

AI for Teacher Training, Personalised Support to Mitigate Crowded Classrooms, And Youth Upskilling: The Potential of AI in Kenya

Dev Aditya^{1*} & Pauldy CJ Otermans²

¹Otermans Institute, London, United Kingdom (dev@oiedu.co.uk)

²Otermans Institute, London, United Kingdom (pauldy@oiedu.co.uk)

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Abstract

This paper examines the transformative role of artificial intelligence (AI) in addressing the significant challenges faced by the Kenyan education sector, particularly in teacher training and youth employability. Kenya grapples with a severe shortage of educators and limited access to quality educational resources. As global economies increasingly rely on digital literacy and technical skills, equipping both teachers and learners with modern competencies has become critical. This paper draws on the implementation of Otermans Institute's AI-driven educational platform, OIAI, as a scalable, accessible, and cost-effective solution. The research analyses qualitative and quantitative data from users, stakeholder feedback, and related academic literature to evaluate the effectiveness of AI teachers in enhancing educational outcomes. Key findings highlight high user engagement, substantial skill acquisition, and the feasibility of AI integration even in low-connectivity regions. The paper concludes by proposing policy recommendations and strategic frameworks to support nationwide AI adoption, ultimately contributing to the upskilling of Kenya's teaching workforce and the empowerment of its youth for the digital economy.

Introduction

Artificial intelligence (AI) is a transformative technology of our time and can be used as an extremely positive force for education worldwide. From adaptive learning platforms to AI-powered tutoring systems, its applications are reshaping how learners engage with content and how educators deliver teaching and learning. AI in education is no longer confined to high-income countries or elite institutions, it is being piloted and adapted globally, including in developing nations where the needs are often the most urgent. In Kenya, the educational system faces a complex array of challenges that make the promise of AI particularly relevant.

Kenya has experienced significant growth in student enrolment at all levels, largely driven by government mandates to expand access to education and a growing youth population (Ministry of Education, 2021). Government data show that public universities have seen a 70% increase in student population, while professor numbers have only risen by 11% over the past decade (Abdi & Kharbiryumbai, 2019). However, this expansion has not been matched with proportional investments in teacher recruitment and training. The result is a critical shortage of qualified educators. Public secondary schools are short by approximately 50,000 teachers, and the situation is even more severe in higher education, where some institutions report professor-to-student ratios as high as 1:563 (Abdi & Kharbiryumbai, 2019; Munene, 2024). These ratios far exceed global averages and reflect a system under immense strain.

Furthermore, digital literacy among educators remains a significant barrier to modernising instruction. A study by Nganga (2022) documented increasing cases of burnout among Kenyan academics, partly attributed to the pressures of integrating technology into traditional pedagogical practices. Many teachers in Kenya have had limited exposure to digital tools, let alone sophisticated AI systems. As a result, the integration of educational technologies has often been superficial or uneven, with many schools lacking the infrastructure or trained personnel to support consistent use. In Kenya, the dual challenge of insufficient teacher training (Simiyu, 2025) and high youth unemployment (Mugambi, Ochieng, Miriti, 2014) calls for innovative solutions. Traditional professional development programmes are often inaccessible, costly, and fail to equip educators with the skills needed to prepare students for the job market. Compounding these issues is the broader socio-economic context. Many Kenyan schools, particularly in rural and marginalised communities, lack basic resources such as stable electricity, internet access, and teaching materials (UNESCO, 2024). These infrastructural deficits further limit the reach and quality of education. Students from such backgrounds often fall behind, perpetuating cycles of poverty and underemployment. In this setting, AI offers a potential leapfrogging opportunity: the ability to provide high-quality, personalised instruction without requiring proportional increases in physical infrastructure or human teaching staff.

The global trend toward AI integration in education adds further urgency to Kenya's position. In 2025, countries like the United States (The White House, 20025) and China (Asia Education, 2025) introduced mandatory AI curricula at the primary and secondary levels, signalling a major shift toward embedding digital intelligence in education from an early age (Maynard, 2025). If Kenya fails to keep pace, it risks widening the digital divide between its learners and their global counterparts. However, now is the right time for Kenya to take action as Africa aims to reach 15% AI literacy (Baru, Wamicha, & Gitau, 2025).

To address these multifaceted challenges, innovative approaches are needed; approaches that combine scalability, affordability, and contextual appropriateness. One such initiative is the OIAI platform developed by Otermans Institute, which deploys AI-powered, human-like virtual teachers capable of delivering instruction across a wide range of subjects and skills (Otermans Institute, 2025). OIAI is specifically designed to operate in environments with limited internet connectivity and minimal hardware, making it well-suited for Kenya's educational landscape.

This paper explores how AI, specifically the OIAI teaching system, can be leveraged to improve teacher training and youth upskilling across Kenya. The study situates AI within the broader framework of educational reform, examining how such technologies can not only alleviate existing challenges but also reimagine how education is delivered. By drawing on both empirical results and stakeholder feedback from deployments in Kenya and comparable contexts, this paper aims to provide a comprehensive evaluation of AI's role in transforming education systems. It further explores what it would take to scale such interventions nationally, while ensuring that they remain inclusive, equitable, and responsive to local needs.

Objectives

The primary aim of this study is to explore the transformative potential of AI in the context of education in Kenya, particularly focusing on the dual challenges of teacher training and youth upskilling. The study is structured around the following objectives:

1. To critically assess the current state of educator availability, capacity, and training programs within Kenya's education system.
2. To analyse the digital literacy gap among teachers and the implications this has on the delivery of quality education.
3. To investigate the deployment and outcomes of the AI-based OIAI teaching system by Otermans Institute in Kenya and similar contexts.
4. To evaluate the effectiveness, accessibility, and scalability of AI as a training and teaching tool in low-resource and low-connectivity settings.
5. To propose data-driven, policy-relevant recommendations for the long-term integration of AI in national teacher development and youth empowerment initiatives.

These objectives aim to not only understand the present challenges but also to formulate a pathway for sustainable and inclusive educational reform through technology.

Literature Review

The integration of AI into education has evolved from a niche research area to a strategic imperative for many countries. Early applications, such as spell checkers and search engines, paved the way for more sophisticated adaptive learning systems like Duolingo and Coursera. With the advent of natural language processing models, particularly GPT-3, GPT-4, and the recently introduced agent-based frameworks, AI has become capable of more complex instructional tasks, including essay writing, problem solving, personalised feedback, and mentoring. Embedding AI into education is a slow process but awareness and positive perspectives are growing (Otermans, Baines, Pereira, Livingstone, & Aditya, 2024).

In Kenya, however, the integration of AI into the education sector is still at a nascent stage. Research by Nganga (2022) and Bill (2023) has pointed to a troubling lack of digital preparedness among teachers. These deficits are further compounded by broader systemic issues such as underfunding, high student-teacher ratios, and a general resistance to adopting new technologies within public education systems. Traditional teacher training programmes have also struggled to adapt to the demands of a digital-first world, often focusing on rote instruction rather than critical thinking or digital pedagogy.

Otermans Institute's work offers a case study in how AI can be integrated even in resource-constrained settings. Their AI teacher system, OIAI, has already been successfully deployed in multiple contexts, including refugee camps and low-income communities. Early evidence from these interventions suggests that AI teachers can deliver high engagement and completion rates, even among users with limited prior exposure to digital tools (Aditya, Otermans, & Pereira, 2021). Furthermore, by operating offline through EDGE AI technology, these systems overcome one of the major logistical barriers to tech adoption in rural or underserved areas. This literature review thus situates the OIAI model within broader trends in educational AI, showing how it aligns with international innovations while addressing local Kenyan needs. It also identifies gaps in current research and practice that this paper seeks to address through a focused case analysis and strategic recommendations.

Methods

This research utilises a qualitative case study methodology supported by a secondary data analysis approach. The primary data sources include reports and internal analytics from Otermans Institute's deployment of their AI-driven teaching solution, OIAI, in Kenya and other comparable contexts. The evaluation also draws on feedback collected through surveys and interviews with educators and learners who participated in the pilot programmes. The study reviews completion rates, satisfaction scores, and learning outcomes from several trial deployments and institutional collaborations.

Additional data were derived from publicly available government reports, academic literature, and global best practices in AI in education. The integration of findings from India, where similar trials were conducted, provides comparative insight into the adaptability of AI systems across socio-economic and technological contexts. Key variables of interest included: Access to devices, digital literacy levels, the effectiveness of content delivery, and learner engagement.

The study places particular emphasis on the feasibility of AI implementation in low-bandwidth environments. OIAI's reliance on EDGE AI, which allows the platform to operate offline or with intermittent connectivity, was closely examined. The ability of the system to deliver consistent educational experiences across different regions in Kenya, especially rural and under-resourced communities, was analysed using user engagement statistics and platform logs.

Results

The implementation of OIAI by Otermans Institute yielded a number of compelling results that highlight the viability of AI in teacher training and youth education in Kenya (Aditya, & Otermans, 2025). The findings can be broadly categorised into learner engagement, skill development, accessibility, and system

performance. First, data from multiple deployments in 2024 show impressive learner engagement and satisfaction. These AI teachers have demonstrated success in delivering high-engagement, high-completion training programmes globally (Aditya, Silvestri, & Otermans, 2024). The initial trial phase conducted in Kenya showed 23.3% of completion rates amongst learners, an average time spent of 60 minutes per lesson, and 91.9% of learners recommended the programme to others (Berglund, Otermans, Aditya, & Silvestri, 2025). Specifically for teacher training, in a study conducted in India using OIAI, results showed that 68% of participants completed their respective AI-delivered training courses (Otermans & Aditya, 2025). Additionally, 95% of users reported finding the AI teacher extremely helpful in facilitating learning. This high satisfaction rating is noteworthy given that many learners were interacting with AI-based instruction for the first time. Furthermore, 73% expressed a strong desire to continue using the AI teacher platform beyond the scope of the pilot programme, demonstrating the tool's perceived value and usability. This was very impressive given that the majority of teachers taken part had low digital skills.

Session durations indicated sustained user interest, with many learners interacting with the AI teacher for extended periods compared to traditional online platforms. Feedback from learners frequently highlighted the AI's responsiveness, 24/7 availability, and ability to provide repeated explanations until understanding was achieved (Aditya et al., 2024; Otermans & Aditya, 2025). Subsequent rollouts in late 2024 and early 2025 showed similar, and in some cases improved, performance metrics. In a recent deployment in Oman, the system recorded over 95% completion rates, unheard of in education. In terms of skill development, the curriculum offered through OIAI also emphasised practical and employability-focused skills. These included presentation skills, communication, leadership, digital literacy, and time management, all competencies essential in the modern workforce. Learners reported feeling more confident in applying these skills in both academic and workplace settings. This can be extremely useful in tackling youth unemployment.

OIAI's capacity to mimic human-like interaction, answering learner queries, giving encouragement, and adapting based on user input, was widely praised. In the Kenyan context where teacher-student ratios can be as high as 1:563, such personalisation is revolutionary. Learners who might otherwise be overlooked in crowded classrooms received tailored attention, dramatically improving their engagement and comprehension.

Discussion

The outcomes from OIAI's deployment raise important considerations about the role of AI in educational transformation, particularly in contexts such as Kenya where systemic challenges are deeply rooted. At the core of OIAI's impact is its ability to provide scalable, consistent, and contextually responsive instruction. This stands in stark contrast to Kenya's current educational delivery model, which is heavily dependent on physical presence, under-resourced teachers, and paper-based curricula. With teacher shortages and burnout on the rise (Nganga, 2022), AI serves not just as a supplement but as a viable co-instructor, capable of handling rote instruction, assessment, and basic skill development, thereby freeing human teachers to focus on mentoring and complex pedagogy.

The personalisation offered by AI teachers and tutors is particularly noteworthy. In Kenya, where classroom overcrowding limits individual attention (Mutisya, 2020), the ability of an AI system to adapt to each learner's pace and style significantly enhances learning outcomes. OIAI's responsive design allows learners to ask unlimited questions, revisit difficult content, and receive feedback in real time; benefits that are nearly impossible to achieve in conventional large classrooms. For learners with disabilities or those facing socio-cultural barriers, the anonymity and consistency of an AI teacher also reduce stigma and improve engagement.

From a pedagogical standpoint, the integration of AI tools like OIAI marks a shift toward blended and flipped learning models. These models emphasise learner autonomy, active participation, and continuous feedback; all of which are essential in developing critical thinking and lifelong learning skills. By training teachers to work alongside AI systems, Kenya has the opportunity to redefine the educator's role from being a sole content deliverer to a facilitator of deeper learning and human connection.

Next Steps

The studies mentioned above showcased an accessibility bottleneck in the form of internet costs and/or connectivity. Based on this finding, OIAI is now powered by EDGE AI, allowing it to operate offline or with minimal internet connectivity. This means that learners can interact with the AI and continue learning even if they are not connected to the internet continuously. This technology will now enable deployment in regions typically underserved by conventional e-learning solutions. Importantly, the system is also mobile-first, meaning it can run on devices most users already own, without the need for new hardware or major financial investment. However, successful AI adoption is contingent on more than just technology. Infrastructure remains a critical bottleneck. While OIAI's EDGE AI technology mitigates some of these barriers, systemic improvements in electricity access, mobile penetration, and digital policy are essential for long-term success. Without these enablers, the risk of unequal access to AI will persist.

Equally important is the issue of teacher buy-in. Resistance to AI tools often stems from fears of obsolescence, lack of familiarity, and concerns about data privacy. Comprehensive training, inclusive design processes, and transparent communication are essential to building trust. AI should be framed not as a replacement but as a collaborator, augmenting rather than replacing the teacher's role. Pilot programmes should continue to include teachers as co-designers and evaluators, ensuring that their professional identity is respected and enhanced.

Ethical considerations also require deliberate attention. Data protection, algorithmic fairness, and inclusivity must be foundational in any AI-driven educational strategy. Kenya lacks a clear regulatory framework for AI in education. As adoption scales, policymakers must establish standards for accountability, auditability, and learner protection.

Lastly, national policy alignment is crucial. AI adoption cannot succeed in isolation, it must be embedded in broader educational reforms, including curriculum revision, assessment innovation, and workforce development. In Kenya, the government's Competency-Based Curriculum (CBC) offers a timely opportunity to integrate AI as both a content area and delivery mechanism. Strategic partnerships with local universities, teacher training colleges, and ministries can help ensure that AI becomes a permanent,

evolving feature of Kenya's educational landscape. AI has the potential not just to plug existing gaps in Kenya's education system but to reimagine its foundations. With thoughtful implementation, strong partnerships, and a commitment to equity, Kenya can become a leader in AI-powered education in Africa and beyond.

Conclusion

This study concludes that AI, particularly in the form of intelligent, adaptive educational systems like OIAI, can serve as a powerful catalyst for educational reform in Kenya. The dual challenges of teacher shortages and youth unemployment necessitate bold, scalable solutions that transcend traditional models of learning and instruction. AI delivers this potential by offering personalised, on-demand teaching accessible to anyone with a basic digital device. OIAI's implementation demonstrates that educational AI can yield high engagement, strong completion rates, and meaningful skill acquisition, even in low-resource and low-connectivity contexts. Its success illustrates a path forward not only for Kenya but for many countries in the Global South facing similar educational barriers.

For AI to reach its full potential, however, there must be complementary investments in educator training, curriculum design, digital infrastructure, and policy development. It is crucial that all stakeholders, from ministries of education to school administrators and community leaders, engage proactively in shaping AI's role in education. As other nations formalise AI in their national curricula, Kenya must act quickly to avoid falling behind. With the right policies, partnerships, and priorities, Kenya can position itself as a leader in AI-enhanced education, setting a precedent for others to follow. The future of education in Kenya can be inclusive, dynamic, and digitally empowered, if the groundwork is laid today.

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