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Educational Leadership and Artificial Intelligence for Sustainable Development

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Abstract

The imperativeness of educational leadership and artificial intelligence in contemporary society cannot be overstated in the quest for sustainable development, given the pivotal role of education in achieving the stated developmental objectives. Sadly, educational leaders in Nigeria face several challenges in maximizing the use of AI for sustainable development. This has not only influenced their effectiveness negatively but has equally deprived them of optimal achievement of the objectives of education in the country, considering the roles of teachers in education service delivery. Using a qualitative research approach, this study offered insights into ways of using artificial intelligence and educational leadership for the attainment of sustainable development in Nigeria. Specifically, this study explored educational leadership, artificial intelligence, sustainable development, artificial leadership and sustainable development. Furthermore, the paper underscores the need for educational leadership that is fortified with artificial intelligence for sustainable development by revealing the roles of artificial intelligence in effective educational leadership and its implications for sustainable development. Also, it considers the associated challenges, such as inadequate infrastructure and funding, a lack of technical expertise among educators and education administrators, a lack of policies and regulations, ethical concerns, and a lack of public awareness, and the mitigating strategies, which include providing infrastructure and funding, technical expertise, policies and regulations, ethical concerns, public awareness, and education to address them.

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Keywords: *Educational leadership, artificial intelligence, sustainable development*.

Introduction

Education is an integral part of sustainable development; sustainable development serves as a solution to environmental degradation problems. Solving such problems requires a long-term and comprehensive strategy that takes into account the relationship between the environmental, social, and economic systems. Therefore, it is imperative that educators and educational leaders prepare students who will be able to thrive and meet the challenges of the future. The preparations should be geared towards qualitative improvement in diverse areas such as social justice, social equality, peace, health education, and environmental education, amongst others, for sustainable development.

According to Leithwood, Harris, and Hopkins (2020) see 8 educational leadership encompasses several key elements, including creating a shared vision, building relationships, developing people, managing resources, and fostering learning communities. Hence, as technology continues to evolve, there is 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 rapidly developing technological machine that can completely transform global sustainability initiatives as a result of its capability to perform tasks that typically require human intelligence. It plays a crucial role in educational leadership by streamlining administrative duties such as scheduling, record-keeping, grading, and decision-making, and also in teaching and learning by means of identifying areas for development and offering individualized support to instructors and students, which by extension will lead to sustainable development (Obadimeji & Oredein, 2022). View 9

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

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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) see 14 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. Additionally, 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. Emdin (2020) view 4 noted that 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 educational leader possesses certain traits, personalities, behaviors, patterns, and styles of leadership, such as instructional leadership, transformational leadership, servant leadership, ethical leadership, distributed leadership, and digital leadership, among others.

Artificial Intelligence

The 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) view 11 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) see 0

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Healthcare, finance, transportation, and education are just a few of the domains where artificial intelligence has a wide range of applications. Artificial intelligence is being used in healthcare to identify ailments, create individualized medicines, and examine x-ray pictures. Also, artificial intelligence is being used in finance to spot fraud, examine financial markets, and offer individualized investment guidance. Similarly, artificial intelligence is being applied in the field of transportation to create autonomous vehicles and improve 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 & Malhotra, 2018) turn to 2. 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, &Gurevych (2022) turn to 20. 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 & Luetge, 2018) see 5.

Sustainable Development

Due to growing concerns about how human activity affects the environment and the need to make sure that economic development does not come at the expense of future generations, 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 Environment and 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" (WCED, 1987, p. 43) turn to 19.

Sustainable development encompasses three key dimensions: economic, social, and

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environmental. These dimensions are often referred to as the "triple bottom line" (Elkington, 1998) view 3. Economic sustainability involves promoting economic growth and development while ensuring that resources are used efficiently and that economic benefits are distributed fairly. Social sustainability involves promoting social equity, justice, and 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. 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 (UN, 2015) turn to 17. 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 a significant contribution 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 environmental awareness and fosters sustainable behaviors among students (Schoormann, Strobel, Möller, Petrik & Zschech, 2023) see 12. Below are specific roles that artificial intelligence can play in actualizing sustainable development goals:

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1. **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.
2. **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 judgements about sustainability initiatives and interventions.
3. **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.
4. **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 & Bozkurt 2019) turn to 6. 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

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adopted in various educational institutions as a means of improving learning outcomes and enhancing the quality of education (Wang, 2021) check. 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 & Gura 2022) View 16.

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, Dongwook, 2021) see 13. 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, & Nazir, 2022) see 15. 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 & Abejide 2021) turn to 10. 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 AI, educational institutions can improve the quality of education, increase access to education, and reduce educational inequalities (Igbokwe, 2023) check 7. 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

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have access to traditional educational resources (Wang, 2021) see 18.

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.

Firstly, 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.

Secondly, a 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 make it difficult for them to maximize the use of AI.

Thirdly, there is a need for the development of appropriate policies and regulations to guide the integration of AI into the education sector. The lack of policies and regulations creates an environment of uncertainty, which makes it difficult for educational leaders to make informed decisions regarding the integration of AI.

Fourthly, ethical concerns also pose a challenge to maximizing the use of AI for sustainable development in Nigeria. There are concerns about the potential biases that may be inherent in AI systems, especially those developed in other countries, which may not be applicable in the Nigerian context. Therefore, it is necessary to develop ethical guidelines that will ensure that the use of AI in the education sector is fair and equitable.

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Finally, there is a need for increased public awareness and education about the benefits and potential risks of AI. Most Nigerians are not aware of the potential benefits of AI in the education sector, and some may be skeptical about its use. Therefore, educational leaders need to engage with the public and increase awareness about the potential benefits of AI in education.

Ways of Addressing the Challenges

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 leaders 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 develop 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

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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.

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 the potential 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 artificial 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.

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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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