Editorial

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supported innovative teaching and artificial intelligence in education, he has received notable accolades throughout his career. His influential ideas have reached wide audiences through the publication of more than 300 academic papers and over 40 books, both domestically and internationally.

Samuel Amponsah is a Professor of open distance learning and inclusive online education and heads the Distance Education Department of the University of Ghana. He was a fellow of the GCRF/LJMU digital Fellowship. He was a Postdoctoral Fellow with the American University in Cairo supported by the Andrew W. Mellon Foundation through the BECHS Africa Scheme. He is an Adjunct Associate Professor for the University of South Africa, a Visiting Fellow at Liverpool John Moores University and a Visiting Lecturer for Birmingham Christian College in the UK. He has provided editorial and guest editing services to numerous recognised peer reviewed journals and publishers.

Today's modern classrooms are expected to be an immersive learning space permeated by smart technologies for optimal learning. Accordingly, smart technologies such as big data, artificial intelligence (AI), automation, learning analytics, robotics, etc. are believed to usher in a new mode of teaching and learning capable of equipping learners with transversal skills for higher productivity. It is in this light that many African countries including Ghana aim to leverage smart technologies to transform their economies into information and technology-driven high-income economies (Adarkwah, 2021). Besides, societal expectations are that academic standards of higher education should lead to higher learning outcomes (Ling and Fraser, 2014). However, higher education the African context is often the place where instructors and learners are initially exposed to cutting-edge technologies and the usage of a learning management system (LMS) for instructional activities or engagements. It is for this reason that academics and learners in higher education institutions in many African countries are late adopters (laggards) of innovative technologies (e.g., generative AI tools like ChatGPT and Bard) (Adarkwah et al., 2023).

Given the foregoing, it is imperative to add that smart education remains a relatively new concept in the African continent with very few smart campuses in HEIs in many African countries in this digital revolution era. It is worth stating that the slow pace of adoption of the smart education concept can be attributed to a myriad of challenges including a lack or no access to the following: digital resources, ICT infrastructure, functioning technology policies, the digital divide, and so on (Adarkwah and Huang, 2023). For this reason, the possibility of higher education institutions in the African continent producing smart citizens (digitally capable citizens) remains elusive. Therefore, this Special Issue aims to create the needed awareness among policymakers, educators and other relevant educational stakeholders of best practices in smart learning environments and call for further research on the topic in the least studied continent, Africa. To achieve this aim, this Special Issue solicited contributions which investigate the role of African higher education in building the digital capacity of learners to achieve a transformative society where citizens can make adequate and sustainable use of technology. In other words, African higher education institutions should churn out smart citizens who can seamlessly operate in the digital economy like their counterparts from the developed and endowed economies.

This Special Issue opens with a conceptual paper by Amponsah et al. titled 'Equipped for the future model as a tool for harnessing lifelong learning in Ghana and South

Africa'. The contribution focused on the sixteen (16) generative skills in the Equipped for the Future (EFF) model that higher education institutions in both Ghana and South Africa can harness to provide lifelong opportunities for all learners. The authors shared that both Ghana and South Africa experienced challenges in the past in their quest to provide technology-driven education systems that strive towards lifelong learning. The EFF model provides guidance for adults regarding the knowledge and skills they require to effectively participate in the global economy, fulfil their roles as responsible citizens, and actively engage in their children's education. Amponsah et al. believe that the first three categories are paramount in developing and assessing the digital competencies of 21st-century learners. They argue that lifelong learning is only viable and valuable after literacy has been achieved through the adoption of technological tools and building human capacities. The study calls for innovative programmes and solutions that are poised to address the current conditions faced by adult learners. The authors concluded by advocating a kind of lifelong learning powered by technology and more learner-centred, environmentally friendly, skills-based education that meets the needs of contemporary smart societies.

The second contribution is an empirical study by Amoako and Mnkandla 'Fused multimodal biometric authentication for an open distance learning environment online examination' conducted an experiment in response to the increased cheating associated with online assessments in many African higher education institutions during the COVID-19 pandemic. Their paper proposed a fused multimodal biometric authentication model based on facial recognition, voice recognition, and keystroke dynamics with the intention of increasing security and preventing cheating through the dictation of answers by a third party. The proposed framework seeks to promote quality education through a two-phased approach: registration and authentication. It also recommended that the agent's demographic information is collected during the registration and the authentication phases. Also, the agent's records should be updated during the learning process, while machine learning techniques are employed during the assessment period to prevent unauthorised access and assistance. The experiment showed that the framework is effective in preventing cheating during exams in open-distance electronic learning (OdeL) environments.

The third paper is a theoretical study by Atubi titled 'Geographical information systems, a smart technology to optimise social studies undergraduate education: an appraisal'. The study emphasised the need for higher education institutions to leverage Geographic Information Systems (GIS) resources as a smart technology for optimising the teaching of Social Studies trainee teachers, particularly in Nigeria. The authors espoused that the application of GIS is positioned as an innovation which can revolutionise Social Studies teaching in higher education. The study revealed that the utilisation of GIS helps in enriching course content, helps in understanding social issues, enables the use of large sets of data, promotes activity-based learning, enhances visual and critical learning, and builds a strong foundation for spatial knowledge. Other interesting findings from the study highlighted that GIS gives visual interphase to its users by making complex physical features to become easy and better to understand, and creates interactive data that makes it easy to comprehend geographical phenomenon. In the end, Atubi theorised that using GIS results in better pedagogical skills and therefore recommended higher education institutions in the African region to transition from conventional approaches to teaching Social Studies to GIS as a means of innovating with smart technology.

The fourth paper is a systematic literature review by Odame. The study 'Enhancing technology professional development for older adults in Ghana to bridge the digital divide: a systematic review' utilised the social cognitive theory to evaluate the effectiveness of technology professional development programmes in Ghana. The programmes aimed at improving digital literacy skills and reducing the digital divide among older adults. A case was made for the persistent inequality in digital connectivity that serves as an obstacle to the capacity of older adults in Ghana to obtain information, participate in digital society and the economy and maintain social relationships. The systematic review utilised studies published between 2010 and 2022 and revealed that technology professional development led to significant improvements in digital literacy, mobile phone usage, tablet usage, and internet usage among older adults. Odame mentioned that the implementation of technology professional development programmes plays a vital role in enhancing digital literacy skills, reducing the digital divide and fostering active engagement among older adults in Ghana. By way of conclusion, the study suggested potential future research areas that involve an investigation into the long-term sustainability of the improvements among the older adults and also the need for a comparative study to assess programme effectiveness and design on the studied phenomenon.

Finally, the paper by Sayibu et al. 'A pedagogical smart learning environment (PSLE): mobile transitioning at home a constructivism theory in Ghana' examined how a pedagogically smart learning environment (PSLE) is advantageous for childhood pre-schooling, caregiving, and smart play learning (SPL) during cognitive learning in five regions in Ghana. The study adopted a qualitative technique to conduct telephonic interviews with forty-five (45) parents and twenty (20) kindergarten instructors over a period of six (6) months. The results were coded into themes and used for statistical analysis. Additionally, the 'Parents' Perceptions of Educational Apps Use' (PEAU-p) was adapted to measure children's cognitive learning in SPL during the COVID-19 lockdown. After analysing the field data, it emerged that smart technology used by children supervised by parents was found to be a useful tool for creating and improving learning experiences and enabled children to learn in an engaging and participatory way. Overall, the study findings found that smart apps enhanced the cognitive skills development and critical thinking among pre-school children in the studied area.

Overall, the contributions in the special issue provide several pathways for higher education institutions in the African region to build the digital capacity of citizens. By harnessing the power of smart technologies to create smart learning environments, higher education institutions can enhance the instructional abilities of teachers and promote optimal learning. Smart technologies and the internet can be leveraged by teachers to create an interactive, personalised, and customised learning environment for their students. Lessons can be learned from the COVID-19 pandemic as the entire continent came to the realisation that transitioning from traditional classroom-based teaching to smart learning environments that are better equipped is the only way to handle unforeseen crises. Moreover, with the influx of AI technologies prompted by ChatGPT, higher education has the responsibility to promote the safe and responsible use of such technologies to build a digital workforce for the higher economic sustainability of the continent.

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