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Integration of Artificial Intelligence in Educational Leadership for Sustainable Development in Nigeria

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Abstract

The critical role education plays in accomplishing the aforementioned developmental objectives, the importance of artificial intelligence and educational leadership in today's society cannot be understated in the pursuit of sustainable development. Sadly, there are a number of obstacles that Nigerian educational authorities must overcome in order to fully utilize AI for sustainable growth. Given the roles that teachers play in the delivery of educational services, this has not only adversely affected their efficacy but also prevented them from achieving the goals of education in the nation to the fullest extent possible. This paper provided insights into how to use educational leadership and artificial intelligence to achieve sustainable development in Nigeria. This paper specifically looked at artificial intelligence, sustainable development and educational leadership. Additionally, by highlighting the functions of artificial intelligence and its implications for sustainable development, the paper emphasized the necessity of artificial intelligence-fortified educational leadership for sustainable development. Additionally, it takes into account the mitigating strategies, which include providing infrastructure and funding, technical expertise, policies and regulations, ethical concerns, public awareness, and education to address them, as well as the associated challenges, which include inadequate infrastructure and funding, a lack of technical expertise among educators and educational administrators, a lack of policies and regulations, and a lack of public awareness.

Keywords: Education, Educational Leadership, Integration, Artificial Intelligence, Sustainable Development.

Introduction

One integral part of sustainable development is education, sustainable development serves as a solution to quality education problems. Solving such problems requires a long-term and comprehensive strategy that takes into account the relationship between the educational, social, and economic systems. It therefore means that, educators and educational leaders prepare students who will be able to thrive and meet the challenges of the future. Sustainable development in education involves creating systems that are equitable, inclusive, and capable of adapting to future needs. This includes integrating technology to support lifelong learning and ensure educational opportunities for all. The preparations should be geared towards

qualitative improvement in diverse areas such as social justice, social equality, peace, health, environment and education amongst others, for sustainable development.

According to Leithwood, Harris, and Hopkins (2020), educational leadership encompasses several key elements, including creating a shared vision, building relationships, developing people, managing resources, and fostering learning communities. Hence, the evolvement of technology has created a growing interest in the use of artificial intelligence in educational settings, which, if further inculcated into educational leadership, has the potential to improve leadership, learning outcomes, and sustainable development. Artificial intelligence is a technological machine that is growing rapidly to transform global sustainability initiatives as a result of its capability to perform tasks that typically require human intelligence. It is essential for educational leadership because, it simplifies administrative tasks like scheduling, grading, record-keeping, and decision-making. It also improves teaching and learning by pointing out areas that need improvement and providing tailored support to teachers and students, which will ultimately result in sustainable development.

(Obadimeji and Oredein, 2022). Therefore, the aim of this study is to contribute to the growing body of research by exploring ways in which artificial intelligence can be used in educational leadership for sustainable development.

Educational leadership plays a major role in the successful running of educational institutions, as it encompasses procedures used in leading and managing educational organizations such as schools, colleges, and universities towards actualizing stated goals and objectives. According to Sergiovanni and Starratt (2013), educational leadership is a critical factor in determining the success of educational institutions. A shared objective can be achieved by staff members who are inspired and motivated by effective educational leaders. Consequently, they are able to develop an environment in the school that fosters learning and the wellbeing of all parties involved. Similarly, promoting equality and social justice in education also requires strong educational leadership. According to Emdin (2020), educational leaders must be committed to addressing systemic inequalities and ensuring that all students have access to high-quality education. They must also be eager to engage in critical self-reflection and work to develop inclusive and culturally sensitive learning environments. The characteristics, dispositions, actions, patterns, and leadership styles of the educational leader include, but are not limited to, instructional leadership, transformational leadership, servant leadership, ethical leadership, distributed leadership, and digital leadership.

Artificial Intelligence first attempts to create machines that could think and learn like people were made in the 1950s, which is when artificial intelligence was first studied. Rule-based systems, neural networks, machine learning, and deep learning are just a few of the stages that artificial intelligence research has gone through. Russell and Norvig (2021) stated that, recent advances in artificial intelligence have been fueled by the availability of large datasets, improved computing power, and sophisticated algorithms. Artificial intelligence can be classified into two main types: narrow or weak artificial intelligence and general or strong artificial intelligence. Narrow artificial intelligence is designed to perform specific tasks, such as playing chess or detecting fraud, and it operates within a limited domain. General artificial intelligence, on the other hand, is designed to perform any intellectual task that a human can do, and it is not limited to a specific domain (Charlotte, 2022). A few sectors with a broad range of applications for artificial intelligence are healthcare, banking, transportation, and education. Artificial intelligence is being applied to healthcare to analyze x-ray images, diagnose conditions, and develop customized medications. Artificial intelligence is also being utilized in finance to analyze financial markets, identify fraud, and provide personalized investment advice. In a similar vein, artificial intelligence is being used in the transportation sector to develop driverless cars and enhance traffic flow.

In education, artificial intelligence is being used to personalize learning analyses, student performance, and develop intelligent tutoring systems (Chui, Manyika, Miremadi, Henke, Chung, Nel and Malhotra, 2018). It is a machine that makes use of algorithms and statistical models to learn from data and make decisions or predictions based on that learning. It provides the opportunity to use a large scale of knowledge that is in some way structured and suitable for use in the educational process to solve certain educational problems and that is personalized for each student (Yuskovych, Zhukovska, Poplavska, Diachenko, Mishenina, Topolnyk, and Gurevych (2022). However, there is a need for accountability and transparency in the development and deployment of artificial intelligence systems to ensure that they are used in ways that are consistent with ethical principles (Floridi, Cowls, Beltrametti, Chatila, Chazerand, Dignum and Luetge, 2018).

Sustainable Development Goal (SDG) aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." This goal is essential in fostering sustainable development, reducing inequalities and enabling individuals to reach their full potentials. Achieving SDG involves addressing various challenges, including disparities in

access to education, gender inequalities, and the need for quality educational resources. The key targets of SDG include: ensuring that, all citizens of primary school age complete free, equitable, and quality primary and secondary education, expanding access to quality in early childhood development, and eliminating gender disparities in education. Furthermore, the goal emphasizes the importance of lifelong learning, which includes access to affordable vocational training, higher education, and opportunities for continuous skill development. Educational management plays a critical role in achieving SDG by improving the quality of education, ensuring efficient use of resources, and promoting policies that support inclusive and equitable education. Through research and the development of evidence-based strategies, educational managers can contribute to closing gaps in educational access and quality, thereby supporting the broader objectives of sustainable development. (Bharat, 2024).

The notion of sustainable development has received a lot of attention in recent years. The Brundtland report, which was released in 1987 by the International Commission on Development, was the first to establish the idea of sustainable development. According to the report, sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Wang, 2021). Sustainable development encompasses three basic dimensions: economic, social, and environmental. These dimensions are often referred to as the "triple bottom line" (Slaper and Hall, 2011). Economic sustainability involves promoting economic growth and developmental while ensuring that, resources are used efficiently and that economic benefits are distributed fairly. Social sustainability involves promoting social equity, justice, inclusion and ensuring that everyone has access to basic needs such as food, shelter, and healthcare. Environmental sustainability involves protecting natural resources and reducing pollution and waste.

The concept of the "Triple Bottom Line" (TBL) is closely related to the goals of sustainable development, including the Sustainable Development Goals (SDGs). The three bottom lines of TBL are: People (Social) this aspect focuses on social well-being and equity. It involves ensuring fair labor practices, community engagement, and improving the quality of life for people. In the context of the SDGs, this aligns with goals related to reducing inequality, improving education, and promoting health and well-being. Planet (Environmental) This line emphasizes environmental responsibility. It includes practices that protect and preserve natural resources, reduce pollution, and combat climate change. This corresponds to SDGs focused on environmental sustainability, such as climate action, life on land, and life below water. Profit

(Economic) In TBL, profit is considered alongside social and environmental impacts. The goal is sustainable economic growth that benefits society without degrading the environment. This aligns with SDGs related to decent work, economic growth, and responsible consumption and production (Slaper and Tanya, 2011).

These three dimensions encourage organizations to achieve a balance between social equity, environmental sustainability, and economic viability, which is the essence of sustainable development. However, the balancing of the economic, social, and environmental components is one of the difficulties of sustainable development. This requires taking a holistic approach to development that takes into account the interconnections between these dimensions. Another important development in sustainable development was the adoption of the United Nations Sustainable Development Goals (SDGs) in 2015. The SDGs are a set of 17 goals and 169 targets that aim to end poverty, protect the planet, and promote prosperity for all and quality education among others (United Nations, 2015). The SDGs provide a framework for governments, businesses, and civil society to work together to achieve sustainable development.

Artificial Intelligence for Sustainable Development:

Artificial intelligence can be defined as a computational mechanism that enables computerized robots or software systems to engage in critical thinking and problem solving activities in a manner that resembles the thinking patterns of an intelligent human. It is an advanced technology that has the potential to make significant contributions to sustainable development in areas such as transportation, agriculture, healthcare, energy, and education, among others. Artificial intelligence can also help address global challenges such as climate change, poverty, and hunger, which are key objectives of sustainable development. Similarly, artificial intelligence can also help deliver sustainable education content that promotes quality education and fosters sustainable behaviors among students (Schoormann, Strobel, Möller, Petrik and Zschech, 2023). Below are specific roles that artificial intelligence can play in actualizing sustainable development goals:

- Personalized learning: learning experiences that are tailored and catered to each student's needs can be made using artificial intelligence by analyzing data on their learning preferences, interests, and passions. Students may benefit from this as they get the skills and information necessary to contribute to a future that is more sustainable, as well as a greater understanding of difficult sustainability-related themes.

- Data analysis: With artificial intelligence, it is possible to find trends, patterns, and areas for improvement in complex data relevant to sustainability, such as climate data or environmental impact assessments. This will aid educators and policymakers in making data driven judgments about sustainability initiatives and interventions.
- Research and innovation: Artificial intelligence can aid in promoting research and innovations in the field of sustainability by evaluating data, modelling scenarios, and spotting new prospects, amongst others. Sustainable development goals can be achieved more quickly as a result of this.
- Accessibility: Artificial intelligence has the potential to make education more accessible for students who have special needs or who might have trouble adjusting to traditional classroom settings. Artificial intelligence-driven voice assistants and chatbots, for instance, may offer students individualized support and direction, and virtual and augmented reality technologies can produce immersive learning experiences that are accessible from any location. Artificial Intelligence and Educational Leadership for Sustainable Development,

The 21st century has witnessed a rapid advancement in technology that has revolutionized various aspects of life. Artificial Intelligence (AI) has emerged as one of the most transformative technologies in recent times (Goksel and Bozkurt 2019). Artificial Intelligence (AI) has emerged as a revolutionary technology that has the potential to transform various sectors, including education. In recent years, AI has been adopted in various educational institutions as a means of improving learning outcomes and enhancing the quality of education (Wang, 2021). Educational leadership, in particular, can leverage AI to improve the quality of education, enhance the effectiveness of teaching, and increase the efficiency of administrative processes (Tapalova, Zhiyenbayeva and Gura, 2022). One of the critical roles of AI in educational leadership is to provide personalized learning experiences for students. AI powered educational platforms can use data analytics to monitor students' progress and provide customized learning materials based on their individual learning styles, interests, and abilities (Seo, Tang, Roll, Sidney and Dongwook, 2021). By doing so, AI can help ensure that every student receives the education that suits their needs, thereby improving learning outcomes. Another role of AI in educational leadership is to support teachers in their daily tasks. AI powered tools can help teachers assess student performance, grade assignments, and provide feedback in real-time (Sharma, Undheim, and Nazir, 2022). This can free up teachers' time and allow them to focus on higher-order tasks such as lesson planning, curriculum development,

and mentoring students. AI can also help identify students who need extra support, enabling teachers to provide timely and targeted interventions. AI can also play a crucial role in administrative processes in educational institutions. AI-powered systems can automate routine administrative tasks such as student record-keeping, scheduling, and course planning (Okonkwo and Abejide 2021). This can save time and reduce administrative errors, enabling educational institutions to allocate more resources to core educational activities. The implications of AI in educational leadership for national development are immense. By leveraging on AI, educational institutions can improve the quality of education, increase access to education, and reduce educational inequalities (Avurakoghene, Oredein and Igbokwe, 2023). This can lead to a better educated workforce, which can help drive economic growth and development. AI can also help bridge the digital divide by providing access to education to students who may not have access to traditional educational resources (Wang, 2021).

Challenges Faced by Educational Leaders in Maximizing Artificial Intelligence for Sustainable Development in Nigeria.

The integration of Artificial Intelligence (AI) in the education sector has the potential to transform the way students learn and teachers teach, ultimately leading to sustainable development. However, educational leaders in Nigeria face several challenges in maximizing the use of AI for sustainable development. According to Goksel and Bozkurt (2019), some of those challenges include:

- Inadequate Infrastructure and Funding: inadequate infrastructure and funding pose a significant challenge. AI requires high-speed internet connectivity, advanced computer hardware, and software systems, which are often lacking in many educational institutions in Nigeria. Furthermore, the cost of acquiring and maintaining such infrastructure is high, and most educational institutions in Nigeria may not have the financial capacity to invest in such technology.
- Lack of technical expertise among educators and education administrators is another significant challenge. Educational leaders in Nigeria need to understand the technical aspects of AI, including the development of AI applications, data analysis, and algorithm design. However, most educators and education administrators in Nigeria lack the necessary technical skills, which made it difficult for them to maximize the use of AI.
- To direct the integration of AI into the education sector, suitable policies and regulations must be developed. Education leaders find it challenging to make well-informed

judgments about the integration of artificial intelligence due to the lack of policies and regulations, which creates a climate of uncertainty.

- Optimizing artificial intelligence (AI) for sustainable development in Nigeria is hindered by ethical issues. Concerns exist over the possible biases that AI systems, particularly those created in foreign nations, may include. As a result, it's essential to create moral standards that guarantee just and equal application of AI in education. The public has to be better informed about the advantages and possible drawbacks of artificial intelligence. The majority of Nigerians may be dubious about the utilization of AI in education, and they are unaware of its possible advantages. As a result, leaders in education need to communicate with the public and raise awareness of the potential benefits of artificial intelligence in educational settings.

Ways of Addressing the Challenges Faced by Educational Leaders in Maximizing Artificial Intelligence for Sustainable Development in Nigeria.

Addressing the challenges faced by educational leaders in maximizing artificial intelligence for sustainable development in Nigeria will require a multi-faceted approach involving various stakeholders. Here are some ways to address the challenges:

- Infrastructure and funding: government and private organizations should invest in the development of AI infrastructure in schools and other educational institutions. This includes providing high-speed internet connectivity, advanced computer hardware, and software systems. Public-private partnerships can be established to fund the development of AI infrastructure in schools, which will help reduce the financial burden on educational institutions.
- Technical expertise: educational managers in Nigeria should collaborate with AI experts to develop training programs for teachers and education administrators. These programs should focus on equipping educators with the necessary technical skills needed to integrate AI into the education sector.
- Policies and regulations: the government should formulate policies and regulations to guide the integration of AI in the education sector. These policies should address issues such as data privacy, ethical concerns, and bias in AI systems. Educational leaders should also be involved in the development of these policies to ensure that they are relevant to the Nigerian context.
- Ethical concerns: educational leaders should develop ethical guidelines that address issues such as bias, data privacy, and transparency. These guidelines should be enforced

to ensure that the use of AI in the education sector is fair and equitable. Public awareness and education: educational leaders should engage with the public and increase awareness about the benefits of AI in education. This can be done through community outreach programs, workshops, and seminars.

- Additionally, AI-based educational resources can be developed and distributed to schools to help students understand the technology and its applications. (Goksel and Bozkurt, 2019).

Conclusion

The integration of artificial intelligence in educational leadership has the potential to promote sustainable development. It underscores the importance of artificial intelligence, which can facilitate personalized learning, data analysis, research and innovation, and accessibility for sustainable development. Furthermore, the study recognizes the need for artificial intelligence and educational leadership to transform education and contribute to sustainable development. The article also addresses the challenges faced by educational leaders in maximizing the potential of artificial intelligence in educational leadership for sustainable development and suggests ways to overcome these challenges. In summary, this paper reveals the potential of educational leadership and artificial intelligence for advancing sustainable development goals, which will benefit students, stakeholders, and society as a whole.

Suggestions

By leveraging on the potentials of artificial intelligence, educational leaders, students and stakeholders can help build a sustainable future through the following suggestions:

1. Encourage educators and students to think creatively and explore new ways to leverage on artificial intelligence development to promote sustainable development. Provide them with the resources and support they need to develop and implement innovative ideas.

2. Educate students and teachers about the potential of artificial intelligence to address sustainability challenges, and help them understand the ethical, social, and economic implications of artificial intelligence adoption.

3. Bring together experts from various disciplines, such as computer science, engineering, business, and environmental studies, to collaborate on artificial intelligence-driven sustainable development projects.

4. Equip educators and students with the skills they need to work with data, including how to collect, analyse, and visualise data to drive informed decision-making for sustainable development.

5. Build partnerships with industry and government to access funding and expertise, as well as to ensure that artificial intelligence applications align with sustainable development goals.

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