

THE ROLE OF SCHOOL PRINCIPALS' INSTRUCTIONAL SUPERVISION AND ARTIFICIAL INTELLIGENCE (AI) EDUCATION FOR NATIONAL DEVELOPMENT

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Abstract

Integration of artificial intelligence and school principals' instructional supervision present a significant milestone in modern pedagogy which create learning-environment that is both engaging for principals and teachers preparing them for the challenges ahead. The use of AI in principal instructional supervision provides tools for personalized learning, data analyses and simultaneous based experience. This paper seeks to examine the role of school principals' instructional supervision and artificial intelligence in national development. The paper also seeks to provide a comprehensive understanding on how principal instructional supervision and artificial intelligence enhance national development. The opinion of the paper is that integrating artificial intelligence in principals' instructional supervision is capable of providing quality supervision of teachers in classroom for quality education which can result to national development, by so doing policy makers and schools can create a more personalized, data, driven, and engaging learning environment that foster quality supervision of teachers in a modern world. To these benefit, the paper suggests among others that government, stakeholders and school proprietors should explore alternative funding solution such as technology grants, public-private partnerships to reduce implementation cost

Key-words:- Artificial Intelligence, Supervision, Instruction, National Development

Introduction

The paper is an opinion aim or at contributing to the on-going discussions by specialists in pedagogic educational practices principals as instructional supervisors as well as government policy makers and teacher educators on how to integrate Artificial Intelligence (AI) Education for national Development in Nigeria. The paper highlighted the contributions of principals as instructional supervisors and artificial intelligence in education for national development it also discusses enormous benefits and challenges of integrating AI in instructional supervision as a discipline. The paper offers implementation strategies for successful integration of AI in instructional supervision in schools.

The terminology of Artificial Intelligence (AI), a buzzword, nowadays exceeds the computer science field, combining all trades and professions. The definition of AI by Pedro et al. (2019)

refers to human performance and rationality of computers, systems or software. AI as a trend of educational technologies, which mainly applies to the realm of higher education, releases the burden of educators via automation and therefore saves time and human resources. In recent years, artificial intelligence (AI) technologies have been increasingly used in various fields. AI enables computer systems to perform tasks such as learning, problem-solving, and decision-making by mimicking human intelligence (Kaya, 2023). The use of these technologies is also growing in the field of schools' supervision. As traditional teaching methods evolve, these technologies create dynamic, personalized learning environments that develop essential 21st-century skills (Sinku, 2021; Shmeleva et al., 2022). For example, it has been stated that ChatGPT can be used in many areas such as educational administration and teachers' performance, and also developing interactive lesson plans, and that it has the potential to make a significant impact on the future of this field (Genç, 2023).

AI has been adopted in science, technology, engineering and mathematics teaching and learning at all levels of education institutes whereas social science struggles with this intelligent technology because of ill-structured content (Roll and Wylie, 2016). Meanwhile, despite the recent surge in the utilization of generative AI and its applications, the progression of AI technology, from weak to strong, has yet to research a point where it can effectively replace the tasks performed by experienced educators (Obschonka and Audretsch, 2020). Especially, educators from educational administrators the domain rarely introduce educational technologies in their daily teaching and administration (Chen et al., 2021). This paper therefore aims to understand the role of principals in instructional supervision and artificial intelligence (AI) education and national development and suggest possible ways of its applicability.

Conceptualizing AI in Current Educational Practices

AI has traditionally been closely associated with computers. However, an examination of numerous research papers, particularly those focused on the field of education, reveals a shift away from the notion that AI is solely tied to computers, their hardware and software, or their equipment. Thanks to embedded computers, sensors, and new technologies, AI has expanded to include machines, robots, and buildings (Chassignol et al., 2018). The dual-sided definition and summary of AI by Chassignol . (2018) is that AI is a theory and a field of study. AI is a discipline of computer science that addresses cognitive difficulties, including learning, problem-solving, and pattern recognition, and adapts them (Chen et al., 2020).

AI-assisted education encompasses intelligent guidance, advanced virtual learning experiences, data analysis, and predictive capabilities. AI has broadened the scope of education by catering to diverse learning requirements. Both educators and students now enjoy the advantages of timely, customized learning and feedback facilitated by intelligent educational systems. These systems harness a range of computing technologies, with a strong focus on machine learning, which closely aligns with statistical models and cognitive learning theories, ultimately enhancing the value and effectiveness of the learning journey. AI-based educational systems employ a multitude of strategies rooted in machine learning, data mining, and knowledge models, encompassing elements such as learning analysis, instructional components, and knowledge acquisition. At its core, an AI-powered educational system comprises instructional materials, data, and intelligent algorithms, further classifiable into system models and intelligent technologies (Han, 2018).

The education sector is anticipated to experience significant transformation due to the substantial potential of AI. AI possesses considerable power and has the capacity to affect various aspects of society, inciting substantial changes within them. Evidently, AI has found acceptance and practical application in the field of education, leading to significant advancements in various aspects of the industry. The utilization of AI in education, particularly in areas such as administration and instruction, has had an influence on students' learning outcomes (Zhai et al., 2021).

A variety of AI applications have been created within educational environments, as revealed

by the academic sources examined in this paper. These applications encompass the automation of administrative functions and processes, the creation of educational curricula and course materials, teaching methodologies, and the enhancement of student learning procedures. AI has notably increased the effectiveness of administrative tasks, which include tasks such as overseeing students' progress, grading assignments, and delivering feedback. This enhancement has been achieved through the automation of these tasks via web-based platforms or computer programs (Hwang & Tu, 2021; Aggarwal & Girdhar, 2022). AI has found applications within the education sector, contributing to the creation of curricula, educational materials, and lesson plans. These educational resources leverage a variety of tools and technologies, including virtual reality, web-based platforms, robotics, video conferencing, audio-visual materials, and 3-D technology. This integration of AI tools has resulted in more efficient and effective teaching practices, leading to more personalized and comprehensive learning experiences for students (Aldosari, 2020).

Concept of Instructional Supervision

Obilade (1989) opined that instructional supervision is a helping relationship whereby the supervisor guides and assists the teachers to meet the set targets. This definition described instructional supervision from the point of establishing the relationship with stakeholders in school system for the purpose of achieving the set objectives. Similarly, Olaniyan (1996) described instructional supervision as a means to help, guide, stimulate and lead teachers through criticism, appraisal and practices in their education and procedures. This definition focuses much on teachers' attitudes over other vital elements that present themselves during the teaching and learning process. Instructional supervision is a service activity that exists to help teachers do their job better (Glickman, Gordon and Ross-Gordon, 2001). Supervision is a cycle of activities between a supervisor and a teacher with the main aim of improving classroom performance (Patrick & Dawson, 1985). Also, Nwankwo (1984) in Ajani (2001) noted that instructional supervision is a set of activities which are carried out with the purpose of making the teaching and learning better for the learner. It has been observed that instructional supervision is an essential activity for the effective operation of a good school system.

In addition, instructional supervision is a behaviour that is officially designed which directly affects teacher behaviour in such a way to facilitate student learning and achieve the goals of the school system. Through the effective supervision of instruction, supervisors can reinforce and enhance teaching practices that will contribute to improved student learning. The foregoing suggested that instructional supervision particularly in secondary schools is basically concerned with supporting and assisting teachers to improve instruction through their changing behaviour.

Theoretical studies

The role of the principal as an instructional supervisor

The role of the principal as an instructional supervisor has now more than ever before become very crucial on the issue of instructional improvement towards effective learning in Nigeria secondary schools. The National Policy on Education (2004) in Nigeria recognizes the need to ensure quality control through regular inspection and continuous supervision of instruction and other services if the laudable national educational objectives are to be meaningfully achieved

Instructional supervision is the role of the principal in this era of development in education administration. The principal of today is not only a disciplinarian and a record keeper but also an instructional supervisor. It is only the principal who has the authority to make administrative changes necessary to improve teaching and learning situations (Nyamwamu, 2010). Unlike other forms of supervision, instructional supervision is school based and therefore an internal process. This is the reason why the role of the principal is better referred to as that of an instructional supervisor rather than simply a supervisor. In recognition of the principals' role as instructional supervisors and agents of improving academic achievement, Sushila (2004) also agrees that the Principal's role in a school is critical in determining academic performance. The principal defines the institution's mission,

promote the instructional resources, and supervise teaching and learning as well as monitoring students' progress.

The principal who is an instructional supervisor must have knowledge of the processes so that he or she can be of help to the teachers. This is echoed by Mullins and Hertinger (2012) who observed that this practical and theoretical knowledge coupled with the varied experience enable the principal command respect and help the school organization to improve. This implies that the standards of working are maintained and people are working as expected and that educational goals are being achieved. The foregoing information is a clear indicator that the process of instructional supervision is significant in the school context for it helps in maintaining quality. Ngunjiri (2012) indicated that teachers' absenteeism would be the order of the day if supervision was minimized. This implies that if quality education is to be given in schools and have improved

Roles of Supervisors

In general, the major function of the supervisor is to assist others to become efficient and effective in the performance of the assigned duties. Apart from this general function, supervisors also perform the following roles in the school system especially at the secondary school level.

1. Instructional leader: One of the most crucial responsibilities of a supervisor is instructional leadership. The supervisor guides other educators in their teaching to maximize their effectiveness. Additionally, they guide educators in creating and carrying out a successful lesson plan. Instead of using a normative style of leadership, supervisors must adapt to the needs of the people and the specific situation. By supporting all teachers' professional development, instructional leaders raise the standard of education. Supervisors should have a positive working relationship with their employees and be adaptable enough to handle any circumstance.

2. Evaluating student progress: A supervisor helps with the planning of different kinds of instruction and evaluates students' progress toward the standards set by the regulatory bodies. Before teachers start lesson planning or instruction, supervisors make sure they are using data from a range of reliable and relevant sources. Supervisors ascertain whether educators are utilizing the various assessment methods at their disposal to help them provide education that is relevant.

The supervisors make sure that teachers are creating and keeping accurate and sufficient records of students' progress. This will involve routinely and methodically documenting significant information on students' development of particular ideas and abilities linked to the standards for each subject at the grade level they are instructing.

Furthermore, the following duties of supervisors in the educational system were highlighted by Aderonmu and Ehhiemetalor in Kiadese (2000).

. Planning: To guarantee that the goals of supervision are met, the supervisor must apply planning concepts to the supervision from the outset. The planning concepts include defining goals, choosing the most effective tactics, and outlining policies, programs, and procedures that will best aid in accomplishing the stated goals.

ii. **Staffing:** In accordance with the school's organizational structure, supervisors are obliged to identify staff vacancies in terms of grades and disciplines through the supervision process.

iii. **Coordination:** This role requires the supervisor to coordinate everyone's work and make sure that decision-making becomes a shared responsibility.

iv. **Observation:** During a regular supervision session, supervisors are expected to watch management, employees, and students at work. Therefore, the supervisor should advise those involved in the school system through consultation in an effort to help change observed habits and standards.

v. **Curriculum development:** Given their degree of engagement in school operations, supervisors can, nevertheless, use their observations to offer helpful recommendations that can aid the nation's curriculum creation process.

Similarly, Kathleen (2006) summarized the roles of supervisor in this way:

i. Monitoring or providing for mentoring of beginning teachers to facilitate a supportive induction

into the profession.

ii. Bringing individual teachers up to minimum standards of effective teaching (quality assurance and maintenance functions of supervision).

iii. Improving individual teachers' competencies, no matter how proficient they are deemed to be.

iv. Working with groups of teachers in a collaborative effort to improve student learning.

v. Working with groups of teachers to adapt the local curriculum to the needs and ability of diverse groups of students, while at the same time bringing the local curriculum in line with state and national standards.

vi. Relating teachers' efforts to improve their teaching to the larger goals of school-wide improvement in the service of quality learning for all students.

From the foregoing, it is evident that the role of supervisor in a school system especially in the secondary schools in Nigeria is very crucial. Thus, for effective supervision of instruction, supervisors should be able to discharge their functions as expected if the goals of education are to be attained.

Benefits of Artificial Intelligent (AI) instructional supervision of schools

The use of Artificial Intelligence (AI) in instructional supervision transforms traditional, often subjective oversight into a **data-driven, efficient, and growth-oriented process**. By automating routine monitoring and providing deep analytical insights, AI empowers school leaders to focus on strategic mentorship rather than manual data tracking.

Key Benefits of AI in Instructional Supervision

- **Enhanced Performance Evaluation:** AI systems analyze vast amounts of data from classroom activities, lesson plans, and assessments to provide a more **objective framework** for evaluating teacher effectiveness. This reduces the impact of personal biases and inconsistencies typical of manual reviews.
- **Real-Time Instructional Feedback:** Supervisors can use AI tools to provide **immediate, personalized feedback** based on live classroom interactions and student performance. This allows teachers to refine their practices—such as engagement strategies or time management—more rapidly.
- **Predictive Analytics for Early Intervention:** AI can forecast instructional challenges by identifying trends in teacher behavior or student performance. For example, if a teacher consistently struggles with classroom engagement, predictive models can flag this early for **targeted mentoring** before it impacts student progress.
- **Streamlined Classroom Observations:** Tools like [GoReact](#) allow supervisors to provide time-coded feedback on video recordings of lessons, making the observation process more flexible and context-specific. Other tools like [AI Coach by Edthema](#) guide teachers through self-observation and action planning.
- **Optimized Resource & Curriculum Management:** AI assists supervisors in analyzing school-wide data to understand the current state of teaching, maximizing the distribution of instructional materials, and identifying curriculum gaps that need improvement.
- **Automated Administrative Supervision:** By handling repetitive tasks like attendance tracking, grading, and scheduling, AI reduces the "paperwork burden" for both teachers and supervisors, freeing up time for high-value human interactions.

Artificial Intelligent in education and national development

Integrating Artificial Intelligence (AI) into education is a critical driver for national development, acting as a catalyst for economic growth, human capital enhancement, and social inclusion. By 2025-2026, AI is no longer viewed merely as a classroom tool but as an essential infrastructure for preparing a workforce capable of competing in a global digital economy.

1. Economic Growth and Workforce Development

AI in education directly correlates with national prosperity by aligning student skills with industry demands.

- **GDP Growth:** Research indicates that rising AI investment in education and training is positively associated with increased Gross Domestic Product (GDP). In some models, AI is estimated to potentially boost economic productivity by up to 40%.
- **Future-Ready Skills:** AI helps shift educational focus toward "Education 4.0," fostering essential 21st-century competencies such as digital literacy, complex problem-solving, and data-driven decision-making.
- **Job Creation:** While automating routine tasks, AI is predicted to contribute to the creation of millions of new roles in fields like data science, AI ethics, and machine learning engineering.

2. Achievement of Sustainable Development Goals (SDGs)

AI is a powerful mechanism for meeting [UNESCO's 2030 Sustainable Development Goal 4](#) (Quality Education).

- **Inclusive Access:** AI-driven tools like real-time translation, speech-to-text, and audio descriptions break down barriers for students with disabilities and those in linguistically diverse populations.
- **Reducing Educational Inequality:** Platforms such as the Nigeria Learning Passport provide over 15,000 resources to students regardless of location, helping bridge the gap between urban and rural learning outcomes.
- **Sustainable Intervention:** AI acts as an "analyst" and "bridge," helping governments identify the root causes of educational poverty and connecting remote learners with high-quality global resources.

3. Human Capital Optimization

By personalizing the learning journey, nations can maximize the potential of every citizen.

- **Personalized Learning Pathways:** AI analyzes individual student strengths and weaknesses to create tailored curricula, ensuring that gifted students are challenged and struggling students receive timely support.
- **Teacher Empowerment:** By automating up to 40% of administrative tasks—such as grading and scheduling—AI allows educators to focus on high-value human interactions like mentorship and emotional guidance.
- **Predictive Analytics for Retention:** National education systems use AI to identify students at risk of dropping out, allowing for early interventions that improve graduation rates and long-term professional success.

Challenges of Integrating AI into instructional supervision of schools

Integrating AI into instructional supervision of schools presents several challenges, including high costs data usage, potential for bias, data privacy concerns, and the need for training of principals on how to adapt. Additionally, the dynamic and interactive nature of instructional supervision in school and AI implementation complex, requiring careful consideration of ethical and practical implications. The following are some of the problems

1. Cost and Accessibility

- Implementing AI technology in education can be expensive, requiring significant investment in hardware, software, and infrastructure.
- The cost barrier may disproportionately affect schools with limited budgets, potentially widening the gap between well-funded and under-resourced institutions.

2. Ethical Considerations

- **Bias and Fairness:** AI algorithms can reflect and amplify existing biases in the data they are trained on, leading to unfair or discriminatory outcomes for certain principals during their instructional supervision
- **Data Privacy and Security:** Collecting and analysing data through AI-powered devices raises concerns about privacy and data security.
- **Accountability:** Determining responsibility when AI systems make errors during instructional supervision it can also affect the result of the outcome of supervision.

3. Technical Challenges

- **Training of principals:** Many principals lack sufficient knowledge and skills to effectively integrate and utilize AI technology in their supervisory role.
- **Dependence on Technology:** There's a risk that principals may become overly reliant on AI tools, potentially hindering their development of critical thinking and problem-solving skills.
- **Technical Issues:** Potential malfunctions or disruptions of AI systems during instructional supervision could negatively impact the principal instructional supervision of schools

Conclusion

The integration of artificial intelligence (AI) into educational administration offers a multitude of benefits. AI has made significant contributions to the field of educational administration and planning, and it holds potential for even more advanced applications in the future. AI-supported educational applications provide substantial benefits in enhancing principals' performance, reducing principals' workload, and offering personalized learning experiences. Notably, AI's potential to increase principal motivation and improve learning processes is creating a major transformation in education. In essence, while instructional supervision of schools might not directly teach AI programing, it provides a foundation of transferable skills of instructional of supervision, cognitive enhancements, and a growth mind-set that are vital for individuals pursuing careers in AI in education. Embracing these innovations will help principal as supervisor will develop resilience, adaptability, and perseverance necessary to navigate the challenges of these fields and achieves successive instructional supervision of schools in education.

Recommendations

As AI continues to transform principals' instructional supervision, the successful integration requires strategic planning, evidence-based practices, and collaborative efforts. To maximize the benefits of these technologies the following are therefore suggested:

- ✓ Government, stakeholders and schools should explore alternative funding solutions such as technology grants, public-private partnerships to reduce implementation costs.
- ✓ School administrators should ensure all AI applications used in schools are transparent, explainable, and free from biases that could adversely affect decision-making.
- ✓ A Comprehensive principal instructional supervision training programs should be developed that combine hands-on technical instruction with practical pedagogical applications specifically designed for instructional supervision of school.
- ✓ For effective promotion of instruction supervision, there should be collaboration efforts of all stakeholders in the educational sectors.

Government should Create clear policies and regulatory frameworks for the ethical use of AI in schools, addressing concerns such as data privacy, accountability, and transparency.

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