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INTEGRATING ARTIFICIAL INTELLIGENCE (AI) IN TEACHING AND LEARNING FOR SUSTAINABLE DEVELOPMENT

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Abstract

Artificial intelligence (AI) is a promising technology that has the potential to change many facets of the educational ecosystem while playing a significant role in the actualization of the sustainable development goals (SDGs). The present status of artificial intelligence (AI) in educational management was examined and identified significant areas for emerging research initiatives. Unified theory of acceptance and use of technology (UTAUT) underpinned the study to showcase ways by which Artificial Intelligence (AI) technologies can be adopted and used for teaching and learning for a sustainable future. With Nigeria being proactive to be the core center of Artificial Intelligence (AI) in the continent of Africa, the study recommended the need for Africa to have a holistic Artificial Intelligence (AI) ecosystem that captures our African histories, perceptions, idiosyncrasies, languages, outlooks, nuances, non-westernizations, etc. The study is significant to educational management practice, society, and policy, and is theoretically based on a developing country perspective.

Keywords: *Integrating Artificial Intelligence (AI), Educational Management, Teaching, Learning, Sustainable Development.*

Introduction

The 21st century has witnessed a swift and unprecedented transformation in the field of education, primarily attributable to the technological progress of Artificial Intelligence (AI). Using its capacities for learning, reasoning, and decision-making, Artificial Intelligence (AI) has the potential to revolutionize the educational management system for a sustainable future.

One area where AI can have a big influence is personalized learning. AI-powered intelligent tutoring systems can adjust to the demands of each learner, providing individualized education and feedback. Meeting their specific learning needs raises student engagement and accomplishment which creates room for life-long learning that promotes sustainable development. Additionally, AI makes it possible for automatic grading and feedback, which lessens the workload on instructors and enables quicker and more accurate evaluation.

Artificial Intelligence

Many researchers have many definitions of the term Artificial intelligence. Prominent among them is Chiu and Chai (2020), who opined that the concept of Artificial Intelligence as "a field of computer science that place premium interest in designing intelligent computer package that is capable to display intelligence attributes found in human behavior". Also, Panigrahi (2020) submitted that Artificial Intelligence as "the science that allows machines to operate things that require intelligence when executed by humans." Furthermore, Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020). asserted that Artificial Intelligence as "a branch of computer science that deals with the study and manufacture of computer systems that display some formulas of intelligence in the sense of systems that learn new concepts and tasks. It is a system that can think and draw useful conclusions about our contemporary world. It is also a system that accommodate natural languages, notice and understand visual landscapes, and systems that can accomplish actions that require human intelligence. Regarding the representation of computer models in a field of life and the identification of the basic relationships between its elements, and then the creation of reactions that are in consonance with the occurrence and situations of things. Artificial intelligence is a system that identifies algorithms, methods, theory and applied study. Hence can complete decision-making process in place of a human being, whether totally or partially, because of its ability to adapt, predict, and quote. (Truby, 2020).

Artificial Intelligence has the characteristics and ability to solve problems, to think and perceive situations, to acquire knowledge, and to apply lesson learnt and understood from previous experiences to new situations. It can respond quickly to new circumstances, deal with difficult and complex cases, handle ambiguous situations with incomplete information, and distinguish the relative importance of the elements of known cases (Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., & Nerini, F. F. (2020)). Hwang, G., Xie, H., & Wah, B. (2020) added that artificial intelligence creates a mechanism for solving problems that relies on objective judgment and the accurate evaluation of solutions. Artificial Intelligence is able to increase the level of an organization Staff knowledge through the provision of solutions to many problems that are difficult to analyze by human element within a short period of time. Its ability includes studying the logical thinking processes of humans and then trying to implement those processes through computer system. Thus the most important characteristic is its relative stability, as it is not exposed to what humans are exposed to in terms of factors affecting abilities, such as forgetfulness.

Artificial intelligence science is not based only on the principle of solving problems quickly, or processing more data, or preserving the largest number of information derived from the human mind, but also in the principle of processing information, whatever its nature and size, in an automatic or semiautomatic manner, and in a manner consistent with a certain goal (Elhajji, 2020). To enable Artificial Intelligence, comprehend information based on human knowledge, Mota-Valtierra, G., Rodríguez-Reséndiz, J., & Herrera-Ruiz, G. (2019) carried out a study in which they were able to extrapolate the objective of artificial intelligence, which is to understand the nature of human intelligence by creating computer programs capable of simulating intelligent human behavior so that the program can solve a problem or make a decision. Artificial intelligence also aims to understand the complex mental processes that the human mind uses during the thinking process and to translate these mental processes into equivalent operations that increase the computer's ability to solve complex problems. This has the potential to improve educational opportunities and access to learners all over the world, as well as to improve human–human, human–computer, and computer–computer communications and to create intelligent communication between perception and action. Liu (2018) confirmed that one of the goals of artificial intelligence is to carry out tasks such as scheduling and movement, analyzing students' food systems, conducting training programs, and monitoring students. Doing such tasks would save time and effort and allow teachers to allocate more time to students. To enhance creativity and build relationships with students, artificial intelligence also aims to build software capable of performing behaviors described as intelligent when a person performs them.

The ability of the machine to carry out tasks that require human intelligence (such as logical conclusions) makes the machine more intelligent and makes devices more useful. Artificial intelligence and its applications have an important and clear role in improving and developing all areas of life, from the development of computer systems to working with super efficiency similar to that of an expert human being. With its various uses and applications as an applied science, artificial intelligence has become the backbone of daily life, enhancing the human race in its present and future. It becomes not only a tangible reality but also an indispensable reality in light of the tremendous technical development that the world is witnessing today a complete dependence of humanity on computers, through the revolution of information, and the technical involvement of words from an implicit reference to cultural and technical contact between humans in various parts of the world (Holmes, W., Bialik, M., & Fadel, C. (2019)). Panigrahi (2020) stressed that artificial intelligence's great contribution to the field of education. Educational institutions are considered a rich source of data, where systems capable of managing educational institutions' and students' data can be created simultaneously and saved in the form of huge databases. Big data can be used to train huge neural networks that can predict vulnerability on an individual student level and shortages in material and human resources before they occur. Such systems will help educational institutions by reducing their costs and increasing the quality of their educational outputs. Examples include automatic teaching and automated systems for evaluating answer sheets. With artificial intelligence

technology, we can ask questions based on learners' weaknesses because the technology is able to study learners' behaviors. Students may tend to resort to information systems rather than to the teacher in asking questions. This is because they may be too shy to ask questions in front of the class or worried about disturbing the teacher, thereby negatively affecting their future evaluations.

Application of Artificial Intelligence in Educational Management

Artificial intelligence is no longer a luxury in the field of educational management as it has become one of the pillars of educational development in developed countries. Application of Artificial Intelligence in educational management is one of the most important means of developing school materials and digital systems for schools interconnected data networks. Its method is to establish large-scale neural networks that can anticipate weaknesses and how to treat them, as well as to contribute to information management and address problems, the most important of which is Class Ara (Chen et al., 2020), where applications of artificial intelligence have surpassed in the field of artificial intelligence in education is characterized by an innovative derivative that derives from multiple theories and fields. The reformulation and crystallization of educational curricula in line with students' interests allow us to reach the shortest paths to deliver study materials and develop students' abilities to communicate with systems similar to humans. It is prepared and equipped to deal immediately with humans in all linguistic and social situations in a way that enhances communication and improves social skills.

Artificial intelligence in education is more complex in the sense that it is characterized by using non-digital coding. It relies on "only one and zero," which means that it can make complex decisions, be used in different fields of study, and solve problems even with incomplete data (Hwang et al., 2020). The use of artificial intelligence in educational management saves time and effort and provides an alternative reality for students as it allows students to grow accustomed to confrontation and to keep up with modern technology. Artificial intelligence also presents questions to students in a way that reveals the weaknesses of each learner and prepares their mental outlook. It explores how students learn and helps them choose the right questions. It also provided a catharsis for them; experiences have shown that students find it easier to engage in dialogue without the teacher.

A study by Zovko and Gudlin (2019) explained the most important applications of artificial intelligence in educational management.

18. Smart content is when educational robots can create digital content with the same degree of ingenuity as their human counterparts, and artificial intelligence can help in digitizing textbooks or creating applicable digital interfaces for learning.

19. Characterizing learners and predicting their performance (profiling and prediction) includes determining enrollment decisions, course scheduling, dropout rates, and school

attendance, as well as identifying student models and academic achievements to support learners in a timely manner.

20. Intelligent educational robots perform learning tasks better than humans can because they are able to employ and integrate human knowledge in various fields through machine learning by borrowing from advanced technologies. At the same time, the capabilities of independent teaching, assistant teaching, and teaching management available with artificial intelligence via educational robots add intelligence and interest. For learners' activities and to become an excellent platform for training learners on abilities and comprehensive knowledge

21. Intelligent tutoring systems include teaching course content and diagnosing strengths and weaknesses, providing automatic feedback, and determining appropriate educational materials for learners according to their needs.

22. Assessment and evaluation involve evaluating tasks with high levels of accuracy and competence. It includes the correction and automatic monitoring of grades, providing feedback, assessing students' understanding and judging the extent of their academic integration, and evaluating teaching.

Studies by Aljohani (2019) and Holmes et al. (2019) have clarified the most prominent uses of artificial intelligence technologies and systems in education, particularly for individual learning. Educational system currently adopts the principle of equality in education so that all students can attend same subject, listen to the same lecture, and take the same test to determine their proficiency, regardless of future application of concepts when a large group of data is collected for each student or group of students. This data is linked to background data for the students and their orientation. It is possible to recommend a system that can predict the type of material that the students will absorb and lead to maximum learning. Each student could have a separate curriculum and separate tests, and there are attempts on a small scale to implement such systems.

Learning can be studied from the angle of machine learning or, alternatively, new theories of education can be developed that may completely reconsider the current educational system and the technology of artificial neural networks. Artificial neural networks are similar to the neural synapse in the brain, so training these networks on a specific task and observing the effect of training on performance and its quality may reveal information about the learning process itself. Training neural networks is the cost and can be repeated thousands of times and can reveal the quality of learning and its measurement. By comparing these experiences with behavioral experiences and their results, a new framework for learning theories can be built, upon which learning methods and educational curricula can be developed. These new theories may result in an educational system completely different from what we currently know. Regarding visual linguistic interactions with children, robots can now work with a child, understanding a child's interactions and making movements and gestures. Automation is still in its infancy, but it may produce a generation of children that can learn faster than previous ones. Artificial intelligence

is used in the work of digital school systems capable of managing school and student data at the same time and saving them in the form of huge databases. Big data can be used to train huge neural networks that can predict vulnerability on an individual student level and shortages in material and human resources before they occur.

Artificial Intelligence as a Learning Aid

Asynchronous learning, in which students have more freedom to choose how they want to learn and can finish assignments at their own speed, has become more popular. This method can help students who have other obligations, disabilities or find it difficult to attend in-person classes because it lets them work when it is convenient for them. The digital gap, where students in low-income or rural locations might not have access to the technology or internet connectivity needed to fully participate in remote learning, has been brought to light by the transition to online learning. It also includes difficulties such as lack of motivation, accountability, and interaction (Baidoo-Anu and Ansah. 2023). In this wise, the application of AI to students learning has helped in assigning tasks based on individual competence, providing human–machine conversations, analyzing student work for feedback, and increasing adaptability and interactivity in digital environments.

Artificial Intelligence as a Teaching Aid

In teaching, it has helped in providing adaptive teaching strategies, enhancing teachers' ability to teach, and supporting teacher professional development. In administration, AI has helped in improving the performance of management platforms, providing convenient and personalized services, and supporting educational decision-making with evidence (Xia et al., 2023).

An intelligent virtual laboratory that meets the needs of students by assigning laboratory tasks at the appropriate level can be developed which provides an AI-based environment that can be used for personalized students learning. Furthermore, an Artificial Intelligence in educational management system with augmented, virtual, and mixed reality technologies can be developed to monitor student learning progress and for assigning adaptive tasks. Therefore, the interaction between humans and robots can make low-achieving pupils feel less ashamed and more capable, thus promoting an all-inclusive educational environment. Attendance and active engagement in class can also be measured by the facial recognition of each student; active participation can be enhanced by hearing each student's voice in the classroom or identifying each student's fingerprint at the door which is a veritable way of sensing, and detecting. In this instance, facial photos, fingerprints, and voice recognition can be used to feed data into machine algorithms to distinguish between teachers, pupils, and administrative staff. By including precise criteria, such as which students belong to which class and the stipulated session, the machine can determine whether a student is enrolled in that class or university. Depending on the specific academic activity allotted, the system demonstrates sufficient predictability on hourly, daily, or weekly basis.

Artificial Intelligence (AI) has enormous potential, but it also raises ethical issues and other fundamental issues that are core to the traditional pedagogical domain. Important factors to consider include protecting data privacy, mitigating algorithmic bias, and guaranteeing openness.

Conclusion

From the above findings, we conclude that the applications of artificial intelligence is proven to be effective in improving and developing education, simplifying basic teaching tasks, assisting managers of educational institutions, and contributing to solving problems facing the education sector, such as teachers' lack of efficiency and failure to meet learner requirements. There are positive trends for both students and teachers regarding the use of artificial intelligence in education. Among the most important applications of artificial intelligence used in education are smart content, smart education systems, and augmented or virtual reality technology. Sustainable Artificial Intelligence (AI) integration in educational management requires robust infrastructure, staff training, data protection, software development, financing, leadership, ethical controls, communication, partnerships, and continuous evaluation.

To successfully integrate AI into teaching techniques, educators must get enough training and professional development which is lacking in most developing countries of which Nigeria is not an exception. Therefore, there is a need to examine these issues and build an enabling environment that leverages the advantages of Artificial Intelligence in educational management, and cooperation among academics, policymakers, educators, developers, and the government. It can also be adapted to situate the development of educational systems in contemporary Artificial Intelligence world.

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