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Review Article

Integrating Artificial Intelligence into Instruction: A Practical Framework for Kenyan Primary and Secondary Schools

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Abstract: Artificial intelligence (AI) tools are becoming an established feature of teaching and learning environments worldwide, and Kenyan primary and secondary schools are not exempt from this shift. This article examines the practical integration of AI into instruction within the Kenyan basic education context, drawing on classroom-oriented evidence and policy developments to move the discussion beyond abstract debate toward actionable practice. It considers how AI tools support teachers in curriculum and lesson planning, classroom management, and workload reduction, and how they support learners through personalisation, immediate feedback, accessibility, language translation, and engagement. The article also identifies the literacy, ethical, and interpersonal skills that learners require alongside AI use, situating these within Kenya's Competency-Based Curriculum. It further examines persistent challenges, including limited teacher training, infrastructural gaps, academic integrity risks, and the danger of over-dependence on technology, before outlining the institutional and policy conditions necessary for responsible integration. The article concludes that AI-enhanced instruction, when deployed thoughtfully and paired with deliberate investment in teacher capacity and infrastructure, offers a scalable means of easing the burden on educators managing large and diverse classrooms while preserving the relational and mentoring role that only human teachers can provide.

Keywords: Artificial intelligence, AI-enhanced instruction, Kenyan education, Competency-Based Curriculum, personalised learning, teacher workload, mobile learning.

1. INTRODUCTION

Tools that use artificial intelligence to support teaching and learning are now widely available, and their presence in classrooms is expanding quickly. In much the same way that the arrival of the internet reshaped teaching practice a generation ago, AI is beginning to reshape it again (Fundi *et al*., 2024). For Kenyan basic education, the pertinent question is no longer whether these tools will be present in classrooms, but how they can be integrated deliberately for the benefit of learners.

Kenyan teachers frequently manage large classes composed of learners with varied ability levels and needs. Within this reality, AI tools carry genuine practical value: they can ease the burden of managing diverse classrooms, personalise instruction to individual learners' pace and needs, make lessons more engaging, reduce administrative load, and widen access to learning materials. This article sets out a practical account of how these possibilities are already materialising in Kenyan schools, the skills learners need to use AI responsibly, the risks that must be managed, and the conditions required for integration to succeed.

2. Understanding and Applying AI-Enhanced Instruction

AI-enhanced instruction refers to the use of artificial intelligence tools to support the work of teachers and to improve how learners engage with content. These tools range from systems that generate quiz questions and revision notes to applications that simplify complex texts for learners reading below grade level. Within an education system built around personalised, competency-based outcomes, AI is well suited to adapting to individual learner needs and offering the kind of individualised attention that would

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otherwise require sustained one-on-one contact with a teacher (Kaswan *et al*., 2024). Importantly, AI tools do not substitute for the teacher. Rather, by taking on repetitive and data-intensive tasks, they free educators to concentrate on the aspects of instruction that depend on human judgement, emotional sensitivity, and relationship-building, which no automated system can replicate.

This support is most concrete in curriculum and lesson planning. Several categories of AI tool now assist teachers in developing lesson materials efficiently. General-purpose generative AI platforms allow an educator to input a topic or passage of text and receive automatically generated quiz questions, simplified explanations, or revision notes. Source-grounded tools that work from uploaded course materials can generate study guides and assessments aligned to what has actually been taught, which the teacher can then refine for the class. In better-resourced schools, adaptive lesson-authoring platforms allow teachers to build online activities that adjust automatically to each learner's performance level.

In rural areas or schools without a computer laboratory or dependable internet connection, integration increasingly relies on a low-bandwidth, mobile-first model. Kenyan educators can access AI platforms through personal smartphones and web browsers, or through purpose-built services such as M-Shule, which delivers adaptive, AI-driven learning content over basic SMS to learners who need nothing more than a phone capable of sending and receiving text messages (Engineers Without Borders Canada, n.d.; UNESCO Institute for Lifelong Learning, n.d.). Founded in 2017 to reach Kenyan learners in low-connectivity settings, M-Shule combines artificial intelligence with SMS delivery to tailor curriculum-aligned micro-lessons to each learner's demonstrated level of mastery (EdTech Hub, 2022). Teachers in such settings can use mobile AI tools to outline lesson structures, generate short targeted quizzes, or obtain simplified explanations of complex topics, and then transfer these materials to the classroom chalkboard, extending the benefits of AI without requiring elaborate institutional infrastructure. Collectively, these tools assist the planning phase of lesson design by identifying learning needs, suggesting objectives, and accelerating the production of teaching materials, which reduces the time teachers spend on administrative preparation and increases the time available for direct engagement with learners.

Beyond planning, AI is also reshaping classroom management. In large classrooms, AI-enabled dashboards can provide real-time tracking of learner engagement and performance, allowing teachers to identify struggling students without waiting for end-of-term examinations to reveal learning gaps. This diagnostic capability supports mid-lesson adjustments to pacing or ability grouping, offering a form of oversight that would be difficult to sustain manually in crowded classrooms.

A further, and increasingly well-evidenced, benefit lies in reducing teacher workload. Survey data from higher education instructors using generative AI daily report a marked decrease in workload (D2L & Tyton Partners, 2025), and controlled studies of tools like ChatGPT have found reductions in lesson-preparation time of up to 31 per cent (Greenhouse Learning, 2025). AI systems can instantly grade multiple-choice assessments, track attendance trends, and organise performance records, work that previously consumed hours of teachers' time (Prahani *et al*., 2025). By automating this data entry, AI frees teachers to focus on student relationships and to provide the kind of personalised feedback that only a human teacher can give, which is of direct practical relief to educators managing heavy workloads across large classes.

3. How AI Supports Student Learning and the Skills It Requires

AI tools analyse individual learners' pace, strengths, and weaknesses to tailor instruction accordingly. Intelligent tutoring systems for mathematics, such as MATHia, offer interactive, one-on-one tutoring experiences that map customised learning paths and generate step-by-step hints based on the specific errors a learner makes. Independent, large-scale randomised evaluation of Carnegie Learning's blended approach, funded by the United States Department of Education and involving more than 18,000 students across 147 schools, found that it nearly doubled growth in standardised test performance, with the strongest gains among students who entered with the lowest scores (Carnegie Learning, n.d.). Subsequent analysis of MATHia usage data has linked greater engagement with the system to stronger later performance in Algebra I, an effect that was more pronounced for historically underserved students (Carnegie Learning, 2021).

For schools and homes with limited internet access, M-Shule's SMS-based delivery model performs a comparable role, automatically adjusting the difficulty of subsequent questions to match a learner's demonstrated skill level (EdTech Hub, 2022). Such systems allow a learner who is struggling with foundational material to receive targeted practice, while a faster learner is accelerated to more advanced content, a form of differentiation that a single teacher cannot easily sustain across a large, mixed-ability classroom.

Alongside personalisation, AI systems can provide instant grading and correction, in contrast to the delay that typically accompanies manual marking. Conversational AI tools allow learners to submit essays or worked mathematics steps and receive immediate feedback, which helps prevent the reinforcement of mistakes and consolidates correct understanding while the material is still fresh. This immediacy is particularly

valuable in large classes, where a teacher cannot feasibly provide individual written feedback after every activity.

AI also widens access to learning for students who would otherwise be left behind. Text-simplification tools allow complex academic content to be rewritten at a lower reading level without altering its core facts, which directly benefits learners who lag in content-heavy subjects such as physics or history because of reading difficulties; by working from a simplified version of the standard curriculum text, such learners can master the required subject knowledge while continuing to build their underlying language skills. In a similar vein, AI translation tools can convert teaching slides, textbook chapters, and test questions into Kiswahili and other local languages in real time, helping to ensure that learners whose primary home language is not English can fully engage with academic content. This form of automated language support has been identified by UNESCO as a priority area for AI integration in African classrooms with linguistically diverse learner populations, alongside the translation of learning resources into national languages more broadly (UNESCO, 2025).

A further contribution lies in student engagement. AI applications can turn passive reading into interactive study activity, for example by transforming class notes into flashcards and revision games, or by acting as a virtual coaching companion that engages learners through guided questioning rather than simply supplying answers. Evidence on this style of Socratic AI tutoring is still developing. Khan Academy's own longitudinal testing of its Khanmigo tutor across more than fifteen million tutoring interactions over a six-month period reported a 6.1 per cent improvement in next-item correctness following iterative product refinement (Khan Academy, 2026), while independent academic evaluation comparing Khanmigo to unassisted search found significant learning gains across all study conditions without a statistically significant advantage for the AI tutor specifically (Slijepcevic & Yaylali, 2025). This mixed picture suggests that engagement-oriented AI tools show real promise but should be treated as a complement to, rather than a replacement for, sound pedagogy, with their impact monitored rather than assumed.

None of these benefits, however, is sufficient on its own. Learners require three related sets of skills to use AI well and responsibly, each of which aligns closely with the core competencies emphasised by Kenya's Competency-Based Curriculum (CBC), which was itself designed to embed digital literacy across learning areas (Fundi *et al*., 2024). The first is the ability to read and evaluate information critically. Learners must learn to question what they read, whether it originates from a human author or an AI system, and to cross-check facts against multiple sources in order to identify inaccurate or fabricated AI output. In practice, a teacher can build this capacity by asking learners to verify an AI-generated summary using a second source, integrating digital literacy directly into standard English or Social Studies lessons.

The second is responsible use. Learners must understand that AI tools are aids to learning rather than substitutes for the learner's own work. Where a learner submits AI-generated work without engaging with its content, this constitutes academic dishonesty and undermines the learner's own education. This concern is well documented in the academic integrity literature: a recent systematic review found that while generative AI creates new opportunities for a decline in submission originality, it can equally be harnessed to strengthen the detection and prevention of misconduct when institutions adopt clear, purpose-built policies rather than relying on tools designed for an earlier, pre-AI era of plagiarism (Balalle & Pannilage, 2025). Teachers can establish clear classroom rules specifying when AI use is permitted, such as for guided brainstorming, and when tasks must be completed independently to ensure genuine learning takes place.

The third is the cultivation of distinctly human skills. As automated tools take on routine tasks such as summarising or correcting basic grammar, the skills that matter most are those that machines cannot replicate: critical thinking, creativity, and teamwork. Schools should design group tasks, such as science projects or classroom debates, that require learners to cooperate, communicate, and solve problems together, so that human interaction is not displaced by increased screen time.

4. Challenges That Must Be Acknowledged

Several challenges must be addressed for AI integration to succeed in the Kenyan context.

First, limited teacher training remains a significant constraint. Kenyan research indicates that AI is not currently part of the formal teacher training curriculum, and that professional development opportunities in this area remain inadequate for both pre-service and in-service teachers (Fundi *et al*., 2024). A national survey of 308 in-service teachers across 37 counties found that confidence in using AI, understanding of AI ethics, and social norms around its use were the strongest predictors of teachers' readiness to integrate it into their teaching, more so than general attitudes toward the technology (Fundi *et al*., 2024). Without structured, hands-on training, AI tools will either be used poorly or ignored.

Secondly, academic dishonesty and data privacy present a related concern. The ease with which AI can generate text raises the risk of plagiarism, while the use of online platforms raises legitimate concerns about the handling of learners' personal data. Institutions need explicit policies on both fronts, developed specifically for the realities of generative AI rather than

adapted from earlier plagiarism frameworks (Balalle & Pannilage, 2025).

On another note, the infrastructure gap continues to limit how far AI can reach. Frequent power interruptions, weak mobile network coverage, and a shortage of smartphones and computers continue to prevent many rural Kenyan schools from using AI tools reliably. Kenya's own AI Strategy acknowledges this gap and has committed substantial public investment to expanding digital infrastructure, including broadband expansion and new digital innovation hubs, as part of a ten-year effort to close it (OECD.AI, 2025).

In addition, over-dependence on technology is a genuine risk. Excessive reliance on digital tools risks weakening learners' independent thinking skills and reducing the quality of face-to-face interaction between learner and educator, a concern raised consistently in the regional literature on AI adoption in African higher education (African Population and Health Research Center, 2025).

Finally, and most importantly, AI cannot replace teachers. AI should function as a support tool rather than a substitute for the instructor. A computer program can deliver data and grade quizzes, but it cannot replace the mentoring, encouragement, and moral guidance that only a human teacher provides.

5. Conditions for Successful AI Integration

Drawing together the evidence above, several conditions appear necessary for AI integration to succeed in Kenyan schools.

First, continuous and practical professional development is essential. Teachers need hands-on training in using specific AI tools to build lesson plans and assessments, rather than one-off workshops. Training should cover effective prompting, evaluation of AI output for accuracy, and integration of mobile AI applications into specific subject areas, consistent with UNESCO's regional guidance on building national AI competency frameworks for teachers (UNESCO, 2025).

Secondly, clear ethical and institutional frameworks are needed. Schools and education authorities need explicit guidelines on the acceptable use of AI platforms, defining the boundary between AI-supported learning and academic dishonesty, and setting data protection standards for the use of public AI tools by learners and staff.

On another note, accessible digital infrastructure remains the baseline requirement. Stable electricity, functioning devices, and reliable mobile data remain the baseline requirements for AI systems to function at all. Implementation plans should prioritise low-bandwidth, offline-capable options, such as SMS-based platforms, for schools that lack a computer laboratory or a formal network, in line with Kenya's stated national digital infrastructure priorities (OECD.AI, 2025).

In addition, collaboration between educators and technical teams matters. Decisions on which AI software to adopt should actively involve classroom teachers rather than technology administrators alone, since educators understand day-to-day classroom dynamics and can ensure that chosen systems address genuine instructional challenges.

Finally, routine performance monitoring of AI tools is necessary. Institutions should consistently measure whether AI-enhanced tools are improving learner understanding, using concrete metrics such as test scores and engagement levels, rather than assuming that the presence of a tool equates to academic progress. This caution is well supported by the evidence: Khan Academy's own testing of Khanmigo required systematic, iterative measurement to achieve modest gains (Khan Academy, 2026), while independent academic evaluation of the same tool found no statistically significant advantage over conventional study methods in a controlled comparison (Slijepcevic & Yaylali, 2025).

6. Practical Recommendations for the Kenyan Context

Given that AI use in teaching and learning is now an established reality, several practical steps are recommended.

First, schools should prioritise low-cost, mobile AI tools. Digital integration should begin by training teachers on platforms that run effectively on personal smartphones, ensuring that schools without computer laboratories or institutional infrastructure can still benefit from AI-supported classroom preparation.

Secondly, AI should be deployed to reduce administrative workload. AI use should be directed toward automating repetitive tasks in large classes, such as generating quiz questions, drafting lesson plans, and creating assessment rubrics, freeing teacher time for direct mentoring and interactive classroom tracking.

On another note, AI literacy should be integrated into existing CBC strands. Rather than treating AI as a separate subject, curriculum developers should embed digital literacy, effective AI instruction-writing, and fact-verification skills into existing learning areas such as English, Social Studies, and Life Skills from the upper primary level onward.

In addition, AI reading support should be targeted to diverse classrooms. Text-simplification tools should be introduced in classrooms with mixed reading abilities so that teachers can quickly generate lower-reading-level versions of complex texts, allowing struggling readers to access core curriculum content while continuing to build language skills.

Furthermore, frontline institutional AI guidelines should be established. Education officers and school leaders should collaborate to draft clear rules on acceptable AI use before introducing the technology, defining the boundary between AI-assisted study and academic dishonesty and setting protocols for safeguarding learner data.

Moreover, continuous evaluation of AI performance should be implemented. School administrators should establish basic tracking routines to measure whether specific AI tools are improving test scores and engagement, adjusting usage based on direct feedback from teachers and learners rather than assuming automatic benefit.

Finally, face-to-face instructional time must be protected. AI integration should never reduce time allocated to physical classroom discussion, group activity, and peer collaboration, which remain essential to the social and communication skills that only in-person schooling can fully develop.

7. CONCLUSION

The integration of AI into primary and secondary school instruction represents a practical step toward more responsive, inclusive, and efficient education in Kenya. When thoughtfully deployed, AI tools can ease the burden on teachers managing large and diverse classrooms while enabling more personalised and accessible learning experiences for learners at every ability level. Realising these benefits, however, depends on deliberate investment in teacher training, clear institutional policy, and infrastructure that reflects the realities of rural and under-resourced schools. The evidence reviewed here indicates that AI tools deliver genuine, measurable benefits, from reduced teacher workload to improved access for learners facing language or literacy barriers, but that their impact on deeper learning outcomes remains an active area of research rather than a settled conclusion. AI should therefore remain a tool in service of human teaching, subject to ongoing evaluation, and never a replacement for the relationships, mentorship, and moral guidance that only educators can provide.

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