statistics for quantitative data and thematic analysis for qualitative responses. The findings revealed that AI is beginning to influence teaching practices by enhancing lesson preparation, supporting personalized learning and assisting teachers in automating routine tasks such as grading and student monitoring. Respondents also reported several benefits of AI integration, including improved learner engagement, timely feedback increased efficiency in classroom management. However, the study found significant challenges that limit AI adoption, including inadequate ICT infrastructure, limited teacher training in AI tools, unreliable internet connectivity, high implementation costs and insufficient government support. Therefore, the study concludes that while AI has the potential to transform teaching and learning in Taita -Taveta County, widespread adoption remains constrained by systems and infrastructural barriers. The study recommends increased investment in ICT, infrastructure, capacity building programs for teachers, development of school level AI policies and collaboration between government and education stakeholders to support integration of AI driven innovations.

Key Words: Artificial Intelligence (AI), Education Technology (EdTech), ICT integration, Digital Literacy, AI Tools in Teaching and Learning, Teacher Digital Competence.

INTRODUCTION

The integration of Artificial Intelligence (AI) in education has become a transformative force globally, reshaping instructional delivery, assessment, and personalized learning. In developed regions such as Europe, North America, and Asia, AI-driven tools including adaptive learning platforms, automated grading systems, virtual tutors, and data-driven decision support systems have significantly improved learning outcomes, efficiency, and accessibility. Global investments in AI for education continue to rise, emphasizing the increasing recognition of AI's potential to enhance educational systems and future workforce readiness.

Across Africa, educational institutions are gradually adopting AI technologies, though progress remains uneven due to infrastructural, financial, and policy-related challenges. Countries such as South Africa, Rwanda, and Kenya are making notable strides through digital literacy programs and ICT integration in schools. Despite these advancements, many African schools still face barriers such as inadequate internet connectivity, limited ICT devices, insufficient teacher digital competence, and inconsistent policy implementation, all of which slow down large-scale AI adoption.

In Kenya, the government has embraced ICT integration through frameworks such as the Digital Literacy Program (DLP), Competency-Based Curriculum (CBC), and the National ICT Policy. Kenyan secondary schools increasingly utilize digital platforms, e-learning resources, and data management systems. However, the application of AI-specific tools such as predictive analytics, automated assessments, and intelligent tutoring systems remains minimal. Challenges including inadequate teacher training, unequal rural–urban ICT infrastructure, and limited awareness of AI-driven pedagogies continue to hinder meaningful adoption.

Within Taita Taveta County, the integration of AI and advanced digital technologies in secondary schools is still at an early stage. The county exhibits disparities in connectivity, device availability, and teacher ICT competency across its sub-counties: Voi, Taveta, Mwatate, and Taita. While some urban schools demonstrate progress in adopting digital tools, many rural schools struggle with limited technological resources and inadequate support systems. This affects teachers' ability to integrate AI-enhanced strategies in teaching and learning effectively. As global and national education systems move toward digital transformation, understanding the county's readiness, challenges, and opportunities becomes crucial in strengthening ICT-enhanced learning in the region.

Objectives of the Study

i) To evaluate the impact of AI on teachers' roles and pedagogical practices

ii) To examine the benefits and challenges of integrating AI in educational institutions

iii) To project future trends and developments of AI in education

Statement of the Problem

Artificial intelligence (AI) has emerged as a transformative force in global education, reshaping how teaching, learning and administrative processes are conducted. Worldwide, AI technologies such as intelligent tutoring systems, automated grading, predictive analytics and adaptive learning platforms have enhanced personalization's, improved assessment efficiency and optimized learning outcomes. However, despite its vast potential, the degree of adopting AI and integration varies considerably across regions. Most developed countries have made substantial progress in embedding AI into their educational systems, while, many developing nations, including Kenya, remain at the early stages of adoption. This disparity raises concerns about equitable access to the benefits of AI in education and the preparedness of teachers and institutions to integrate these technologies effectively. In Kenya, AI integration in education is gaining recognition through national policies such as the Digital Economy Blueprint and the Competency-Based Curriculum (CBC). Nonetheless, implementation remain slow and fragmented. Most educational institutions face challenges such as inadequate infrastructure, limited teacher training in AI literacy, lack of technical support and minimal research on AI driven pedagogical transformation.

Taita Taveta county presents a clear example of uneven digital transformation. Although the county has made commendable strides in ICT integration through initiatives such as the *Future Ni Digital* program and *Ajira Digital Program*, literature on actual AI implementation in Taita Taveta remains limited. There is insufficient literature on how AI affects teachers' roles and pedagogical practices, the benefits and challenges associated with its use in the Kenyan education system and the projected future trends that may influence learning at both national and county levels. Therefore, this study seeks to address the gap between the theoretical promise of AI in transforming education and its practical integration in teaching and learning in Kenyan schools, particularly in Taita Taveta County.

REVIEW OF RELATED LITERATURE

Artificial Intelligence (AI) has become one of the most transformative forces in education globally, reshaping the way teaching, learning, and administration are conducted. Scholars widely agree that AI has redefined the role of the teacher from being a transmitter of knowledge to a facilitator and designer of learning experiences (Holmes et al., 2022). AI-enabled systems such as intelligent tutoring systems, adaptive learning platforms,

automated grading, and chatbots are increasingly being integrated into classrooms, allowing teachers to focus on higher order cognitive and socio-emotional support for learners (Luckin, 2023).

Globally, evidence suggests that AI contributes to personalized learning by tailoring content to individual learner needs through data analytics and machine learning (Zawacki-Richter et al., 2019). For instance, in developed contexts such as the United States, the United Kingdom, and China, AI systems provide real-time insights into student progress, enabling teachers to adapt instruction accordingly (OECD, 2024). These systems have also automated routine administrative duties such as attendance, marking, and performance tracking, thereby enhancing efficiency and freeing teacher time for pedagogy (UNESCO, 2023).

However, despite these benefits, global literature highlights persistent challenges. These include inadequate teacher training in AI, ethical dilemmas around student data privacy, and widening inequalities between high-income and low-income education systems (Nguyen & Yuen, 2024). Moreover, the risk of algorithmic bias and over-reliance on AI-generated content has raised questions about creativity and critical-thinking skills (Holmes et al., 2022). Looking forward, global reports forecast that hybrid human-AI teaching models will dominate the near future, where AI augments but does not replace educators (UNESCO, 2024). There is also growing advocacy for the inclusion of AI literacy in school curricula and teacher education to prepare both teachers and students for the future learning ecosystem (OECD, 2024). In short, the global consensus is that AI's transformative potential in education depends on thoughtful integration, ethical governance, and investment in teacher capacity.

AI Integration in Kenya

Kenya has begun to embrace AI in education, aligning with its Digital Economy Blueprint and Competency-Based Curriculum (CBC), which emphasize technology-driven learning. However, the implementation stage remains nascent, with AI integration still concentrated in higher-education and technical institutions.

Impact of AI on Teachers' Roles and Pedagogy in Kenya

Recent Kenyan studies demonstrate that AI is gradually shifting teacher roles and pedagogical practices. Karanja (2024) proposes an AI competency framework for educators in higher education, emphasizing that effective teaching in the digital age requires not only content mastery but also AI literacy and ethical awareness. Similarly, Matere (2024) found a strong positive correlation between the availability and use of AI tools and the effectiveness of teaching and learning in universities. Teachers using AI-enabled systems reported improved learner engagement, better feedback, and enhanced curriculum delivery.

In the technical and vocational sector, Kimutai et al. (2025) observed that teachers' technological, pedagogical, and content knowledge (TPACK) significantly influenced the perceived usefulness and ease of use of AI in TVET institutions. Nevertheless, limited access to AI tools, low institutional readiness, and inadequate digital infrastructure constrained adoption. These findings echo global trends showing that teacher readiness is a key determinant of AI success in education.

Benefits and Challenges of AI Integration in Kenya

The benefits of AI adoption in Kenyan education include improved personalization of learning, efficient assessment, and time savings in administrative tasks (Matere, 2024). AI-driven feedback systems have helped instructors monitor progress, address learning gaps, and provide individualized support, especially in higher-education settings. Additionally, national programs such as the Ajira Digital initiative have begun equipping youth with AI and data-related skills, aligning education with future workforce needs (Ministry of ICT, 2023).

However, challenges remain substantial. Infrastructure disparities persist between urban and rural schools, where inadequate connectivity and limited access to devices hinder AI use (Wang'ang'a, 2024). Teachers often lack structured professional development in AI pedagogy, and many institutions lack clear policies on ethical use, data privacy, and intellectual property. Furthermore, the rural-urban digital divide threatens to exacerbate educational inequalities, as only a fraction of schools outside major cities had the technological and financial

capacity to implement AI-based systems. Ethical and governance issues are also emerging. Wang'ang'a (2024) found that while 63 percent of students in a Kenyan university had used generative AI tools, few institutions had guidelines on their responsible use. This reflects the urgent need for a regulatory framework that safeguards academic integrity and data protection while encouraging innovation.

The Future trends of AI in Kenya

Kenya's policy landscape suggests growing commitment to AI in education. The government announced plans to introduce AI-assisted examination systems in over 150 TVET institutions to enhance objectivity and efficiency in marking (The Star, 2025). Similarly, curriculum reforms and initiatives by the Ministry of Education are exploring how to embed AI literacy across learning levels. Karanja (2024) and Aditya & Otermans (2025) argue that AI can play a critical role in mitigating teacher shortages, providing adaptive learning solutions in overcrowded classrooms, and enabling large-scale personalized tutoring. Future trends for Kenya include hybrid teaching models that combine AI automation with teacher facilitation, increased demand for AI competent educators and potential collaborations with private tech firms to develop context-appropriate AI learning platforms. Nonetheless, ensuring equitable access and robust teacher support remains central to realizing these trends.

AI Integration in Taita -Taveta County

Taita Taveta presents a case of gradual digital transformation that lays the groundwork for future AI integration. In 2019, more than 200 secondary-school teachers in the county underwent ICT capacity-building through the Global E-Schools and Communities Initiative (GESCI) "African Digital Schools Initiative." This program enhanced teachers' ability to use digital tools, shifting instructional methods from chalk-and-board to interactive, technology-supported pedagogy (Baraka FM, 2019).

More recent developments show momentum toward digital and AI readiness. In 2024, the Stanbic Kenya Foundation, Microsoft Kenya, and American Tower Corporation launched the *Future Ni Digital* program in Taita Taveta, equipping vocational training centers with computers, internet connectivity, and training in AI and cybersecurity (Tsavo Media, 2024). Additionally, the county partnered with the *Ajira Digital* Program to promote digital literacy among youth and instructors (The Star, 2024). These initiatives collectively enhance local capacity for integrating AI into education and vocational training. However, literature on actual AI implementation in Taita Taveta remains limited. While ICT training and digital-skills programs are well documented, studies rarely examine how AI tools such as adaptive learning systems or automated grading are used within schools or vocational institutions. Challenges similar to national ones persist, including limited connectivity in remote areas, insufficient teacher training in AI pedagogy, and absence of county-level policies to support AI in education.

Nonetheless, the county's proactive approach to digital skilling, positions it well for future AI adoption. Given ongoing infrastructure improvements and training initiatives, Taita Taveta could serve as a pilot region for implementing AI-based educational programs in rural Kenya. Research into teachers' readiness, infrastructure adequacy, and learner outcomes would thus fill an important knowledge gap. Across all scales global, national, and county the literature reveals that AI in education is reshaping pedagogical practices, enabling data-driven personalization, and improving administrative efficiency. The degree of transformation varies widely by context. In high-income countries, integration is advanced and policy frameworks are mature, while in Kenya, progress is emerging but constrained by infrastructure, policy, and training challenges. For Taita Taveta, progress is primarily in the foundational phase: improving digital infrastructure, teacher ICT competency, and youth digital literacy. AI-specific adoption remains minimal, pointing to a clear research gap. Future studies should investigate teachers' attitudes, knowledge, and readiness for AI integration, institutional and infrastructural capacity to deploy AI tools, and the pedagogical, ethical, and equity implications of introducing AI in a rural county context.

RESEARCH METHODOLOGY

This study employed a descriptive survey research design. This is because the design allows generalization of research findings to the entire population. The target population comprised of 1200 public secondary school

teachers,80 administrators (principals and deputies) and all County ICT champions. These respondents were selected because they directly engage with digital tools and play a key role in AI adoption within schools. Both stratified sampling and purposive sampling were used to obtain a sample size of 80 teachers and 20 school administrators (principals, deputies and ICT champions). For collection of data, structured questionnaires were used to collect quantitative data from the teachers while Semi-structured interview guides were administered to school administrators and ICT personnel. Validity and reliability of research instruments was effectively done while collected data was analyzed qualitatively and quantitatively using descriptive statistic tools such as frequencies, percentages and pie-charts and the results were presented using tables bar graphs and pie charts.

FINDINGS, DISCUSSION AND CONCLUSIONS

Introductions

This chapter presents the findings, discussion, and conclusion of the study examining the influence of Artificial Intelligence (AI) on education and how it is shaping the future of learning, with a specific focus on Taita Taveta County

Demographic Characteristics of Respondents

Table I Respondents Responses on Gender

Variable	Category	Frequency n=100	Percentage%
Gender	Male	55	55%
	Female	45	45%
Teaching experience	Below 5 years	40	40%
	5-10 years	35	35%
	Above 10 years	25	25%
ICT literacy	Basic ICT skills	75	75%
	AI-specific training	20	20%

The findings indicate a fairly balanced gender distribution.55% and 45% respectively. However, majority of the respondents lack specialized training in AI, highlighting a key skill gap in AI literacy.

Influence of AI on Teachers' Roles and Pedagogical Practices

Table II Respondents response on influence of AI on teachers' pedagogical practices

Aspect	Agree%	Neutral%	Disagree%	Total%
AI enhances lesson planning	65	20	15	100
AI improves student assessment	70	15	15	100
AI increases learner engagement	60	25	15	100
Teachers are adequately trained in AI	20	10	70	100

From the above findings, majority of the teachers acknowledge that AI tools positively influence classroom practices and learner engagement. However inadequate teacher training remains a major barrier to effective adoption of AI in teaching.

Benefits and Challenges of AI Integration in Education

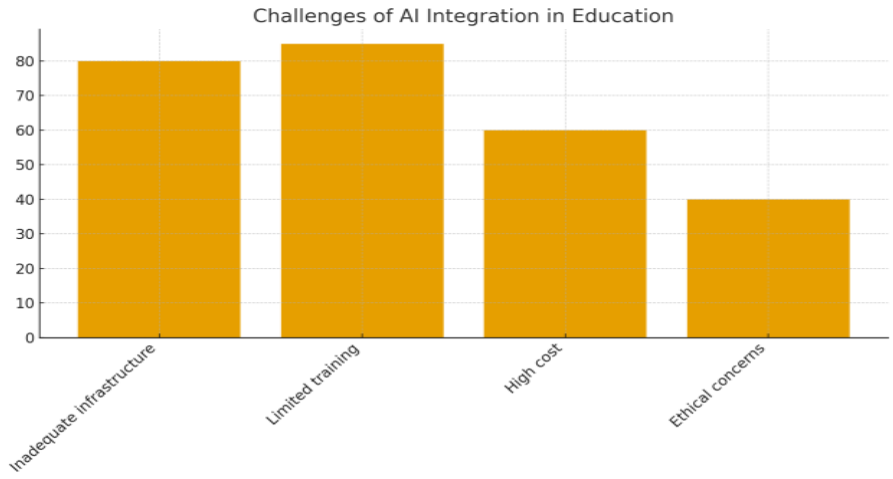

Figure 1. Respondents' responses on benefits of AI integration

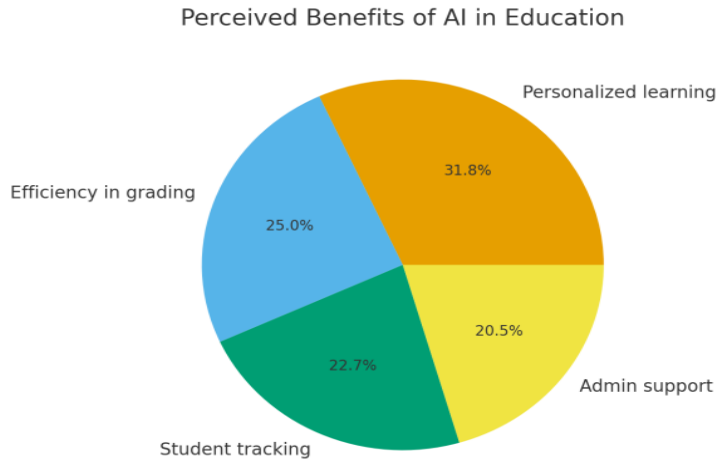

Figure 2. Respondents' Responses on Challenges of AI Integration

From the above findings, 31.8% agreed that AI can tailor lessons to learners' pace and ability while 25% reported improved grading speed and feedback accuracy, AI was also viewed as useful for student data management and performance tracking. However, the integration of AI faces significant challenges: 80% of the respondents indicated that there is inadequate infrastructure, that is; limited internet connectivity, unreliable electricity and lack of AI compatible devices.85% of the teachers indicated limited training, meaning there is no clear structure of AI professional development. Moreover 60% indicated high cost of AI implementation, meaning most schools rely on donor-funded digital projects that are often unsustainable. While 40% of the teachers, suffer the fear of data privacy and job displacement.

In general, these findings mirror UNESCOs (2024) global review, which highlights similar barriers in developing regions. The findings demonstrate that although AI adoption in Taita Taveta County is still developing, teachers recognize its potential to transform educational delivery. However, challenges such as inadequate infrastructure, limited training, and high cost significantly reduce the pace of adoption. The study aligns with global trends indicating that while AI enhances personalization, efficiency, and learner tracking, under-resourced regions struggle to fully harness its benefits.

Future Prospects and Trends of AI in Education

Table III Respondents responses on future trends of AI in education

Future trend	**Agree%**	**Neutral%**	**Disagree%**	
AI will be essential in education within the next decade	72	15	13	
AI can enhance career guidance and counselling	68	20	12	
AI can automate administrative work	60	25	15	
Government should support AI training and infrastructure		85	10	5

From the above findings, 72% of teachers and administrators believe that AI will become essential to education within the next decade, 68% projected that AI could enhance carrier guidance, automate administrative work and improve access to quality education in remote areas. However, 65% emphasized the need for national policy frameworks and county-level capacity-building programs to ensure sustainable adoption. These projections align with global trends identified by OECD (2024) and UNESCO (2023), which predict increased reliance on AI-driven analytics, adaptive learning environments and intelligent tutoring systems. For Taita-taveta county, the success of AI in education will depend on long-term investment in digital infrastructure, teacher training and policy support.

M. Summary of Key Findings

1. AI is beginning to influence teaching and learning in Kenya, but its use in Taita taveta remains limited.
2. Teachers recognize AIs potential benefits but lack the technical capacity and institutional support to implement it effectively
3. Major challenges include inadequate infrastructure, limited AI training and high implementation costs.
4. Future adoption is promising, provided the government strengthens digital literacy programs, invest in infrastructure and establishes clear AI-in-education policies

Conclusion

The findings confirm that while AI holds immense potential to transform education in Taita- Taveta County, its integration is still at a nascent stage. Addressing infrastructural and capacity gaps will be critical for ensuring equitable access to AI-driven learning. With strategic investment, policy alignment and teacher empowerment, AI can indeed shape the future of learning in Kenya and bridge the educational divide between rural and urban regions.

Recommendations

Based on the study findings, the following recommendations are proposed to enhance the adoption of AI in teaching and learning in Taita-Taveta County:

1. The Ministry of Education and Taita- Taveta County government should prioritize investment of AI supportive ICT infrastructure, including reliable internet connectivity, adequate computers and electricity supply in rural areas
2. Schools should adopt low- cost AI- enabled platforms such as adaptive learning apps, automated assessment tools and digital content management systems to improve learning outcomes

3. Schools should create inter-school ICT AI networks where teachers share experiences, challenges and best practices

4. The Teachers Service Commission (TSC) and Kenya Institute of Curriculum Development (KICD) should organize regular teacher training programs focused on AI use in teaching, including automated grading, personalized learning platforms and data analytics.

REFERENCES

1. Aditya, V., & Otermans, P. (2025). Artificial Intelligence and Education in Africa: Opportunities and Challenges. African Journal of Educational Technology, 9*(2), 45–62.
2. Baraka FM. (2019). GESCI Trains Over 200 Teachers in ICT in Taita Taveta County. Baraka FM News.
3. Holmes, W., Bialik, M., & Fadel, C. (2022). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Center for Curriculum Redesign.
4. Karanja, J. (2024). Towards an AI Competency Framework for Educators in Higher Education. Kenya Journal of Education and Technology, ESSRAK
5. Kimutai, P., Langat, F., & Wanjiru, M. (2025). Teachers' Readiness and Perceived Usefulness of AI in TVET Institutions in Kenya. Journal of Technical Education Research, 7(1), 33–49.
6. Matere, L. (2024). The Role of Artificial Intelligence in Enhancing Teaching Effectiveness in Kenyan Universities. Journal of Educational Innovation, 12(4), 55–70.
7. Nguyen, T., & Yuen, K. (2024). Ethical Considerations in AI-Driven Learning Systems. International Review of Education Technology, 18*(2), 87–105.
8. OECD. (2024). Trends Shaping Education 2025. Organization for Economic Co-operation and Development.
9. The Star. (2024, Feb 10). Ajira Digital Program Expands Training in Taita Taveta County. The Star Kenya.
10. The Star. (2025). Government to Introduce AI-Assisted Exam Systems in TVET Institutions. The Star Kenya.
11. Tsavo Media. (2024). Stanbic, Microsoft, and ATC Launch Future Ni Digital in Taita Taveta. Tsavo Media News.
12. UNESCO. (2024). Guidelines on the Use of Artificial Intelligence in Education. United Nations Educational, Scientific and Cultural Organization.
13. Wang'ang'a, R. (2024). Ethical Implications of Generative AI Use Among University Students in Kenya. Kenya Journal of Educational Research, 8(3), 21–37.
14. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic Review of Research on Artificial Intelligence Applications in Higher Education. International Journal of Educational Technology in Higher Education, 16(39).