Chapter 10

Artificial Intelligence in Open Distance e-Learning Institutions in Sub-Saharan Africa: Quality Assurance Opportunities and Challenges

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Introduction

This chapter critically reviews the literature on the use of AI (Artificial Intelligence) with specific reference to ODeL (open distance e-learning) institutions in SSA (Sub-Saharan Africa). A critical review of the literature was conducted on works that explored the application of AI in education through the search of popular databases on previously published works. These were carefully evaluated, synthesised, and evaluated for their fitness, and then systemically presented. The chapter highlights the various quality benefits accrued from the application of AI applications in education. The integration of AI in ODeL systems is linked to quality assurance challenges and the integrity of assessments, and poses significant new challenges to research, policy-making, and institution governance. It also provides

implications to researchers, businesses, politicians, and all users, including educators and other education stakeholders.

AI is a term that was predominantly used in science fiction but has recently found a space in our daily lives. UNICEF (United Nations Children's Fund) adopted the definition used by the OECD (Organisation of Economic Cooperation and Development), indicating that AI refers to machine-based systems that, given a set of human-defined objectives, make predictions, recommendations, or decisions that influence real or virtual environments (Penagos, Kassir, & Vosloo 2020:3). Soori, Arezoo, and Dastres (2023:54) consider AI as a branch of computer science that combines machine learning, algorithm development, and NLP (natural language processing). In basic terms, AI is the science of making machines that think like humans, but unlike humans, AI technology can process large datasets that surpass human capabilities (Collins, Dennehy, Conboy, & Mikalef 2021:11 of 17).

Akgun and Greenhow (2021:432) regard AI as the ability of a digital computer or computer-controlled robots to perform tasks commonly associated with intelligent human beings. It is thus a process of using computers and machines to mimic human perceptions, decision-making, and other processes to complete a task. Humans have been using machines to augment their capabilities for a long time, so it is only natural that humankind has arrived at a point where we are looking to replicate our cognitive processes in some of those machines. According to Sarker (2021:1 of 21), AI is a field of science that combines computer science to enable problem-solving. AI enables adapting machines to the student learning process (Kabudi, Pappas, & Olsen 2021:2 of 12). It assists in finding out what students do and do not know about their personalised study schedule considering the knowledge gaps. In this way AI tailors studies according to students' specific needs, increasing their efficiency (Seo, Tang, Roll, Fels, & Yoon 2021:2). In education, AI enhances learning outcomes and provides more engaging learning experiences (Kumar 2023:154). Although AI has recently become a buzzword, its impact on education is just beginning to be realised. It has now been positioned as a powerful tool to deliver knowledge that is

organised and packaged by educators (Li, Bastone, Mohamad, & Schiavone 2023:2 of 8).

Pantelimon, Bologa, Toma, & Posedaru (2021:2 of 10) claim that the idea of using AI in education is not new, as the first AI programme in education was written in 1951. The tutoring systems that aimed to adapt to the needs of students was initiated in 1991 with a focus on teaching computers (Pantelimon *et al.* 2021:3 of 10). Though AI in education has become more popular during the last 10 years, this phenomenon has already started in the 1970s (Guan, Mou, & Jiang 2020:135). Even though AI is yet to be a standard cult in IHEs (institutions of higher education) it has been accepted to have the potential to be the next big thing in teaching and learning within universities (Chen, Chen, & Lin 2020:75270). Its impact will start from early childhood education to HE (higher education) up to corporate training (Tuomi 2018). It is expected that AI will yield positive results in improving students' experiences by offering them opportunities to create adaptive learning features such as personalised learning tools.

The use of AI in education allows for the application of technologies such as automated classroom classification, discussion robots, and NLP which help in improving feedback from educators through enhanced feedback (Martínez-Comesaña, Rigueira-Díaz, Larrañaga-Janeiro, Martínez-Torres, Ocarranza-Prado, & Kreibel 2023:97). The use of virtual tutors which is an AI development has ensured that students receive feedback quickly and adequately. For e-learning institutions, incorporating AI in e-learning offers enhanced accessibility and personalisation of education like streamlining grading processes, supporting instructors, and identifying potentially at-risk students. In the e-learning environment, AI refers to the use of trained models that can analyse student learning processes, recognise learning difficulties, and adjust course content accordingly (Kamalov, Santandreu Calonge, & Gurrib 2023:20 of 27). These models can also answer questions or provide learning materials in a variety of languages. The integration of AI into learning ranges from adaptive learning platforms that modify themselves to suit individual students, to chatbots that are available to answer questions around the clock.

AI-enabled online learning platforms can analyse individual student data including patterns, preferences, and strengths (Tapalova & Zhiyenbayeva 2022:640). With abundant AI options institutions must adopt appropriate ones that address their students' needs. AI inevitably spurs innovation thus making countries competitive (Holmes, Chakroun, Miao, Mendes, Domiter, Fan, Kharkova, Orr, Jermol, Issroff, Park, Holmes, Crompton, Portales, Orlic, Rodriguez, Kaur, & Assouline 2019:8), and when it comes to education it creates room for cooperation through information sharing (Akinwalere & Ivanov 2022:15). New digital technologies are creating a great revolution by transforming all aspects of education in teaching, learning, assessment, and feedback (Janardhanan, Rajamohan, Manu, & Rangasamy 2023:30).

AI in Africa

The quality of education is a concern for Africa, with many educational institutions experiencing a lack of basic amenities like libraries, laboratories, and computers. Musau (2018:10) laments that it is widely accepted that most of Africa's education and training programmes suffer from low-quality teaching and learning as well as inequalities and exclusion at all levels. Moreover, in most parts of Africa, there is an evident use of outdated teaching methods and curricula which block the development of critical thinking and problem-solving competencies among African students. The rapid uptake of disruptive technologies in Africa prompted speculations about whether AI applications will take root on the continent since many African countries lack the statistical capacity, infrastructure, and good governance needed for AI to take off.

As the world has produced the 4IR (fourth industrial revolution), AI as a technology within that space is expected to impact Africa in several ways (Neupane & Sibal 2021). For many African countries, the prospects of AI are thrilling since AI carries with it a keen anticipation of new technology and innovations (Onaolapo & Onifade 2020:8 of 9). For African countries, AI has the potential to usher in innumerable positive things. However, the dawn of AI in these countries carries fears of falling behind

more developed economies than the eager anticipation of new technology. Against this backdrop, Africa is embracing AI uniquely realising that it has the potential to transform many of its key sectors such as health, education, and agriculture, among others. In Africa, many people are already utilising AI, developed in social networks, businesses, and health care (Okolo, Aruleba, & Obaido 2023:50). If meticulously planned AI can leverage African countries' economies by hinging on workers' productivity. For instance, in the era of AI, machines can be equipped to perform complex tasks rather than to rationalise several employees.

In the African educational space, AI can facilitate the access of students to educational resources and materials. Using online platforms and digital libraries powered by AI algorithms, students can have access to a wealth of educational content regardless of their geographical location. This means that AI systems can be beneficial to remote area students who lack access to physical libraries and learning materials. AI is not a panacea to all educational challenges faced by African countries but has the potential to address many of them by providing personalised learning experiences, improving access to educational resources for students, and supporting educators to provide quality education. As Holmes, Persson, Chounta, Wasson, & Dimitrova (2022:10) note, AI is increasingly having an impact on education, bringing opportunities and challenges.

AI and Quality Assurance in an Open and Distance e-Learning Space

During the 4IR era, online learning has increased the participation rate in HE (Penprase 2018:979), QA (quality assurance) is an important component of any educational institution's operations. Over the years QA practices have evolved from manual processes to incorporate dedicated software solutions. The invention of AI necessitated the revolutionisation of QA practices to achieve accuracy and efficiency, since with the utilisation of AI systems institutions can expedite several quality processes through reduced time. In reaction to both modern society and advances in technology, distance education has been provoked to rethink

its educational programmes and provide innovative approaches to its teaching and learning practices by including cutting-edge technologies in educational environments as supporting tools in teaching processes in digital interactions (Jamalova, Aymatova, & Ikromov 2022:600).

Online learning is expected to offer significantly increased access to HE at a reduced cost. Despite the expected gains from online education quality remains a concern. QA in online learning is a highly strategic issue (Pannen 2021:122). In open and distance e-learning QA has become a universal concern to those involved in aspects of teaching and learning. By leveraging AI, institutions can uncover critical areas for improvement and enhance overall performance. In education, continuous improvement is a critical process that helps to ensure that students receive the highest quality education possible. AI-powered systems foster a culture of continual improvement through the collection of feedback from students. AI-powered chatbots offer a valuable tool for continuous improvement in education through the utilisation of data analytics. By analysing the data collected, IHEs can identify patterns, trends, and areas needing attention.

Innovative Applications of AI in Quality Assurance

According to Zawacki-Richter, Marín, Bond, and Gouverneur (2019:5), AI applications in education have been on the rise in the last 10 years, which made them attract a lot of attention. According to Yufei, Saleh, Jiahui, and Abdullah (2020:555), the typical scenarios in AI applications used in education include automatic grading systems, intelligent tutoring, adaptive learning, chatbots, NLP, and Chart GPT AI (chart generative pre-trained transformer artificial intelligence). AI's potential in QA extends beyond traditional assessment methods and curriculum design.

A critical advantage of AI-powered applications is how they democratise education by making better education available to more students thereby increasing social mobility and equity (Saltman 2020:200). With the use of AI in education high-quality learning resources are no longer confined to affluent schools and privileged students (Luckin, Holmes, Griffiths, & Forcier 2016:23).

AI applications enable inclusive and equitable access by offering standard and quality education to students irrespective of their location or financial status (Milanez 2023:78). AI applications offer personalised study materials, interactive lessons, and doubt-solving platforms. In this chapter, the following applications have been handpicked: NLP, automated grading system, ITSs (intelligent tutoring system), and ALSs (adaptive learning systems).

Natural Language Processing

NLPs are part of AI that leverages concepts and techniques from computer science and computational linguistics to cognitive psychology (Tyagi & Bhushan 2023:860). NLPs are used to enable computers to interact with human language more naturally and intuitively (Khan 2023:5). It encompasses various activities such as language translation, text classification, sentiment analysis, named entity recognition, and speech recognition. NLPs aim to develop models and algorithms that can understand and generate human language in a way that is accurate and contextually relevant (Otter, Medina, & Kalita 2020:610). NLP algorithms can process large amounts of data, including students' performance data, and find patterns that might improve students' learning efficiency. Through data analysis using NLP algorithms, educators can learn about areas where students need more help and create lessons to address those needs. NLP algorithms can be used to analyse assignments and written essays by providing valuable insights, critical thinking, coherence, and language proficiency. NLPs are useful tools for improvement by transforming the feedback process into an art by offering an in-depth analysis of students' textual data (Bauer, Greisel, Kuznetsov, Berndt, Kollar, Dresel, Fischer, & Fischer 2023:1230).

One technology that is gaining popularity in the education sector is chatbots. They constitute intelligent conversational agents capable of delivering adaptive learning experiences through NLP dialogues (Zhang, Fleyeh, Wang, & Lu 2019:239). Chatbots are AI-powered programmes that can converse with humans, providing them with information and assistance on a variety of issues. One of the most advanced chatbots currently

available in Africa is ChatGPT (chat generative pre-trained transformer), which is an application that has been trained to generate human-like responses to questions and prompts (Naidu & Sevnarayan 2023:9 of 12). ChatGPT offers a variety of benefits to students.

At many IHEs chatbots support students by responding to inquiries, connecting students to course information and student services including sending out reminders (Essel, Vlachopoulos, Tachie-Menson, Johnson, & Baah 2022:15 of 19). The technology is always available to provide support and guidance to students (Lopez & Qamber 2022:18). It uses a machine learning algorithm to analyse student learning history and provide them with personalised recommendations based on individual student needs. The system has been designed to provide quick and accurate answers to student questions.

Automated Grading System

The impact of AI technology is pervasive in the ever-changing educational landscape, particularly with the development of applications that can automatically grade students' work and provide them with objective scores (Bozkurt, Karadeniz, Baneres, Guerrero-Roldán, & Rodríguez 2021:4). An automated grading system is designed to grade student's assignments, exams, and essays in a scientific computing way (Ramesh & Sanampudi 2022:2496). Through this system, a grade for a correct solution is automatically recorded. A student can also use this system to check the correctness of their programme assignments. An automated grading system uses machine learning to recommend grades for students, thereby automating grading and freeing academics so that they can focus on other duties (Weegar & Idestam-Almquist 2023:267).

The significance of AI-graded assessment in the education sector cannot be overstated. According to Kaipa (2021:20), traditional methods of grading where educators have to manually evaluate piles of assignments and exams have been a staple of educators for many centuries. However, with the new evolving technology, AI is poised to revolutionise this fundamental process by automating it, expediting the evaluation process and

providing fast individualised feedback (Kamalov *et al.* 2023:14 of 27). AI-graded assessment is built on the principle of utilising AI algorithms to evaluate and grade assignments, tests, essays, and even open-ended questions (Owan, Abang, Idika, Etta, & Bassey 2023:4 of 15). AI-graded systems can streamline the grading process by providing instantaneous feedback, thereby improving the overall efficiency of assessments (Grivokostopoulou, Perikos, & Hatzilygeroudis 2017:220). These automated grading systems have considerably enhanced educational efficiency and consistency by giving students timely feedback and lowering educators' workload (Gordillo 2019:3 of 24). By automating grading, planning, and administrative work, AI systems can free up time for educators to concentrate more of their time on interaction with students.

The versatility of the automated grading system and its adherence to set criteria lead to a fair and standardised assessment. The incorporation of AI technology into the grading process is one of the many revolutionising innovations that stand out for their remarkable successes in altering the traditional assessment practice (Adiguzel, Kaya, & Cansu 2023:6 of 13). A whole new grading system has emerged because of the development of AI. An automated grading system powered by AI is positioned to overcome the drawbacks of the traditional grading system. This contribution to rethinking conventional approaches for evaluation and assessment of student performance provides a wealth of benefits to students and educators. AI-powered grading systems are altering how quickly examinations are graded.

Adaptive Learning Systems

Educational technology like adaptive learning platforms can customise learning activities and content in real-time. They constitute a broad paradigm aimed at tailoring educational experiences to optimise engagement, effectiveness, motivation, and access (Shah 2023:5 of 8). They are utilising intelligent technologies leveraging machine learning, AI, and advanced analytics. The concept of adaptive learning revolves around the idea that students have diverse backgrounds, learning preferences, and cognitive abilities (Kerr 2016:89). It personalises

learning by continuously evaluating each student's performance in real-time, and ever-changing student learning paths directed by machine learning, thus increasing student engagement and satisfaction (Taylor, Yeung, & Bashet 2021:25). ALSs support students in acquiring knowledge and skills in a particular domain. The system enhances student learning to their comprehension speed, accuracy, quality, and quantity of learning (Wu, Chen, & Chen 2017:910). With an ALS, students can choose the speed and pace at which they work, hence they become more motivated to complete their work. An ALS uses data-driven instruction to adjust and tailor experiences to meet the individual needs of each student (Gligorea, Cioca, Oancea, Gorski, Gorski, & Tudorache 2023:5 of 27). They are capable of tracking student data such as their progress, engagement level, and performance and use that data to provide personalised learning experiences. The adaptive learning platforms analyse solutions to problem-solving tasks or even observe students while they interactively generate problem solutions. ALSs have been developed as a response to the recognition that students learn differently and that their comprehension of concepts varies. ALSs address differences in learning abilities by targeting teaching practices (Wang, Christensen, Cui, Tong, Yarnall, Shear, & Feng 2023:800). The use of ALSs ranging from technological programmes to intelligent systems can be used in a traditional classroom. Because of the customised nature of learning when using adaptive learning platforms students tend to feel that they have more control over their learning and therefore persevere in the programme tasks. Students also grow in confidence and show less academic dishonesty in their academic work. An ALS can allow students to either advance or remediate, and this capability makes it reputed for its potential to accord students' learning mastery (Dziuban, Moskal, Johnson, & Evans 2017:27). Because of its responsiveness, adaptive learning enables universities to accommodate demographically diverse student cohorts potentially levelling the education field (Dziuban, Moskal, Parker, Campbell, Howlin, & Johnson 2018:20). When using an ALS, underachievers gain the most from the supportive nature of the model and succeed in their learning to achieve their education goals. This is possible due to the personal learning plan offered by the adaptive learning

programme. In this programme, students begin to realise control over their learning and authority over tasks (Kem 2022:387).

AI Powered Learning Games

The concept of game-based learning is that principles and game characteristics are associated with learning community prospects (Utsler 2021:186). Learning in the form of a game is one of the oldest and most useful pedagogical ideas that has been applied throughout the history of humankind (Ferreira, Gouin-Vallerand, & Hotte 2016:8 of 8). This activity promotes student involvement and engagement in the learning domains (Wagan, Khan, Chen, Yee, Yang, & Laghari 2023:7 of 12). Game-based learning refers to the use of videos and elements related to games, reading, content, and images in the educational process (Ge & Ifenthaler 2018:10). Educators have long recognised the value of play-based learning and have used it in computer games to stimulate and deliver targeted learning.

McLaren and Nguyen (2023:440) conceive AI-powered learning as a digital learning game which is an interactive, computer-based system in which users (players) engage in artificial activities involving fun, challenge, and fantasy where instructional and entertainment goals are part of the system. AI-driven gamification elements can transform learning into an interactive and enjoyable experience by incorporating game-like features such as rewards, achievements, and leaderboards. With the increased popularity of video games across all ages, digital-based learning can prove to be a valuable tool in energising students and encouraging active learning in the classroom (Nadeem, Oroszlanyova, & Farag 2023:4 of 23). However, Liu, Shaikh, and Gazizova (2020:55) note that game-based learning has limitations which include the complexity and labour intensiveness during its development and the difficulty of integrating the games into the learning process.

Intelligent Tutoring Systems

ITSs are emerging as a powerful tool in education, employing the capabilities of AI to provide personalised learning experiences. According to Lin, Huang, & Lu (2023:3), ITSs can be defined as

computer-based educational systems that have independent databases or knowledge bases for educational content in addition to teaching strategies and aim to use conclusions about students' abilities to understand topics and identify their strengths and weaknesses. From this analysis, they can adapt the learning process dynamically (Chen *et al*. 2020:75265).

These are complex computer systems designed to provide immediate and customised instruction feedback to students without requiring instruction from a human educator. The software application tracks students' work, adjusting feedback, and providing hints along the way. ITSs are often dedicated to a single subject or language. They are designed to help students master difficult knowledge and skills by implementing powerful algorithms that adapt to the student at a fine-grained level and that instantiate complex principles of learning (Guo, Wang, Gu, Li, Wang, & Zhou 2021:450). They simulate the one-on-one experience of working with a human tutor. It has a common goal of enabling learning in a meaningful and effective manner by using a variety of computing technologies. It is an educational software tool that has an AI component in it (Alshaikh & Hewahi 2021:410). The AI component allows it to model students' psychological states such as motivation, emotion, and cognition, as well as their prior knowledge skills and preferences.

According to Li *et al*. (2023:2 of 8), ITSs can also monitor students' progress, provide feedback, hints, and scaffolding, and select appropriate problems or tasks for students to practise. Students who use ITSs have been found to perform better than those who use conventional methods of learning. This is because an ITS uses advanced algorithms to provide customised learning techniques for various students according to their needs and capacities (Akyuz 2020:954). They are developed and based on the notion that customised learning is more effective than traditional classroom teaching and learning.

Benefits of AI for QA in ODeL Institutions

The inclusion of AI in ODeL teaching and learning has attracted much interest, particularly the belief that AI has the potential

to improve the quality of education in IHEs. AI has positively impacted the quality of curricula, teaching and learning, the quality of evaluations, and feedback from students and educators.

AI and Curriculum

Curriculum development is the backbone of the educational process, as it determines what students learn, how they learn it, and how their learning is ultimately evaluated (Haque & David 2023:10). It is imperative to ensure the quality and effectiveness of the curriculum in the rapidly evolving education landscape, as the advent of AI possibilities for enhancing QA in education has emerged. AI offers educators the opportunity to create and develop high-quality learning materials (Khosravi, Denny, Moore, & Stamper 2023:3 of 20).

By analysing vast amounts of data AI algorithms can identify knowledge gaps, update curriculum content, and recommend resources for teachers (Southworth, Migliaccio, Glover, Glover, Reed, McCarty, Brendemuhl, & Thomas 2023:4 of 10). This capability ensures that curriculum design adheres to accurate and up-to-date information, enabling educators to provide students with the most relevant and comprehensive learning materials. Curriculum creation and development used to be a tedious and time-consuming exercise, however, with AI entering the field of play, the situation has been upended. AI algorithms can continuously monitor and analyse educational data in real time. Using AI to track students' performance, engagement, and feedback can identify areas where the curriculum may be lacking or need updating (Owan *et al*. 2023:3 of 15).

AI can be used in the curriculum to provide opportunities for enhancing the evaluation of the quality of courses for their effectiveness. AI's predictive and analytic capabilities can be harnessed to inform curriculum design and decisions thereof (George & Wooden 2023:6 of 20). The other significant advantage of AI is its ability to tailor the curriculum according to the specific needs of each student. AI algorithms can analyse student data including learning preferences, strengths, and weaknesses to develop personalised learning paths for them (Seo *et al*. 2021:6).

AI and Accreditation

Accreditation is a formal recognition and approval granted by an authorised body or agency to an institution, programme, or organisation (Duarte & Vardasca 2023:3 of 19). It is an assurance that the institution entity meets specific standards and criteria set forth by the accrediting body. Accreditation is thus an acknowledgment of an educational institution's ability to carry out required educational tasks according to the set prerequisites by a regulatory authority. The purpose of accreditation in HE is to improve the quality of programmes and services and to assure public accountability (Van Jaarsveldt, De Vries, & Kroukamp 2023:47). Using AI, learning programmes and courses can be evaluated against international and national standards in preparation for their accreditation. Given the lengthy process of accreditation and the number of programmes including courses submitted for consideration to an accrediting body, the use of AI can expedite and simplify the process significantly. In the same way peer reviewers are trained on curriculum evaluation, AI systems are designed using data elements, evidence, rubrics, and decisions made by past reviewers to conduct accreditation assessments.

AI can be a transformative tool for institutions in managing the accreditation of programmes through automation. The integration of AI into programme accreditation offers an exciting frontier for IHEs. By harnessing the power of AI IHEs not only improve their operations but also elevate the quality and relevance of their programmes. Using AI the evaluation of courses and programmes according to international and national standards can be significantly simplified and expedited. For instance, the process of validating external education units for certification requires manual work, which is both expensive and time-consuming. Institutions can streamline this process by employing AI tools to automate key steps of the certification process. The use of AI in the certification process eliminates the need for manual review while saving a considerable amount of time and resources. AI algorithms can analyse the curriculum, assess its alignment with the accreditation requirements, and provide reports with detailed areas of compliance and those needing improvement.

The use of AI in accreditation assessment not only saves time and resources but also ensures a more objective evaluation process. AI can also be valuable in maintaining compliance when standards are strict. Through continuous monitoring and analysis, AI systems can ensure that programmes consistently meet the required standards (Brey & Dainow 2023:7 of 13). They can provide real-time feedback on compliance issues, helping institutions address potential gaps before they become significant challenges.

Personalised Learning

Personalisation is one of the biggest trends in education. Personalised learning is, however, not a new concept in education. According to Bhutoria (2022:2 of 18), the concept has been used interchangeably with terms such as matching or tailoring to recognise the heterogeneity of students with special challenges. Personalised learning is an educational approach that aims to customise learning for each student's weaknesses, strengths, skills, and interests (Shemshack & Spector 2020:8). This requires tailoring learning according to individual needs and prior experiences to allow every student to realise their maximum potential through customised instruction (Bernacki, Greene, & Lobczowski 2021:1682). It requires a digital learning environment to be adaptive to individual knowledge, experience, and preferences for it to be supportive of desired student outcomes.

Personalised learning is therefore a way of using AI that focuses on training that fits the needs of each student. With the use of AI, students have personalised approaches to learning. Traditionally it has followed a 'one-size-fits-all model' where all students were expected to learn in the same way and at the same pace. However, it is a known fact that students learn differently and at different paces. AI is very handy in circumstances like these as it bridges the gap by providing students with adaptive personalised learning experiences. AI-powered adaptive learning platforms can collect and analyse data about students' learning styles, progress, and performances (Akavova, Temirkhanova, & Lorsanova 2023:3 of 34). Based on such data the platform can adjust the content and develop methods that suit each student's needs, preferences, and their pace of learning. The major result

of personalisation in education is the maximisation of motivation and creativity of students and educators alike through the implementation of individualised programmes, learning goals, and methods (Makhambetova, Zhiyenbayeva, & Ergesheva 2021:10). Personalised learning helps students to learn more efficiently and achieve better learning outcomes.

Access to Vast Resources

The use of digital technologies in education holds significant promise. When AI is applied to education, they have the potential to improve the quality and equity of learning by providing learners with limitless access to information resources (Božić 2023:9). Easy access to vast amounts of information reduces students' need for rote memorisation of facts and figures as they can readily access and retrieve such information. In the past students were often limited to materials that were made available in their institutions' libraries. However, with the advent of digital technologies students can now access a vast array of educational resources from anywhere in the world. AI-powered search engines such as ChatGPT help students to quickly and easily find relevant and high-quality educational content on a wide variety of topics (Javaid, Haleem, Singh, Khan, & Khan 2023:5 of 12).

Assistive technology, powered by AI can help students with special needs and educational requirements by offering them personalised resources and interventions to aid their learning. AI-embedded platforms can bridge the learning gap by providing educational resources to students in remote and underserved areas (Olanrewaju, Adebayo, Omotosho, & Olajide 2021:3 of 10). These tools offer access to a wide range of learning materials and courses thereby democratising education whilst promoting learning. Addressing the issue of inclusivity and equity through AI-powered systems creates and ensures an inclusive learning environment and equal opportunities for students' academic success (Abbasi, Davis, Heredia, & Camacho 2024:3).

Automated Evaluation and Feedback

Feedback has been recognised as a vital element of learning at all levels (Wisniewski, Zierer, & Hattie 2020:2 of 14). In addition to its potency feedback is also one of the mechanisms in courses that tailors what is a common programme to the needs of each student (Buckingham Shum, Lim, Boud, Bearman, & Dawson 2023:40 of 42). Automated evaluation is the ability of computer technology to evaluate and score written tasks. It is the feedback that is generated by AI-based software and delivered to students upon completion of a written task (Fleckenstein, Liebenow, & Meyer 2023:2 of 11). It provides immediate scoring and feedback on students' work (Zhai & Ma 2022:2820). Automated feedback addresses mechanical and structural elements like citation, academic style, grammar, and structure leaving educators to focus on high-order cognitive skills like comprehension and argumentation of concepts. It therefore focuses on low-order concerns making personalised feedback possible even for a large student cohort. The use of AI-powered systems is enabling the ease of collection of big data. The sophistication found in learning analytics provides just-in-time information (Atherton, Shah, Vazquez, Griffiths, Jackson, & Burgess 2017:123). This allows data from digital teaching and learning experiences to provide valuable insights for prompt and accurate decision-making (Martínez-Comesaña *et al.* 2023:95).

AI-powered assessment tools provide numerous benefits, including improving the accuracy and efficiency of assessments and generating personalised feedback for students (Owan *et al.* 2023:13 of 15). The generation of automated assessments and feedback enables educators to adapt their teaching strategies to meet the needs of students. AI algorithms can also automate the evaluation of programmes and courses thereby reducing the time needed for educators and administrators to undertake such exercises. Depending on the configuration of the automated evaluation system it can support teaching and learning by enabling interactions between the technology, students, educators, and peers (Wilson & Roscoe 2020:89). It encourages students to participate in the active-reflective process in which

they actively improve their work instead of relying on the tool to correct their work (Cherepinsky 2011:298).

AI and Predictive Analytics

AI is very effective at performing predictive analytics because it collects, organises, and analyses data quickly. AI predictive models can generate solutions to challenges or tasks using complex algorithms within a matter of minutes. It provides foresight and vision for the future that can help to improve learning effectiveness and prompt remedial, timely, and appropriate actions (Sghir, Adadi, & Lahmer 2023:8300). Predictive analytics is a branch of advanced analytics that makes predictions of outcomes using historical data combined with statistical modelling, data mining, techniques, and machine learning (Kumar & Garg 2018:31). It is used to predict future events.

IHEs use predictive analytics to find patterns in the data to identify tasks and opportunities. In IHEs predictive analytics can be used to predict learning behaviours or performances based on past patterns and trends (Sghir *et al.* 2023:8310). Consequently, educators can provide timely and precise interventions, potentially averting academic setbacks, and fostering more supportive learning environments (Ifraheem, Rasheed, & Siddiqui 2024:255). Predictive analytics can be used to build predictive models that forecast student success and retention (Essa & Ayad 2012:62). If the platform notices a trend that could indicate a student is at risk, it notifies the student support team. Predictive analytics can help educators to streamline grading and assessment processes, saving time, and allowing the educators to focus more on their research (Igbokwe 2023:303). It can also assist educators in analysing data to make informed decisions about their teaching and students learning. This predictive analytic capability is critical in helping students improve their academic performance by providing them with personalised learning experiences. This can make students learn more effectively and efficiently, leading to student engagement, motivation, and ultimate satisfaction.

As an important component of AI, predictive analytic models and providing feedback to the instructors and students

have become critical (Ouyang, Wu, Zheng, Zhang, & Jiao 2023:5 of 23). For example, AI-powered systems can identify at-risk students at an early stage of their learning and suggest the needed support systems and intervention strategies they might require (Baneres, Rodriguez-Gonzalez, & Serra 2019:255). Traditional methods of addressing effective student retention have limitations in the early identification of at-risk students and in providing effective interventions (Villegas-Ch, Govea, & Revelo-Tapia 2023:15 of 20). AI has been used to analyse large-scale data sets to identify at-risk students and to provide personalised interventions (Ikram, Fiaz, Mahmood, Ahmad, & Ashfaq 2021:2 of 12).

Challenges Posed by AI for QA in ODeL Institutions

Integrating AI in education has sparked a dynamic discussion about potential gains and drawbacks (Viljoen 2023). Challenges posed using AI may emanate from privacy concerns, ethical considerations, and AI's potential to preserve existing biases.

Ethical Concerns

Another important challenge that is encountered when implementing AI in the educational system is the issue that concerns ethics and transparency in data collection and use. The advent of AI has heightened concerns about data protection and privacy. Aldoseri, Al-Khalifa, & Hamouda (2023:15 of 33) notes that as explainable AI technologies become more advanced, there is a risk of generating explanations that may be misleading and biased leading to potentially harmful consequences. The use of AI in IHEs requires the collection and analysis of student data. While the benefits of AI are promising, students and instructors may perceive an indiscriminate collection and analysis of their data as an invasion of their privacy (Seo *et al*. 2021:15). The integration of AI in education raises ethical concerns as AI relies on data for it to function effectively. Holmes *et al*. (2022:506) also note that as with any transformative technology, some AI applications are bound to raise ethical and legal questions related to liability or potentially biased decision-making. AI has the potential to

infer sensitive information such as student location, habits, and preferences and it poses a risk of unconsented data dissemination (Manheim & Kaplan 2019:120).

The use of AI in learning raises ethical issues that must be addressed. Bias in algorithms used by AI systems is a significant concern as programming can result in biased outcomes or the promotion of certain ideologies without transparency (Silva & Kenney 2018:13). When educators and students interact with generative AI systems their conversations and personal information might be stored and analysed, posing a serious risk to their privacy. With public AI systems educators should refrain from submitting sensitive details about their colleagues or students including but not limited to private communication, personal identifying information, health records, academic performances, emotional wellbeing, and financial information (Chen, Wu, & Wang 2023:8 of 33). The deployment of AI in education also raises concerns about accountability (Memarian & Doleck 2023:5 of 12). For instance, it might be unclear why an AI system has made specific recommendations, how it arrived at a certain decision, and a particular assessment result. This makes it difficult to hold the system accountable for its actions and decisions. Educators and policymakers must carefully consider these concerns when implementing AI in teaching and learning. Students must be fully informed about the data being collected, how it is used, and who has access to it.

Academic Integrity

As technology continues to evolve, the use of AI in academic settings has become increasingly common. According to Kier and Ives (2022:1 of 19), maintaining academic integrity has always been a critical concern for educators and instructors, but in a digital atmosphere where digital technologies are being used, this challenge has since multiplied. The concerns with academic integrity increased since the shift to online learning that was necessitated by the advent of the COVID-19 pandemic (Ives & Cazan 2024:120). This is so because of the ease of accessing information and the apparent availability of various AI applications.

Nilsson (2016:5) contends that with the advent of digital technologies, cheating, plagiarising, and colluding students are attracting a lot of attention. Technology is thus acting as a double-edged sword since it aids learning but at the same time promotes cheating (Zainuddin 2024:2). AI in education can lead to unintended consequences, making the bad worse and the good better. Some of the AI-powered applications can inadvertently perpetuate behaviours that compromise academic integrity technologies like ChatGPT that can generate text that closely mimics human-generated content. Students may use these convenient technologies to complete assignments, essentially outsourcing their thinking process to a machine. It is therefore important to establish guidelines and mechanisms for ensuring that the use of AI is both ethical and effective. This is important because information generated by AI can be inaccurate or misleading, a fabrication of research, faking sources, and not attributing work to their authors. AI can thus obscure the students' lack of comprehension of a particular subject matter. In response to this challenge, solutions are being developed to safeguard academic integrity. The development of tools to detect AI-generated content has become an urgent need in many fields including education (Uzun 2023:45).

There are available AI tools used for preserving the sanctity of student assignments by monitoring remote student work closely. Such tools enable educators to assess student assignments with their rubrics online. The instructor can keep track of both analytics and student engagement, and answer any questions that may arise (Owan *et al*. 2023:4 of 15). The AI-generated content detection tools will ensure the authenticity and credibility of the content and that issues about plagiarism and academic integrity are addressed (BaHammam, Trabelsi, Pandi-Perumal, & Jahrami 2023:155). Therefore, while AI poses a challenge concerning academic integrity it can also be an integral part of the solution (Cotton, Cotton, & Shipway 2023:5 of 12). For instance, plagiarism software can evolve to identify AI-generated content by analysing patterns, syntax, structures, and other unique markers. Parallel to fighting the ills of AI in academic integrity could be continuous education on academic integrity by emphasising the value of

original thinking and creation and speaking against an undue reliance on AI.

Balancing Automation with Human Interaction

AI has revolutionised humans' interaction with technology, making their lives more efficient, convenient, and even more interesting (Füller, Hutter, Wahl, Bilgram, & Tekic 2022:1 of 22). In an era marked by rapid technological innovations, the juxtaposition of AI and human interaction is a prominent subject of discussion (Lee, Kavya, & Lasser 2021:5). As IHEs continue to adopt digital information, they must find a balance between automation and the human touch for optimal results. While AI offers efficiency it cannot replace the invaluable human interaction provided by educators, therefore striking a balance between technology and personal interaction is crucial for a well-rounded education.

There is much more to consider on the human side of digital transformation and automation than simply implementing new software and its associated processes. Achieving harmony between AI, automation, and human interaction requires a strategic approach and an adaptive mindset (Davenport, Guha, Grewal, & Bressgott 2020:26).The key to harnessing the full potential of AI while preserving the value of human interaction lies in striking a balance between the two. This can be achieved by, among others, using AI-powered applications whilst preserving human support for complex and emotionally sensitive issues. AI can also be designed and encouraged to handle repetitive tasks while humans focus on innovation, creativity, and tasks requiring EI (emotional intelligence) (Nandan, Arya, Binjola, & Chaudhary 2023:458). The other way to achieve a balance or harmony between automation and human interaction is by combining the data analysis capabilities of AI with human expertise to make well-informed decisions (Trunk, Birkel, & Hartmann 2020:883). This goes to show that AI and human interaction are not necessarily opposing forces but can complement each other to create a harmonious digital environment.

High Costs of Implementation

Implementing AI is an ambitious undertaking with serious financial implications for the institution. While AI systems are beneficial to the organisation it is critical to consider expenses associated with its adoption. The maintenance of technological devices employed in AI can be very expensive (Sjödin, Parida, Palmié, & Wincent 2021:577). There are many costs associated with implementing AI tools. These costs include hardware and software costs, labour costs, and training and maintenance costs. Adopting AI technologies can be very expensive in terms of initial investments or ongoing maintenance. One of the expenses in implementing AI is the cost of acquiring the necessary technology and infrastructure (Mun, Housel, Jones, Carlton, & Skots 2020:85).

Moreover, customisation and integration costs may rise when adapting AI systems to fit an institution's specific needs. The implication of integrating AI into the education system means that the budget for the institution must increase. Institutions that cannot cope with the costs will be left behind and will lose the opportunity to adopt the use of AI to enhance their operations and their teaching and learning (Ahmad, Han, Alam, Rehmat, Irshad, Arraño-Muñoz, & Ariza-Montes 2023:6). IHEs often need to allocate significant resources to integrate AI effectively, which can be challenging for those with smaller or limited budgets. The high cost of deployment and a lack of skilled workforce are some of the key factors hindering the implementation of AI in education (Abioye, Oyedele, Akanbi, Ajayi, Delgado, Bilal, Akinade, & Ahmed 2021:5 of 13). Employees need to be trained on how to effectively use AI systems and integrate them into their workflows.

Limited Ease of Accessibility

AI-powered education technology has the potential to improve access and inclusivity for students with disabilities or other learning needs. However, there is a risk that AI-based systems in education will not be accessible to all students which could potentially contribute to already existing inequalities (Williamson 2023:3 of 8). AI systems can adversely impact students' abilities to access educational services because not all students have

access to computer devices and the internet. This imbalance could accelerate the gap between students from different economic backgrounds.

Moreover, if AI algorithms are biased their decision-making processes may inadvertently discriminate against certain individuals or groups (Varsha 2023:3 of 9). For instance, if an AI-powered system used for admissions is designed and trained on biased historical data it may disadvantage students from under-represented backgrounds or those attending IHEs with fewer resources. This can perpetuate inequities or hinder social mobility (Zajko 2022:5 of 16). Furthermore, in developing countries, resources that are utilised in the implementation of AI are scarce or not easily available. There is a huge concern regarding the availability and reliability of internet connections in the developing countries. Additionally, modern-day gadgets and devices that support the effective functioning of AI applications such as smartphones are not readily available. The resource constraints experienced by many African countries act as a detrimental factor to the adoption of the necessary AI needed to enhance the quality of education (Jaldi 2023:20 of 25). This means that AI systems can contribute to limiting access to educational opportunities for students in different geographical locations.

Educators' Digital Competencies

The term 'digital literacy' denotes a set of skills needed for one to live, learn, and work in a society where people need to communicate and access information through digital technologies such as internet platforms, social media, and mobile devices. Since its inception, AI, as well as its development and integration have been concentrated within the Global North (Acosta, Riordan, & Jarrín 2023:7). This concentration has created a disparity that has limited the ability of AI applications to be effective and not being able to operate in a functional manner that does not compound existing inequalities (Okolo *et al*. 2023:40).

Digital skills literacy is a significant barrier to the adoption and implementation of AI in Africa. It must be stated that in developing markets such as Africa, AI-ready workers are

scarce, posing a major issue (Ade-Ibijola & Okonkwo 2023:106). According to the IFC (International Finance Corporation) LEK (Lawrence, Evans, and Koch) Consulting (2019:36), globally SSA has the lowest percentage of citizens equipped with digital skills equalling to about half of the average level of digital adoption status globally. According to Falloon (2020:2451) as well as Dwivedi, Hughes, Ismagilova, Aarts, Coombs, Crick, Duan, Dwivedi, Edwards, Eirug, Galanos, Ilavarasan, Janssen, Jones, Kar, Kizgin, Kronemann, Lal, Lucini, Medaglia, Le Meunier-FitzHugh, Le Meunier-FitzHugh, Misra, Mogaji, Sharma, Singh, Raghavan, Raman, Rana, Samothrakis, Spencer, Tamilmani, Tubadji, Walton, & Williams (2021:9 of 97), although institutions implementing AI claim to provide training to their employees, a shortage of appropriate skills remains a major barrier to AI adoption. AI skills are more difficult to master and there is undoubtedly a demand-supply imbalance in the market (Jaldi 2023:7 of 25).

A major part of educators' responsibilities is to create meaningful learning environments to deepen students' learning experiences and boost their capabilities. However, some educators may not be digitally ready to use AI-driven educational applications for teaching and learning purposes (Ally 2019:303). They may not be familiar with these novel technologies to facilitate aspects of their teaching, in terms of technical and other broader aspects such as communication, collaboration, and other multidisciplinary skills (Ng, Leung, Su, Ng, & Chu 2023:141).

Reduction of Staff

AI's ability to complete routine tasks raises worries about job displacement for occupations previously deemed impervious to automation. The potential of AI in education is exciting but also poses significant challenges for the future of the teaching profession. According to Tuomi (2018:2), as educational systems tend to adapt to the requirements of the industrial age, AI could make some functions of education obsolete and emphasise others. For example, as AI becomes more advanced the role of educators will shift. Educators will become more focused on high-level tasks such as lesson planning and student engagement, while AI systems will proceed with the administrative and grading tasks.

As AI becomes sophisticated it could potentially replace human labour in a range of sectors leading to job losses (Khogali & Mekid 2023).

AI has the potential to automate various tasks, which can lead to business efficiency but also to job cuts (Dwivedi, Kshetri, Hughes, Slade, Jeyaraj, Kar, Abdullah, Baabdullah, Koohang, Raghavan, Ahuja, Albanna, Albashrawi, Al-Busaidi, Balakrishnan, Barlette, Basu, Bose, Brooks, Buhalis, Carter, Chowdhury, Crick, Cunningham, Davies, Davison, Dé, Dennehy, Duan, Dubey, Dwivedi, Edwards, Flavián, Gauld, Grover, Hu, Janssen, Jones, Junglas, Khorana, Kraus, Larsen, Latreille, Laumer, Tegwen Malik, Mardani, Mariani, Mithas, Mogaji, Nord, O'Connor, Okumus, Pagani, Pandey, Papagiannidis, Pappas, Pathak, Pries-Heje, Raman, Rana, Rehm, Ribeiro-Navarrete, Richter, Rowe, Sarker, Stahl, Tiwari, Van der Aalst, Venkatesh, Viglia, Wade, Walton, Wirtz, & Wright 2023:5 of 63).The use of AI can lead to job losses for educators who could be replaced by automated systems and robots. The use of robots can therefore result in a decrease in jobs available for qualified educators. While AI has the potential to enhance productivity and create new job opportunities it also poses challenges and causes disruptions in the labour force (Zirar, Ali, & Islam 2023:10 of 17).

With the automation of tasks, there is a possibility of humans being replaced by machines and robots (Acemoglu & Restrepo 2018:5). The use of AI technologies will impact jobs soon as most jobs get automated especially when humans will be expected to work together with robots in ways that were never imagined before (Poba-Nzaou, Galani, Uwizeyemungu, & Ceric 2021:65). Although AI can automate certain administrative tasks and provide personalised learning experiences, it cannot replace human qualities. According to Haladjian and Montemayor (2016:215), despite their breathtaking capabilities, AIs cannot replicate the attributes of emotion, compassion, and ethical judgement. AI lacks the depth of emotional understanding and subjective interpretation of human beings concerning their subjective endeavours. According to Kerasidou (2020:246), in the realm of human touch where the ability to incorporate diverse perspectives are intrinsic to artistic expression are emphasised,

AI is found wanting. Therefore the notion that AI will completely replace educators needs to be approached with scrutiny and analysis (Ghamrawi, Shal, & Ghamrawi 2023:4).

Algorithmic Bias

The term 'algorithmic bias' has been applied to a variety of unfairness in automated systems (Baker & Hawn 2021:3). According to Gaskins (2023:418), algorithmic bias refers to algorithms that produce results that are systemically prejudiced due to erroneous assumptions in the machine learning process. It stems from biases held by people who design or train AI, and machine learning systems (Idowu 2024:3). While the design and training can increase the unfairness, biases often come from the data itself capturing historical prejudices, cultural stereotypes, or demographic disparities (Yu, Li, Fischer, Doroudi, & Xu 2020:298).

AI systems are not immune to bias, and they can perpetuate or amplify existing social inequalities (Igoe 2021:10). Algorithmic bias is the discrimination of one group over another due to recommendations or predictions of a computer programme. According to Jimenez and Boser (2021:4), bias occurs when students' inputs are misinterpreted and in turn misevaluated and then scored differently. Given how fast computer programmes operate they can apply bias more quickly and efficiently than humans can. Since AI is trained on data, the underlying data could be implicitly or explicitly biased (Marinucci, Mazzuca, & Gangemi 2023:748). If data contains biases the results will also contain biases. Algorithmic biases have been detected and documented in situations ranging from the prediction of student dropout rates (Anderson, Boodhwani, & Baker 2019:490) to the prediction of students failing a course (Hu & Rangwala 2020:435; Kizilcec & Lee 2022:178). In the face of algorithmic bias, organisations can make attempts to mitigate this bias through a variety of ways. They can promote an awareness and educate designers and users about the implications of bias in technology. The creation of more education and awareness about algorithmic bias can effect necessary change. Furthermore, organisations can actively work towards inclusive data collection, ensuring that diverse perspectives are

represented, and data are thoroughly evaluated for potential bias. Regular audits and assessment of algorithms can serve as a tool in identifying and rectifying biases.

Assessment Change

AI not only introduces opportunities but also challenges assessment practices (Swiecki, Khosravi, Chen, Martinez-Maldonado, Lodge, Milligan, Selwyn, & Gašević 2022:2 of 10). A primary challenge that needs attention before educators can apply AI in assessment is their lack of knowledge and skills relevant to AI techniques as well as their access to big data (Su, Ng, & Chu 2023:6 of 14). Just like all technologies, AI-based systems suffer from technical difficulties and glitches. These may disrupt the education process, causing students to lose valuable learning time. When it comes to assessments, if an AI system crashes during a crucial examination slot, it could result in impacting negatively on the student's performance and their grades.

In the present and emerging AI context, the allocation of marks and grading in both formative and summative assessments are becoming increasingly challenging. There is only a limited collaboration and transparency between educators and students, as well as among students mutually. The rise of AI has prompted IHEs to depart from traditional assessment practices to online and automated assessment methods. Such a transition affects the quality of assessment. The use of AI applications may cause a significant risk if used by students completing their qualification assessment. Applications such as chatbots may produce answers that seem correct but are incorrect and biased (Kooli 2023:11 of 15). AI applications have been found to produce not only biased answers but harmful and dangerous answers to questions and can also produce fake references to books and articles by real or fake authors.

AI-generated text provides quick solutions to assessment-based questions. However, an overreliance on this easy way of completing assessments can negatively impact students' high order thinking capabilities (Farhi, Jeljeli, Aburezeq, Dweikat, Al-shami, & Slamene 2023:6 of 8). It can also hinder the

development of other important competency skills such as critical thinking, problem-solving, and other essential skills. At present technology-based assessments provide immediate and precise descriptive feedback relating to student performance, enabling both diagnostics and differentiation of instruction (Bulut, Cutumisu, Aquilina, & Singh 2019:3 of 16). However, the usual concern with technology-based assessments is that they can be done by other sources rather than by the students themselves, and the use of AI takes this concern to a different level.

Opportunities Created by AI for QA in ODeL Institutions

Assessment

AI in assessment is transforming education by automating grading and feedback processes. In the world of education where innovation is key to staying ahead, AI-powered tools for e-learning are emerging as transformative forces in the field of assessment (Pratama, Sampelolo, & Lura 2023:353). One such area experiencing changes is in e-learning assessments. AI-based techniques have been developed to automate parts of the traditional assessment practice partially or fully. AI has the potential to improve the way students receive assessment feedback by bringing a new level of authentic assessment, accessibility, inclusion, and automation (Richardson & Clesham 2021:5). AI can generate assessment tasks, find peers to grade work, and automatically grade student work. These techniques offload work or tasks from humans to AI making assessment practices more feasible to maintain (Swiecki *et al*. 2022:4 of 10).

AI-driven assessment ensures that students are evaluated based solely on the quality of their work, fostering a more equitable learning environment. AI systems can identify individual student strengths and weaknesses and tailor feedback to address specific areas needing improvement (González-Calatayud, Prendes-Espinosa, & Roig-Vila 2021:5 of 15). AI systems render more accurate, unbiased, and constructive feedback which can

lead to more effective learning, motivation, and growth in the mindset of students.

Increase in Productivity and Efficiency

The gradual integration of AI technologies into complex tasks has the potential to significantly impact productivity across a wide range of activities (Gao & Feng 2023:4 of 21). AI technologies use the power of automation to enhance productivity and improve efficiency. The integration of AI into HE offers promising outcomes, including personalised education, automation of administrative tasks, and improved efficiency. By automating time-consuming tasks institutions can free their employees from the menial administrative tasks so that they could focus on more critical and strategic aspects of their jobs. According to Czarnitzki, Fernández, & Rammer (2023:190), the pace and scope of a groundbreaking development in AI technology can substantially change organisations' production methods thereby affecting their productivity. With AI individual students' needs can be addressed leading to increased efficiency in the education system. AI technologies can gather and process large amounts of institutional data thus generating wholistic insights from these data points.

Promotion of Inclusivity and Accessibility

AI has emerged as a powerful tool for making online content accessible and inclusive. It can help remove many of the barriers that people with disabilities face, allowing them to easily and freely access information and ideas. AI technologies can create inclusive and accessible educational materials, platforms, and tools for individuals with disabilities, ensuring equal access to education and promoting an inclusive learning environment (Salas-Pilco, Xiao, & Oshima 2022:8 of 17). The field of AI is continuously advancing, with researchers and developers exploring new ways to leverage AI to improve accessibility for individuals with disabilities.

Designing inclusive experiences is essential to building a user-centric and fair society in the modern-day digital era

(Apostolidou & Fokaides 2023:5 of 16). AI technology is rapidly advancing, creating new opportunities for improving accessible technology and diversity design. There are AI technologies developed specifically to enhance accessibility for individuals with disabilities. One such technology includes speech recognition software which converts spoken language into written text, allowing individuals with mobility impairment or conditions such as dyslexia to interact with computers through speech (McCollum, Nation, & Gunn 2014:11 of 13) and a screen reader which uses AI algorithms to convert on-screen text into synthesised speech or braille output (Mukhiddinov & Kim 2021:6 of 31). They enable individuals with visual impairment to access digital content. These are just a few of the technologies that enhance accessibility, particularly for students with disabilities. These technologies aim to provide equal opportunities and improve the quality of life of people with disabilities. AI is used to promote inclusion rather than reinforcing existing disparities and inequalities. By leveraging AI capabilities IHEs can create inclusive environments and provide equal opportunities for everyone irrespective of their abilities.

Research Support

The role of AI in academic research has garnered attention from the information community in recent years (Collins *et al*. 2021:2 of 17). This transformative technology powered by machine learning algorithms and data analytics is revolutionising the research landscape. By using AI for research purposes both students and academics will find the information they need for their studies quickly with abundant data, thus enriching the quality of their research output (Crompton & Burke 2023:4 of 22). AI tools can be used to sift through large data sets to identify patterns, build models, recommend articles, and prepare manuscripts for publication (Sarker 2021:4 of 21).

AI can assist researchers in the discovery and synthesis of information from vast amounts of existing research papers and patents, finding relevant literature and other academic sources. This can help to identify research gaps and relevant literature and generate new insights. AI has the potential to accelerate the pace

of scientific discovery and enhance the quality of research outputs by enabling researchers to process vast amounts of data, extract meaningful insights, and automate repetitive tasks. As AI evolves, researchers need to adapt and embrace this powerful tool while also being mindful of its limitations and ethical considerations. By striking a balance between automation and human ingenuity researchers can unlock new possibilities, advance scientific knowledge, and contribute to the transformative potential of AI in the realm of academic research.

Over the years the ability of researchers to generate and store data has increased tremendously causing data deluge (Munshi & Mohamed 2017:370). Sometimes this made it difficult for researchers to analyse this vast amount of data for patterns and insights (Sivarajah, Kamal, Irani, & Weerakkody 2017:265). Given the deep learning techniques, AI algorithms play a critical role in making research work easy for data collection and analysis (Soori *et al.* 2023:56). The use of AI algorithms is applied to analyse large amounts of data sets and identify patterns, correlations, and trends that may not be easily recognisable by humans alone. According to Malik, Pratiwi, Andajani, Numertayasa, Suharti, Darwis, & Marzuki (2023:3 of 11), AI algorithms can help suggest relevant research papers, conferences, or potential collaborations in academia based on researchers' interests and previous work.

Reduction of Teaching Load

Reducing the teaching load for academics has been a long-lasting challenge for educationists, hoping to achieve more effective teaching in the classroom by empowering and having them focused more on teaching than the surrounding activities (Chaudhry & Kazim 2022:160). With the emergence of focus on online learning education and the emergence of new tools to facilitate online learning, there is a need for educators to adapt their teaching strategies to these new changes. Celik, Dindar, Muukkonen, and Järvelä (2022:620) assume that a reduced teaching load is another advantage brought about by the emergence of AI systems in education.

Educators could benefit from AI tutors thereby saving them time for other activities. AI can therefore be utilised to reduce educators' workload and allow them to focus more on interacting with their students in several ways. This is achievable since AI has the potential to automate tasks that would traditionally be performed by educators such as grading assignments and providing feedback to students. The integration of AI into the educational system has altered the way in which educators deliver content and how educational institutions function (Kamalov *et al*. 2023:2 of 27). The utilisation of AI systems frees educators so that they can meaningfully focus on the curriculum and interact closely with students.

Conclusion

AI technology evolved and developed predominantly in the Global North, but its growth and application has since permeated the entire globe. This digital technology has caused people to rethink how to integrate information, analyse data through the use of machine technology, and use the resultant information. AI is now being applied across all sectors of health, agriculture, engineering, and education. In education AI is instrumental in addressing issues related to assessment, tutoring, grading, and feedback. Information collected using AI platforms in education has contributed to improvements around inclusivity and the general quality of education due to enhanced curriculum and AI aided teaching and learning methodologies. However, the adoption of AI technology has raised a lot of debates and controversies emanating from ethical concerns.

Despite the challenges and ethical concerns that surround the use of AI in open and distance e-learning the benefits of this technology far outweigh the challenges that are posed by its usage. Amidst the problems and challenges it has become acceptable that AI plays a significant role in enhancing student learning experiences and teaching and learning in general. AI is also critical in improving the use of technology, particularly in enhancing efficiency and providing inclusivity and accessibility. It is thus important for IHEs to carefully plan how to integrate AI systems and processes responsibly to ensure their equitable

use. By harnessing the power of AI and other new technologies, institutions can create better learning environments that are inclusive, flexible, and responsive to students' needs.

AI technology will never terminate education services but will generate opportunities for accelerating transformation in education. Open and distance institutions should therefore strategise on how to leverage AI and new technologies to enhance efficiency, encourage learning, and foster creativity while ensuring fairness and equity. AI has emerged as a transformative force across various sectors revolutionising processes and enhancing efficiency. In the field of education, AI holds an enormous potential to reshape students' experiences, enhance assessment, streamline administrative tasks, and even personalise learning for students.

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