



Application of Artificial Intelligence in Adult Education: A Case of Institute of Adult Education, Coast Region, Tanzania

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Abstract

The study examined the application of Artificial Intelligence (AI) in adult education programmes and its influence on undergraduate learners' academic achievements at Institute of Adult Education (IAE) in Tanzania's Coast Region. A qualitative approach with case study design was adopted involving 15 participants (10 undergraduate students, 4 lecturers, and 1 Resident Tutor) selected purposively based on their experiences with AI tools in teaching and learning. Data were collected through in-depth interviews that were later analysed thematically. Findings revealed that IAE is employing AI technologies to enhance both academic effectiveness and overall institutional performance. Despite its strength, usage of AI at IAE faces several challenges including shortage of skilled professionals capable of effectively deploying the technology to support learning, inadequate technological infrastructure and high cost of internet bundles required for learners to access and utilize AI-based platforms. The study recommends that government should establish a specialized training framework on AI and related technologies, aimed at raising awareness and enhancing competencies among both students and lecturers. It is also recommended that there is a need for government and private sector share the responsibility of collaborating to strengthen the infrastructure required to improve internet accessibility and ensure effective use of AI technologies in facilitating education at IAE.

Keywords: Institute of Adult Education, non-formal education, artificial intelligence, academic achievement

Introduction

The Institute of Adult Education (IAE) plays a pivotal role in Tanzania's socio-economic development by providing lifelong learning opportunities, reducing adult and youth illiteracy, fostering the development of productive members of society, and enhancing professional skills and innovation in adult education. Through its mandate, the Institute contributes significantly to human capital development and national development goals by equipping learners with relevant knowledge and skills for social and economic participation.

In recent years, rapid advancements in Information and Communication Technologies (ICT) have accelerated the integration of Artificial Intelligence (AI) into adult and non-formal education systems globally (Gegenfurtner et al., 2020). Artificial intelligence refers to a set of technologies that enable machines to perform tasks that typically require human intelligence, including learning, reasoning, problem-solving, and decision-making. AI-mediated platforms—such as e-learning systems and digital media applications provide flexible, universal, and on-demand access to learning resources. For example, employees and adult learners can enhance their knowledge and professional competencies through AI enabled learning management systems, thereby supporting lifelong learning and workforce development (Dowling-Hetherington et al., 2020).

Globally, the application of digital technologies, including AI, has transformed the nature, delivery, and scope of education. In Cyprus, the adoption of digital technologies has reshaped educational practices and prompted governments and institutions to develop policies and strategies for ICT integration in education (Cachia et al., 2022). Similarly, in the United Kingdom, AI literacy has been incorporated into non-formal education as a national priority within the context of a knowledge-based economy (Coscolluela, 2018). Consequently, digital literacy has become increasingly recognized as a critical component of lifelong learning, enabling individuals to continuously acquire new skills in response to changing labour-market and economic demands (Olasehinde, 2024).

Within the African context, several countries have adopted ICT and AI technologies to enhance access and quality in non-formal education. In Nigeria, non-formal education initiatives have historically relied on ICT innovations such as Artificial Intelligence, Very Small Aperture Terminal (VSAT) satellite communication, the Internet, and CD-ROM technologies. These innovations have facilitated the development of new learning tools that have transformed the delivery of non-formal

education, strengthened access, and expanded learning opportunities across diverse populations (Bebeji et al., 2020). Similarly, in Kenya, modern ICT tools have played a critical role in facilitating distance learning and adult education. AI-powered platforms, alongside digital tools such as YouTube, Google Classroom, Zoom, and Microsoft Teams, have enabled flexible and self-paced learning, allowing learners to access education at their convenience (Coscolluela, 2018).

In Tanzania, the integration of AI in education has brought notable transformations in teaching and learning processes. AI technologies have simplified academic tasks such as searching for learning materials and identifying relevant references. In addition, AI has improved efficiency by reducing the time required to complete academic activities, thereby enhancing productivity among facilitators and learners. Furthermore, the use of AI has enhanced creativity, particularly through increased engagement with digital systems in educational contexts.

Despite these benefits, the utilization of AI in adult and non-formal education faces several challenges. Facilitators' confidence in adopting AI technologies is influenced by factors such as access to digital devices, availability of technical support, and the adequacy of training opportunities. These factors often act as barriers to the effective adoption of AI and other digital technologies in educational settings (Bundalla & Nyangarika, 2020). Moreover, adult education institutions continue to experience difficulties in implementing advanced technologies due to the high costs associated with acquisition, maintenance, and sustainability. This challenge is compounded by a limited number of facilitators with sufficient expertise in AI applications relative to the overall teaching workforce, as revealed in a pilot study conducted in 2025 at the Institute of Adult Education, Coast Region.

The Government of Tanzania has made significant efforts to establish systems that promote the integration of digital technologies within educational institutions (NM-AIST, 2025). However, several critical challenges persist. pilot study in 2025 indicates that major obstacles to the application of artificial intelligence include limited availability of technological resources that support digital learning and a shortage of skilled professionals, particularly facilitators with adequate knowledge and expertise in AI use. Many facilitators lack essential digital competencies, which undermines instructional effectiveness and limits the potential impact of digital learning systems (URT, 2024).

This skills gap is also evident among learners, many of whom enter adult education programmes with limited foundational digital knowledge. As a result, instead of

effectively utilizing digital platforms for self-directed learning, learners are often required to begin with basic concepts, which slows the learning process and creates barriers to effective knowledge acquisition. In addition, inadequate infrastructure remains a major challenge, particularly for learners in rural areas where internet connectivity is unreliable or largely unavailable. This situation restricts learners from fully benefiting from digital learning opportunities and exacerbates disparities between urban and rural populations (Ventures, 2023).

Supporting this perspective, the study by Kavula (2024) identified poor infrastructure, insufficient expertise, and inadequate technological resources as key challenges affecting the use of digital technologies in education. The study further emphasized that governments should leverage technology to mitigate teachers' shortages, particularly in rural areas. Such shortages have negatively affected both learners and teachers, contributing to reduced motivation and increased dropout rates. Increased financial investment in education was recommended to ensure equitable access and improve the quality of teaching and learning outcomes.

Similarly, Latchem (2014) emphasized that promoting equitable access to digital learning empowers learners to take greater ownership of their learning process. Expanding access to digital tools, particularly in rural institutions, is essential for narrowing the technology gap between urban and rural areas. Such investments are critical for sustainable development and for equipping current and future generations with skills required in an increasingly digital society. It is also to highlight the importance of reliable electricity supply in rural areas, including the adoption of alternative energy sources such as solar power, and the strengthening of Education Management Information Systems (EMIS) to improve data quality and educational planning.

The study by Pienimäki et al. (2021) emphasized the importance of aligning education with labour-market demands through entrepreneurship, technology, and innovation. This view aligns with the 2025 Global Action Week for Education (GAWÉ) national theme, Education and Skills for National Development, which underscores the importance of collaboration between governments and development partners in promoting skill development. The study further recommended that African countries, including Tanzania, should intensify investment and collaborative efforts to expand the integration of AI technologies in education. Effective strategies, innovation, and policy reforms are necessary to ensure inclusive and quality education for all learners. Moreover, unequal access to education—particularly between urban and rural settings—continues to exacerbate social and economic

inequalities. Consequently, education policies and curricula must explicitly address these disparities to ensure that AI-driven teaching and learning approaches are accessible, equitable, and sustainable.

It is therefore the purpose of this study to examine the application of artificial intelligence at IAE focusing on two key objectives: to determine the application of artificial intelligence in relation to undergraduate academic achievement at IAE; and to explore the challenges facing the use of AI at IAE.

Methodology

This qualitative case study was conducted at the Institute of Adult Education (IAE) in the Coast Region of Tanzania. IAE was purposively selected due to its wide range of adult and continuing education programmes, including Certificate Diploma and Bachelor Degree Programmes in various fields run both conventionally and through open and distance learning. These programmes emphasize flexible learning modes, learner autonomy, community engagement, and practical problem-solving, making the institution an appropriate setting for examining the integration of artificial intelligence (AI) in adult education.

The study involved fifteen (15) purposively selected participants with direct experience in AI-supported teaching and learning. These included ten undergraduate bachelor degree students, four lecturers (and one Resident Tutor). Data were collected using in-depth interviews. Data were analysed thematically following Stewart's (2020) stages of thematic analysis: familiarization, coding, theme identification, interpretation, and reporting. Themes were generated in relation to the study objectives, and findings were synthesized using thematic summaries supported by selected participant quotations to accurately reflect participants' experiences and perspectives.

Results and Discussion

The results are organized into two parts, the first covers how AI was applied in the learning process, and the second outlines the challenges affecting its effective use.

Application of Artificial intelligence in Learning Process

The findings from the study revealed that the application of AI was found to be very useful in learning process among students as put by one student:

During an interview with students, it was noted that, artificial intelligence is prevalent in the studies, especially when it comes to accessing academic

materials for assignments. Students noted that AI tools have been very helpful in the searching process by providing quick and accessible information, which is especially when assignments are due.

The usefulness of AI in learning process is evidenced by a study of Bond et al. (2020) who, found out that educational technologies support behavioural, emotional and cognitive students' engagement in higher education by enhancing access and interaction. In the same line, (Herodotou et al., 2020) demonstrates that AI systems are capable of providing insights that support learners and educators alike, thereby reducing study time that can be used in other equally important activities.

The findings further revealed that AI is not only utilized by learners, but also by lecturers at IAE though at lower levels comparing to students. The ease of access to information and instant feedback makes AI an indispensable tool for us especially in academic success.

This finding resonates well with the review by Zou et al. (2025), which highlights that digital learning technologies including AI are central to trends in education and significantly influence learners' flexibility, autonomy and engagement, especially in assessment practices.

From the lecturers' perspective, the study found that AI has become a valuable resource that supports them in searching teaching materials and enhancing the effectiveness of classroom content delivery.

During an in-depth interview with Lecturers, it was highlighted that the advancement of science and technology has contributed significantly to the application of AI in academic settings. Learners benefit immensely from these technological developments as they can now complete academic tasks that previously required extensive time and effort in a fraction of the time. For example, whereas learners previously had to spend hours searching information in the library, they can now complete similar tasks within just thirty minutes using AI tools.

This correlates with Herodotou et al. (2020), where institutional-wide implementation of learning analytics at a distance university revealed that technology enables significant improvement in efficiency and scalability of academic support systems.

Challenges facing the application of Artificial Intelligence in the Learning Process

Despite the usefulness of AI in learning process, the researcher found that its application is constrained by several challenges. These include; shortage of skilled professionals capable of effectively deploying the technology to support learning, inadequate infrastructure, limited access to digital equipment, and high cost of internet bundles required for learners to access and utilize AI-based platforms as described in the following section.

Shortage of skilled personnel

The study noted that lecturers who teach various programmes at IAE, possess limited knowledge and skills regarding the use of AI technologies hence constraining their effective integration into teaching practices.

During in-depth interviews conducted with lecturers, one of them reported:

Although this technology is being used in the execution of academic responsibilities, most of us do not possess a proper understanding of its effective application. This is attributed to lack of foundational training that would enhance our comprehension of how to appropriately apply AI technologies in academic matters (In-depth Interview, Lecturer, August 2025).

In addition, the Regional Resident Tutor for the Coast Region commenting on the challenges associated with the use of AI was quoted, saying:

The deployment of AI technologies is hindered by a shortage of professionals, primarily due to limited educational exposure to such programmes. For instance, at my centre, there has not been a single facilitator who has received any formal training on the appropriate use of AI to source educational materials or guide students in their academic tasks (In-Depth Interview, Regional Resident Tutor, September 2025).

The study findings are supported by the study of Herodotou et al. (2020), which emphasized the critical role of practitioners training and institutional readiness for effective learning-analytics and AI adoption in higher education.

From the learners' perspective it was highlighted:

While there is great enthusiasm for AI among both students and teachers, the general lack of knowledge surrounding the technology poses a significant challenge. There is a limited understanding often leads to uncertainty about when and how to use AI correctly or incorrectly

This is largely attributed to the way AI is embedded within modern communication platforms, such as mobile phones and web browsers like Chrome and Google, often without the provision of structured training for users. Such challenges pose a significant threat to the quality of education, as students frequently overlook the ethical dimensions of AI usage. Instead, many resorts to simply inputting questions and passively receiving responses, an approach that not only diminishes critical thinking and originality but may also constitute academic dishonesty due to the absence of independent analysis and ownership of ideas.

These findings corroborate with Bond et al. (2020), who caution that without educators' support and ethical pedagogy around AI, students may misuse tools, a concern aligning with broader discourse on technology adoption in education and the need for digital-literacy frameworks.

Inadequate Technological Infrastructure

The study findings further revealed infrastructural constraints that hinder consistent and effective utilization of AI technologies. Notably, these challenges include unreliable internet connectivity learning environments both at home and within educational institutions, insufficient access to necessary equipment, and the high cost of data bundles. During an interview one student remarked that,

Access to the internet is a major challenge. At times, when an assignment is due, poor network connectivity forces us to seek alternative sources of information, such as visiting libraries or using peer-provided notes.

In addition, the study established that the use of AI is hindered by a shortage of essential electronic equipment, such as computers. This limitation was particularly emphasized by one of the lecturers during an in-depth interview, who explained:

In IAE, for instance, there are numerous staff members but only a limited number of computers. This scarcity creates long queues and delays, making it difficult for facilitators to utilise these tools effectively (In-depth Interview, Lecturer, September 2025).

These issues mirror the digital-divide challenges reported by Zou et al. (2025), which emphasize that equitable access to technology remains a critical barrier to successful digital-learning implementation globally.

According to the study, internet connectivity is a serious hindrance to the use of AI. Without access to reliable internet, mobile phones and computers cannot connect to networks, making it virtually impossible to access or utilize Artificial Intelligence technologies.

The high cost of internet bundles emerged also as one of critical barriers to the effective utilization of technology. It was revealed that most students were unable to afford data bundles, thereby restricting their access to AI-based platforms and limiting their ability to engage productively with learning resources, which in turn undermines their academic progress and comprehension. Commenting on this; one student had the following to say:

Sometimes the bundles are just too expensive. We cannot afford to buy enough data to use AI tools consistently, so we end up reducing how often we go online

These study findings resemble with the findings by Kavula (2024) who reported that use of digital technologies like artificial intelligence to enhance education in Tanzania, is affected by challenges such as poor infrastructures, insufficient expertise and poor technologies facing the use of digital technology.

Conclusion and Recommendations

The study concludes that, the use of AI is prevalent at IAE as it enhances access to learning materials and support in the teaching process. However, its effective use is constrained by a shortage of skilled professionals, inadequate infrastructure and digital equipment, and the high cost of internet bundles. Basing on the findings and conclusion made the study recommends that the government should establish a specialized training framework on AI and related technologies, aimed at raising awareness and enhancing competencies among both facilitators and learners. In addition, it is proposed that the government and private sector organizations share the responsibility of collaborating to strengthen the infrastructure required to improve internet accessibility and ensure the effective use of AI technologies in an Institute Adult Education.

References

- Barria-Pineda, J., Narayanan, A. B. L., & Brusilovsky, P. (2022). "Augmenting digital textbooks with reusable smart learning content: solutions and challenges," in Proceedings of the Fourth Workshop on Intelligent Textbooks. *International Conference on Artificial Intelligence in Education (AIED 2022)*, eds. S. A. Sosnovsky, P. Brusilovsky, and A. S. Lan (Aachen: CEUR Workshop Proceedings), 77–91.
- Bebeji, U. G., Suleiman, M. M., & Tukur, M. (2020). The Impact of ICT in Adult and Non-Formal Education in Nigeria. *International Journal of Business, Law, and Education*, 1(2), 77 -86.

- Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education. A systematic evidence Map. *International journal of educational technology in higher education*, 17(1), 1-30.
- Bryman A. (2012). *How many qualitative interviews are enough?* In: Baker SE, Edwards R, editors. *How Many Qualitative Interviews are Enough? Expert Voices and Early Career Reflections on Sampling and Cases in Qualitative Research*. Southampton: ESRC National Centre for Research Methods, University of Southampton; pp. 18–20.
- Bundalla, F., & Nyangarika, A. (2020). Impact of Advanced Technology in the Provision of Adult Education in Tanzania. *International Journal of Advanced Research and Innovative Ideas in Education*. 6. 1626-1636.
- Cachia, R., Dimitriadis, Y., Giannoutsou, N., Ioannou, A., Miliou, O., Sobrino, V. S., Monés, M. A., & Timotheou, S. (2022). Impacts of digital technologies on education and factors influencing schools’ digital capacity and transformation: A literature review. *Journal of Education and Information Technologies*. Retrieved from <https://doi.org/10.1007/s10639-022-11431-8>.
- Cheng, X., Zou, Y., Kuek, F., & Feng, W. (2025). Digital learning in the 21st century: trends, challenges, and innovations in technology integration. *Front. Educ.* 10:1562391. doi: 10.3389/educ.2025.1562391.
- Coscolluela, J. C. C. (2018). A Set of Patterns in Adult Education. In Proceedings of the 23rd European Conference. *Pattern Languages of Programs 15*(1), 1-17.
- Creswell, J. W. (2012). *Educational Research Lanning, Conducting and Evaluating Qualitative and Quantitative Research* (4th ed.). Boston: Pearson Education Inc.
- Creswell, J. W. (2014). *Educational Research Lanning, Conducting and Evaluating Qualitative and Quantitative Research* (5th ed.). Boston: Pearson Education Inc.
- Dawson, C. (2002). *Practical Research Methods: A user-friendly guide to mastering research techniques and projects*. British Library Cataloguing-in-Publication Publication.
- Dowling-Hetherington, L., Glowatz, M., McDonald, E. and Dempsey, A. (2020), ‘Business students’ experiences of technology tools and applications in higher education. *International Journal of Training and Development*, 24, 1.
- Efremova, N., & Huseynova, A. (2023). “Digital Pedagogy: opportunities and challenges of learning in the information environment,” in *XV International Scientific Conference “interagromash 2022*, eds. A. Beskopylny, M. Shamtsyan, and V. Artiukh (New York, Springer International Publishing), 283–292. doi: 10.1007/978-3-031-21432-5_29
- Familoni, B. T., & Onyebuchi, N. C. (2024). Augmented and virtual reality in U.S. education: a review: analysing the impact, effectiveness, and prospects of AR/VR tools in enhancing learning experiences. *Int. J. Appl. Res. Soc. Sci.* 6, 642–663. doi: 10.51594/ijarss.v6i4.1043.

- Gegenfurtner, A., Zitt, A. and Ebner, C. (2020), ‘Evaluating webinar-based training: a mixed methods study on trainee reactions toward digital web conferencing’, *International Journal of Training and Development*, 24, 1.
- Hemajothi, S., and Kumar Jain, S. (2022). Challenges of e-learning during the pandemic and its implications in education. *Technoarete Transactions on Applications of Information and Communication Technology (ICT) in Education 1*, 1–6. doi: 10.36647/TTAICTE/01.04. A001.
- Herodotou, C., Rienties, B., Hlosta, M., Borooa, A., Mangafa, C., & Zdrahal, Z. (2020). The scalable implementation of predictive learning analytics at a distance learning university: *Insights from a longitudinal case study. Internet High. Educ.* 45:100725. doi: 10.1016/j.iheduc.2020.100725.
- Institute of Adult Education (2025). *Students enrolment document*, Coast Region. Tanzania.
- Kavula, R. I. (2024). Education and technology. *Journal of Kiswahili and other African languages*, 3. 76-88.
- Kivuti, E. M. (2021). Comparative effect of interactive multimedia to text-based content for software application courses. *International Journal of Information. Communication Technological Education*, 17, 1–5. doi: 10.4018/IJICTE.20211001.oa16.
- Kombo, K. D. & Trompo, A. L. D. (2006). *Proposal and Thesis Writing: An Introduction*. Nairobi: Pauline’s Publications Africa.
- Kumbo, L., Mero, R. F., and Hayuma, B. J. (2023). Navigating the digital frontier: innovative pedagogies for effective technology integration in education. *J. Inform.* 3, 14–33. doi: 10.59645/tji. v3i1.142.
- Latchem, C. (2014). Informal Learning and Non-Formal Education for Development. *Journal of Learning for Development*, 1(1), 1–13.
- Laurell, C., Sandström, C., Berthold, A., & Larsson, D. (2019). Exploring barriers to adoption of virtual reality through social media analytics and machine learning, an assessment of technology, network, price and trialability. *J. Bus. Res.* 100, 469–474. doi: 10.1016/j.jbusres.2019.01.017.
- Mamgain, N., Sharma, A., & Goyal, P. (2014). “Learner’s perspective on videoviewing features offered by MOOC providers: Coursera and edX,” in 2014 IEEE *International Conference on MOOC, Innovation and Technology in Education (MITE) (Patiala: IEEE)*, 331–336. doi: 10.1109/MITE.2014.7020298.
- Mhando, F. S. (2022). *Understanding Research Methods in Education*. Tanzania: ISBN 978-9976-5475-7-3.
- Mishra, B. S. & Alok S. (2017). *Handbook of Research Methodology*. India: Edu Creation Publishing.
- Morse, J. M. (2015). *The significance of saturation. Qualitative Health Research journal*, 5(2):147–149. doi: 10.1177/104973239500500201.

- Murcia, K., Campbell, C., and Aranda, G. (2018). Trends in early childhood education practice and professional learning with digital technologies. *Pedagogika* 68, 235–250. doi: 10.14712/23362189.2018.858.
- Nelson Mandela African Institution and Technology (NM-AIST). (2025). Harnessing Ai to transfer research: NM-AIST's Ground-breaking Training Program. Tanzania.
- Ntorukiri, T. B., Kirugua, J. M., & Kirimi, F. (2022). Policy and infrastructure challenges influencing ICT implementation in universities: a literature review. *Discovery Journal of Education*. 1.doi:10.1007/s44217-022-00019-6.
- Olasehinde, T. (2024). The Role of Digital Literacy in Sustainable Adult Education for the UK Economy. Retrieved from <https://www.researchgate.net/publication/384867692>.
- Ordaya-Gonzales, K., Cortez Restuccia, J. C., Cossio Bolaños, W. J., & Arriola-Montenegro, J. (2024). From crisis to connectivity: exploring the role of information and communication technologies in medical education during the COVID-19 pandemic. *Cureus* 16: e60302. Doi: 10.7759/cureus 60302.
- Pienimäki, M., Kinnula, M., & Iivari, N. (2021). Finding fun in non-formal technology education. *International Journal of Child-Computer Interaction*, 29, 100283. <https://doi.org/10.1016/j.ijcci.2021.100283>.
- Raffi, M. L. M., Hussain, M. A. M., Mustafa, W. A., Zabidi, M. N. A., Mardiansyah, A., & Subari, K. (2025). A systematic review of open-source software for technical and vocational education and training (TVET). *J. Adv. Res. Appl. Sci. Eng. Technol.* 49, 75–89. doi: 10.37934/araset.49.2.7589.
- Sahito, Farzna & Hussain Sahito, Zahid & Uzma, & Phulpoto, Jadul. (2024). ICT Tools for Lifelong Learning: Enhancing Accessibility and Engagement in Adult Education. *International Journal of Social Science & Entrepreneurship*. 4. 33-58. 10.58622/IJSSE. v4i4.337.
- Salo, P., Francisco, S., & Olin Almqvist, A. (2024). Understanding professional learning in and for practice. *Professional Development in Education*, 50, 444–459. doi: 10.1080/19415257.2024.2311108.
- Shenton, A. K. (2004). Strategies for Ensuring Trustworthiness in Qualitative Research Projects. *Education for Information*, 22, 63-75. <https://doi.org/10.3233/EFI-2004-22201>.
- Stewart, A. (2020). *Strategies in Qualitative Research Approaches*. Los Angeles: SAGE Publications.
- United Republic of Tanzania, (2024). *Guideline for the secure and ethical use of artificial intelligence in Tanzania*. Tanzania: Ministry of Communication and Information Technology.
- Ventures, S. (2023). *Report of Artificial intelligence in Tanzania, what's happening*. Tanzania: Sahara Accelerator.

- Zaid, T., & Garai, S. (2024). Emerging trends in cybersecurity: a holistic view on current threats, assessing solutions, and pioneering new frontiers. *Blockchain Healthc. oday* 30:7. doi: 10.30953/bhty.v7.302.
- Zou, X., Kuek, F., Feng, W., & Cheng, X. (2025). Digital learning in the 21st century: Trends, challenges, and innovations in technology integration. *Frontiers in Education*, 10, 1562391. <https://doi.org/10.3389/feduc.2025.1562391>.