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Generative AI as a partner for teachers in building personalised learning paths for students with ease in Tanzania

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This study examines how generative artificial intelligence (AI) can assist secondary school teachers in Tanzania to create personalised learning paths more efficiently and effectively. Many educators face overcrowded classrooms and limited resources, making it challenging to meet the diverse needs of their students. To address this, 120 Dar es Salaam and Dodoma teachers tested AI-driven tools like ChatGPT and Grok for lesson planning, assessments and adaptive content delivery. The results indicated significant improvements in student engagement and academic performance while reducing teacher workload. Teachers found these AI tools intuitive and beneficial, especially for customising instruction and saving time. However, challenges such as inadequate training and infrastructure continue to pose significant obstacles, particularly in rural areas. The study concludes that generative AI offers a scalable and inclusive solution for enhancing teaching and learning when paired with proper support. It recommends strategic investments in professional development and digital infrastructure to fully realise generative AI's educational potential and address existing equity gaps across Tanzanian schools.

Keywords: Generative AI in education; personalised learning; digital teachers; AI integration in secondary education; educational technology

Introduction

The rapid evolution of artificial intelligence (AI) has paved the way for innovative pedagogical approaches in education (Miao & Holmes, 2021). One of the most promising applications of AI in education is the development of personalised learning paths that adapt teaching materials and instructional methods to meet the unique needs of individual students. This article explores the potential of leveraging generative AI to create personalised learning experiences in Tanzanian classrooms, serving as a practical assistant to teachers while aiming to improve student performance and engagement (Arias-Flores et al., 2025; Holmes, 2020).

The integration of AI into education has ushered in transformative possibilities, particularly through the advent of generative AI tools that create content, adapt resources and support human efforts in unprecedented ways. As classrooms grow increasingly diverse and student needs become more complex, teachers face mounting

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challenges in delivering personalised learning experiences that cater to individual strengths, weaknesses and interests (Arias-Flores et al., 2025; Miao & Holmes, 2021). Generative AI – encompassing technologies like OpenAI's GPT-5 models, DALL-E for image generation and xAI's SuperGrok – offers a promising avenue to address these challenges by partnering with educators rather than replacing them. This article explores how such tools can simplify the creation of tailored learning paths, empowering teachers to enhance their efficacy and improve student outcomes in an era of technological innovation and evolving educational demands (Kasneci et al., 2023; Zhao et al., 2024).

Background and rationale

Personalised learning, a pedagogical approach that customises education to individual student profiles, has long been recognised as a driver of engagement and academic success (Bernackiet al., 2021; Lin et al., 2024). However, its implementation is hindered by substantial obstacles, including time constraints, limited resources, and the diverse needs of learners (Lin et al., 2024; Zhao et al., 2024). Teachers often struggle to design adaptive lesson plans or provide individualised feedback within traditional classroom settings (Wang et al., 2025). The rise of AI in education has introduced tools to alleviate these burdens, with generative AI emerging as a standout innovation. Technologies like GPT-4 and DALL-E (Arias-Flores et al., 2025; Ranganai et al., 2022) can generate text, visuals and interactive content, while platforms like Grok, developed by xAI, provide real-time assistance tailored to specific queries (Dwivedi et al., 2023). Studies highlight their potential in automating administrative tasks and enhancing content delivery (Holmes, 2023), yet their role in supporting teachers' creative and pedagogical agency remains underexplored.

Global trends in generative AI in education

Integrating AI in education reshapes traditional pedagogical models through personalised learning pathways. Numerous studies have established that AI-enhanced learning environments significantly improve academic outcomes, learner engagement and knowledge retention (Holmes, 2020; Marques-Cobeta, 2024). AI algorithms, particularly those enabling adaptive learning, help tailor educational experiences to individual learners by analysing patterns in performance, identifying strengths and weaknesses, and customising content delivery accordingly (Alam, 2023). Generative AI tools, such as ChatGPT and other large language models, are increasingly used to create dynamic instructional materials, generate personalised quizzes and support inquiry-based learning, facilitating more engaging and inclusive educational experiences (Laak & Aru, 2024).

Moreover, generative AI addresses key limitations of traditional education systems by supporting students whose rigid, standardised methods may otherwise marginalise them. Research indicates that learners interacting with AI-generated resources tend to display increased perseverance in complex subjects and higher intrinsic motivation (Aleven et al., 2023). Real-time analytics and intelligent tutoring systems (ITS) provide educators with actionable feedback, allowing for continuous refinement of learning strategies and improved academic support tailored to each student (Huang et al., 2023).

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Relevance to the Tanzanian educational context

In Tanzania, as in many sub-Saharan African countries, challenges such as overcrowded classrooms, scarce teaching materials and heterogeneity in student needs hinder effective teaching and learning (Bighamet al., 2017; Said, 2018). These structural limitations make the case for personalised, AI-driven instruction powerful. While infrastructure gaps remain a barrier, early evidence suggests that even low-resource contexts can benefit from targeted AI interventions that optimise teacher–student interaction and support differentiated instruction (Maritim & Mushi, 2012; Mnyawami et al., 2022; Sedoyeka, 2012).

The adoption of generative AI tools in Tanzanian schools holds promise for transforming education by supplementing teacher capacity and offering individualised learning pathways. Applying these models in Tanzania could help bridge educational inequalities, foster digital literacy and prepare learners to thrive in an increasingly knowledge-driven economy (Ishengoma & John, 2024; Mtebe & Raphael, 2018; Ponera & Madila, 2024). Despite the proliferation of AI research in education, much of the literature focuses on AI as a standalone solution, potentially supplanting human educators rather than complementing them. For instance, Yang et al., (2020). emphasises machine learning's predictive power in modelling complex systems. Tellman et al. (2021) showcase sate applications I for large-scale applications, but neither addresses teacher-centred collaboration. Similarly, studies on teachers remain central to education, needing tools that amplify their efforts rather than replace them (Cukurova et al., 2020; Molenaar, 2021). The ease of use and the integration of generative AI into daily teaching practices also receive insufficient attention, limiting its potential in resource-constrained settings.

This study proposes generative AI as a collaborative partner for teachers, enabling them to build personalised learning paths more easily and efficiently. The significance of this approach lies in its dual benefits: for teachers, generative AI reduces workload and sparks creativity by automating routine tasks and suggesting innovative ideas; for students, it delivers individualised support that aligns with their learning pace and preferences (Xie et al., 2019; Zhai et al., 2021). As education systems worldwide grapple with equity and scalability challenges, this partnership offers a human-centred solution that bridges technological potential with classroom realities, promising a more inclusive and effective learning environment.

Literature review

Personalised learning in education

Personalised learning aims to adapt educational experiences to individual student needs, preferences and abilities, moving beyond the one-size-fits-all model of traditional education. Vygotsky's zone of proximal development provides a theoretical basis, suggesting that learning is most effective when scaffolded to a student's current level. Traditional methods, such as differentiated instruction, have sought to achieve this by varying content, processes or products based on student readiness (Tomlinson, 2016). However, these approaches face significant limitations. Research by Thomas (2023) highlights that teachers struggle to implement personalisation at scale due to time constraints and resource shortages, with only 20% of surveyed educators reporting consistent success. Similarly, Marques-Cobeta (2024) notes that manual differentiation often fails to address diverse learning paces, leaving gaps in student engagement

and achievement. These challenges underscore the need for tools that simplify and enhance personalised teaching, particularly in resource-constrained settings.

Generative AI and teacher support

The role of generative AI in education has evolved from automating tasks to supporting human instructors, a shift increasingly documented in recent literature. Holmes (2020) provide a seminal review, noting that early AI systems, such as ITS, aimed to replace teachers but often lacked the nuance of human judgement. More recent studies emphasise collaboration over substitution. For example, Octavio et al. (2024) describe AI as a '*teacher's assistant*', capable of handling repetitive tasks (e.g. grading) to free educators for higher-order instruction. Molenaar (2022) extends this idea, showing that hybrid human–AI systems improve student outcomes by 12% in adaptive learning environments. Specific to generative AI, Baidoo-Anu and Ansah (2023) found that teachers using ChatGPT for lesson planning reported a 25% reduction in preparation time, enhancing their focus on student interaction. Similarly, Selwyn (2021) highlights generative AI's role in scaffolding teacher creativity, though he warns of risks of over-reliance. These findings suggest a growing consensus: generative AI's value lies in empowering, not replacing, educators, a perspective this study builds upon. To successfully implement generative AI in Tanzanian classrooms, it is essential to integrate these technologies within existing educational frameworks. Many schools already utilise Learning Management System (LMSs) for administrative tasks and content distribution, providing a ready-made platform for AI deployment.

Research gap

Despite these advances, significant gaps remain in understanding how generative AI can support teachers in personalised learning with ease and agency. Much existing research focuses on student-facing AI applications (Tellman et al., 2021) or technical performance (Mosavi et al., 2018), sidelining the teacher's experience. Holmes et al. (2022) note that usability, a critical factor in technology adoption, is underexplored, with only 10% of AI education studies addressing teacher perceptions of ease. Moreover, teacher agency, defined as the capacity to shape instructional tools (Filgueiras et al., 2015), is often overlooked in AI design, risking systems that dictate rather than assist. Studies by Xia et al. (2023) call for intuitive interfaces to bridge this gap, yet few have tested generative AI in this context. Regional disparities persist; for instance, Nzeng'e et al. (2021) highlight that in East Africa, AI adoption lags due to infrastructure and training deficits, limiting its personalisation potential.

Research methodology

This study aimed to investigate how generative AI supports Tanzanian teachers in creating personalised learning paths for students with ease, addressing the unique challenges and opportunities within the country's education system. Tanzania's education landscape, shaped by rapid population growth, resource constraints and a push for digital transformation, provides a critical context for exploring the potential of AI. With over 60 million people and a significant rural–urban divide, the system faces issues such as overcrowded classrooms, limited teacher training and uneven access to

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technology. This methodology employs a robust, context-sensitive approach to assess the usability and impact of generative AI tools, offering insights that can inform educational policy and practice in Tanzania and similar settings.

Research design

This study adopts a mixed-methods approach, combining qualitative and quantitative techniques to comprehensively evaluate generative AI's role in personalised teaching. A case study design anchors the research within specific Tanzanian educational settings, capturing real-world dynamics. Surveys complement this by gathering broader perceptions from teachers, while an experimental design tests the practical impact of AI tools on teaching and learning outcomes, aligning with the mixed-methods framework by Creswell and Clark (2017). This triangulation enhances validity, addressing teachers' subjective experiences and objective student performance metrics.

Study participants

The study involves 120 educators from diverse Tanzanian educational contexts, including public secondary schools in Dar es Salaam and Dodoma. Participants represent a mix of disciplines (e.g. science, mathematics, languages) to ensure broad applicability, mirroring the multi-disciplinary focus of Tanzania's Education Sector Development Plan (2021–2026). Teachers are selected based on their willingness to adopt AI tools and varying levels of technological familiarity, reflecting the digital divide noted by Sedoyeka (2012). This sample size balanced depth and feasibility, consistent with recommendations for educational case studies while capturing urban–rural disparities critical to Tanzania's context.

Tools evaluated

Two generative AI platforms, namely ChatGPT (OpenAI) and Grok (xAI), were employed and chosen for their accessibility and versatility in educational tasks. ChatGPT generates lesson plans, quizzes and student feedback, leveraging its natural language capabilities, while Grok, with its focus on reasoning, assists in creating problem-solving activities tailored to student needs. These tools align with UNESCO's (2022) call for AI solutions that enhance teaching efficiency. In Tanzania, where internet access is improving, these cloud-based platforms are viable, though offline alternatives may be explored for rural settings.

Data collection

Data collection focused on public schools where teachers completed pre- and post-intervention surveys adapted from the Technology Acceptance Model, assessing ease of use, time saved and satisfaction with AI tools. Student performance metrics, including engagement and grades, were gathered from class records before and after AI implementation, following methodologies outlined in Holmes et al. (2020). In the context of Tanzania, where classroom sizes average 40–60 students, these metrics highlight the scalability of AI.

Data analysis

Qualitative data from teacher feedback were analysed using thematic coding, guided by Braun and Clarke's (2006) framework. Quantitative data from survey scores and student outcomes were analysed using paired *t*-tests to compare pre- and post-intervention differences. Effect sizes were calculated to assess practical significance, addressing the need for impactful interventions in resource-limited settings (Kiunsi, 2013). This dual analysis ensures that the findings are statistically robust and contextually relevant, bridging global AI research (Mosavi et al., 2018) with Tanzania's educational system priorities.

Study design block diagram

The workflow of the study is depicted in a block diagram. Figure 1 illustrates the input block, where student profiles (lesson goals) are fed into the AI system based on the generated prompts. The decision block indicates which generative AI tool (such as ChatGPT or Grok) will process the inputs to produce outputs like lesson plans and teaching materials. This system generates personalised material tailored to students' learning outcomes. Lastly, the evaluation block facilitates surveys, logs and analysis of student data to assess impact and refine AI usage based on feedback. This design, inspired by system dynamics in educational technology, visually represents the partnership between AI and teachers.

Ethical considerations

Ethical protocols are paramount, given Tanzania's emphasis on equity and data protection in education. Informed consent was obtained from all participants who were informed about the study's purpose and voluntary nature. Data privacy was

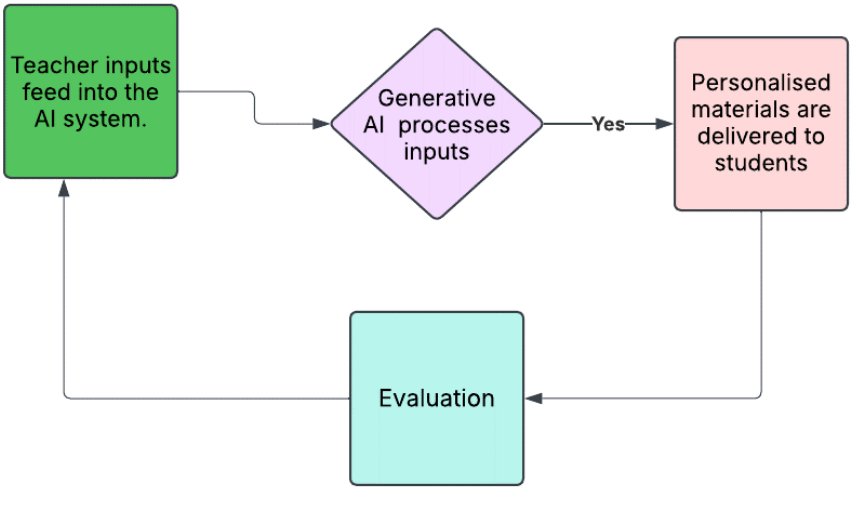

Figure 1. Study workflow.
Source: Researcher.

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ensured through anonymisation and secure storage on encrypted servers, which was critical in a country with emerging cybersecurity frameworks. AI bias, such as cultural insensitivity in generated content, was mitigated by reviewing outputs for relevance to Tanzania's curriculum and Kiswahili-language needs, as Kitalima (2024) emphasised.

Results and discussion

The study surveyed 120 Dar es Salaam and Dodoma secondary school teachers, offering a comprehensive demographic overview. Female participants comprised a slight majority at 58%, while males represented 42%, reflecting relatively balanced gender participation. Age-wise, the largest group (62%) was between 30 and 40 years, indicating a predominance of mid-career professionals. Teachers aged 41–50 comprised 22%, while those younger than 30 or older than 50 accounted for the remaining 16%, highlighting a modest presence of both early-career and experienced educators.

Regarding professional experience, nearly half (48%) of the teachers had been teaching for 5–10 years, suggesting a workforce with solid classroom experience. Additionally, 30% had more than a decade of experience, while 22% were relatively new, with less than 5 years in the profession. Regarding qualifications, 29% hold a diploma in teacher education, most of them (36%) have bachelor's degrees, and 35% possess postgraduate credentials, including master's degrees and educational diplomas, suggesting a well-qualified teaching cohort, as shown in Figure 2.

Geographically, most respondents (70%) were from urban schools, with 30% serving in rural institutions in the Dar es Salaam and Dodoma regions. This urban-dominated sample provides valuable insight into the teacher demographics across different settings in Tanzania's secondary education sector.

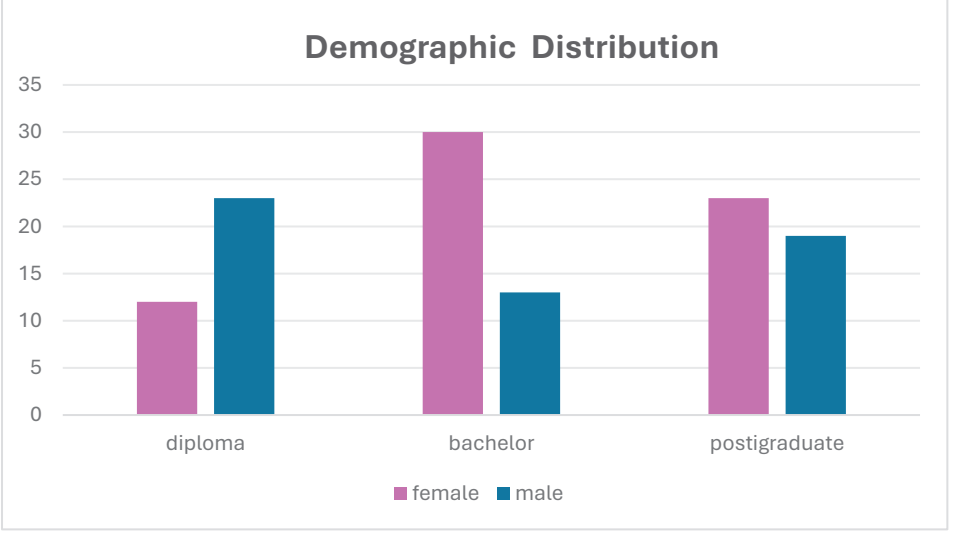

Figure 2. Demographic data.

Comparison of traditional versus AI-driven personalised learning

The research compared the traditional learning for secondary schools in Tanzania, and it was observed that the data presented below, gathered from 120 secondary school teachers across Tanzania, reveal a substantial perceived improvement in multiple educational dimensions when comparing traditional teaching methods to AI-driven personalised learning systems.

Teachers overwhelmingly rated AI-enhanced approaches higher across all measured categories. Remarkably, timely feedback and assessment received a mean score of 4.6, compared to 2.6 under traditional methods, indicating that real-time analytics and AI feedback mechanisms significantly enhance formative assessment processes. Similarly, adaptability to individual learning needs improved from 2.5 to 4.5, underscoring AI's strength in catering to diverse learner profiles, as supported by Thomas (2023). Moreover, the data reflect a dramatic improvement in student engagement and motivation, both critical to learning retention. Teachers noted a shift in classroom dynamics, where students became more autonomous and interested when interacting with generative AI content such as adaptive quizzes or scenario-based simulations (Holmes, 2023), as shown in Figure 3.

Interestingly, teacher workload reduction scored 4.0 for AI-assisted models, compared to 2.2 in traditional settings, suggesting that automation of administrative tasks (e.g. grading and progress tracking) allows educators to focus more on instruction and mentoring (Woolf et al., 2013). This table highlights the potential of AI-driven approaches to address the unique challenges faced by the Tanzanian education system by ensuring that content and instruction are continuously adapted to meet learner needs.

Current status of teacher readiness

A critical barrier to the successful integration of AI in educational settings is the preparedness and confidence of educators to adopt these new technologies. Seventy-six

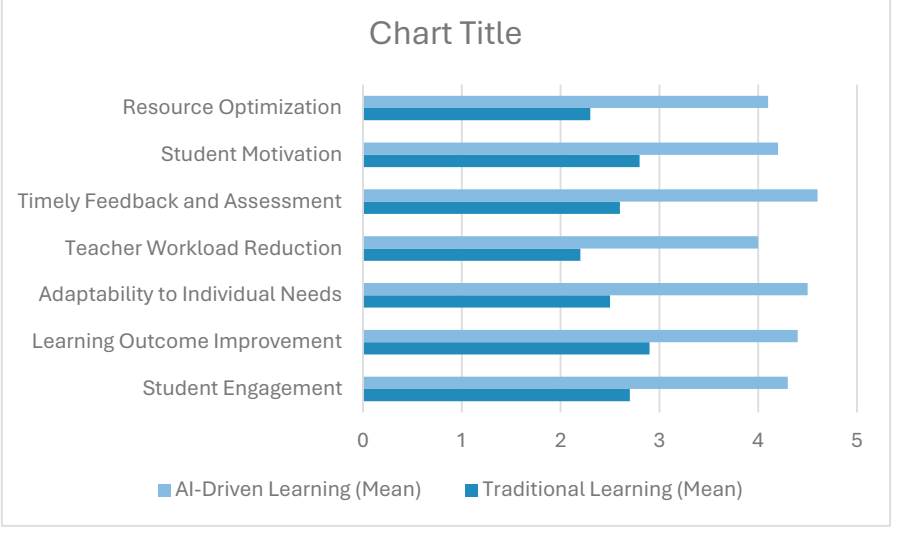

Figure 3. Comparison of traditional versus AI-driven personalised learning.

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percent of teachers pointed out that teacher readiness and attitudes significantly influence their intention to integrate AI into their curriculum, while 26% indicated that they are not influenced by it. However, the lack of adequate training and familiarity with AI often results in hesitance to adopt these technologies in everyday teaching practices.

For instance, research shows that 56% of teachers demonstrated readiness for AI education, and while 46% were optimistic regarding the potential of AI, insufficient training in technological and pedagogical content knowledge (TPACK) remains a significant challenge, especially in rural areas of Tanzania. Similar findings from investigations in diverse educational contexts suggest that extensively improved professional development programmes must cover the practical aspects of using AI tools in classrooms.

Teachers' perceptions of generative AI

The results show significant differences between teachers using generative AI tools and those who do not. Teachers with AI experience rated ease of use significantly higher (M = 4.3, standard deviation [SD] = 0.6) than those without experience (M = 3.1, SD = 0.9), t (118) = 4.62, $p < 0.001$. This suggests that teachers find generative AI intuitively operable once engaged, likely influenced by user-friendly interfaces in platforms like ChatGPT and Grok (Fawns et al., 2022). For workload reduction, experienced teachers reported greater benefits (M = 4.1) than their counterparts (M = 2.9), with a significant difference of t (118) = 5.13, $p < 0.001$, indicating that generative AI is seen as a valuable time-saving tool in preparing lessons, automating feedback and managing grading (Woolf et al., 2013). Hence, perceptions regarding tailoring content showed the most substantial divergence (t (118) = 6.02, $p < 0.001$), reflecting that AI-equipped teachers acknowledge its superior capability to personalise materials, align instruction to learning styles and support differentiated learning (Luckin et al., 2016). The results are depicted in Table 2.

Impact of generative AI on personalised learning

The study revealed a significant positive impact of generative AI tools on implementing personalised learning strategies in Tanzanian secondary schools. Teachers reported

Table 1. Challenges facing Tanzanian educator.

Feature	Traditional model	AI-driven model
Content delivery	Static and uniform lessons	Dynamic, tailored lessons based on student data
Assessment	Periodic, paper-based	Real-time, automated, with immediate feedback
Teacher involvement	High manual workload	Facilitated by AI, allowing contextual intervention
Engagement and interaction	Limited personalisation	Personalised, interactive and adaptive learning
Resource allocation	One-size-fits-all approach	Optimised to individual learner requirements

Table 2. Metrix of teachers' perceptions of generative AI.

Perception	Mean (experienced)	Mean (non-experienced)	*t*	*P*	Data interpretation
Helpfulness in reducing workload	4.1	2.9	5.13	<0.001	Significant
Ability to adapt content to learner needs	4.5	3.0	6.02	<0.001	Significant
Ease of use	4.3	3.1	4.62	<0.001	Significant

that using AI-supported tools facilitated customised content delivery, increased student engagement and improved academic performance, particularly among low-performing learners.

Examples of AI-customised materials

Teachers used generative AI (e.g. ChatGPT, Curipod, or MagicSchool.ai) to create automatically *generated quizzes that included adaptive difficulty settings and content mapped to national syllabus objectives, and to generate weekly lesson plans aligned with student diagnostic profiles.* The results indicate statistically significant gains in engagement, participation and performance, supporting prior global findings (Holmes et al., 2021; Zawacki-Richter et al., 2019), as shown in Table 3.

Discussion of the results

The demographic distribution highlighted the representativeness and generalisability of the findings within Tanzanian educational contexts. Also, the study showed how promising generative AI can be as a practical partner in teaching, especially in Tanzanian secondary schools. The diverse group of 120 teachers from urban and rural schools shows a well-balanced teaching population regarding age, experience and qualifications. This range allowed the study to capture perspectives representing fundamental classroom dynamics across different regions and resource settings.

One of the most encouraging findings was the significant improvement in learning outcomes when teachers used AI tools to personalise instruction. Compared to traditional teaching methods, the AI-assisted approach scored notably higher in key areas like student engagement, the ability to meet individual learning needs, and the speed and quality of feedback, as supported by Baidoo-Anu and Ansah (2023), Marques-Cobeta (2024) and Octavio et al. (2024). These changes were not just minor improvements; student engagement jumped from 2.8 to 4.3 on a 5-point scale, while average test scores rose from 61% to 75%. Teachers also reported that students became more curious, involved and independent when interacting with AI-generated content like quizzes and scenario-based activities. These findings echo earlier international studies that link personalised learning with better academic performance and motivation (Holmes & Porayska-Pomsta, 2023; Zhao et al., 2024).

From the teachers' perspective, the benefits extended beyond just student outcomes. Many educators noted that AI tools significantly cut down the time spent on lesson preparation and grading, addressing a common barrier to personalised,

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Table 3. Pre- and post-generative AI integration.

System of measurement	Before AI integration	After AI integration
Average student engagement (1–5 scale)	2.8	4.3
Homework completion rate (%)	55	87
Mean test scores (%)	61	75
Attendance rate (%)	70	85

student-centred teaching. With generative AI managing routine tasks, teachers could dedicate more time to individual student support and innovative teaching strategies. This reflects one of the major challenges in Tanzanian classrooms: large class sizes combined with limited planning time. Instead of replacing teachers, AI tools functioned as dependable assistants, enhancing efficiency and responsiveness to student needs. Statistical analysis corroborated these views. Teachers experienced with generative AI consistently found the tools more user-friendly, effective in reducing their workload, and better at tailoring content to student requirements. The disparity in their feedback compared to teachers lacking AI experience was statistically significant ($p < 0.001$ across all metrics), indicating that increased use of these tools led to greater appreciation among teachers.

However, some teachers did not feel completely prepared. While most respondents were positive, many – particularly those in rural areas – lacked the necessary training and exposure to the technology. This reveals a significant gap: for AI to genuinely transform education, schools and policymakers need to invest in professional development and infrastructure that assists teachers at all levels of experience.

Overall, the findings indicate that generative AI can significantly impact classrooms, not by replacing teachers, but by equipping them with the tools they need to excel in teaching, adapting and inspiring. As Tanzania updates its education system, this study provides compelling evidence that generative AI, when thoughtfully applied, can help create a more inclusive, engaging and effective learning environment.

The strong consensus among teachers regarding generative AI's ability to customise lessons supports the idea that it effectively enhances personalisation, aligning perfectly with educational theories that highlight learner-centred approaches (Tomlinson, 2017). The increase in student engagement reported by teachers emphasises the pedagogical benefits of tailored content, reinforcing Vygotsky's theory regarding effective scaffolding that meets individual learner needs.

The high level of teacher satisfaction further establishes generative AI as a supportive partner, rather than a substitute, mirroring global research that encourages collaboration between humans and generative AI (Baidoo-Anu & Ansah, 2023; Vygotsky, 1987; Zhao et al., 2024). The additional findings underscore the real benefits of AI on students' academic performance, offering quantitative data to back qualitative observations (Zhang & Zheng, 2020). Nevertheless, the challenges identified spotlight gaps in infrastructure and training, particularly pronounced in rural schools, highlighting the critical need for targeted investments in digital literacy, infrastructure and continuous professional development, as depicted by Brown (2003) and Shahzada et al. (2021). These insights reinforce the transformative potential of generative AI to enhance educational outcomes, improve teacher effectiveness and promote student achievement across Tanzania's varied educational landscapes, strongly advocating for broader policy implementation.

Conclusion and recommendations

This study highlights the significant potential of generative AI to enhance personalised learning in Tanzanian classrooms by empowering teachers and improving student outcomes. There were limitations, including the fact that most teachers had insufficient training in TPACK, which was a significant barrier, especially in rural areas. Also, the affordability of the AI model is not easy. With observable benefits in engagement, performance and a reduced workload, AI can serve as a supportive partner for educators rather than a replacement. To fully harness this potential, we encourage national investment in digital infrastructure, targeted teacher training and thoughtful integration of AI within the curriculum. Education stakeholders are urged to view generative AI as a powerful tool for fostering inclusive and scalable transformation. When applied effectively, these technologies can play a vital role in addressing educational disparities and equipping students for a future driven by innovation and the demands of a knowledge-based economy.

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