INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

A CRITICAL ANALYSIS OF ARTIFICIAL INTELLIGENCE ADOPTION IN BRIDGE CONSTRUCTION IN THE 21ST CENTRY THE PROSPECT AND CHALLENGES

By

Prof. T. KALAIKUMARAN
Department of Artificial Intelligence and Data Science,
VSB College of Engineering Technical Campus,
Coimbatore – 642109

Prince Uko EBENEZER,
Department of Civil Engineering,
Akwa Ibom State University, Akwa Ibom State.

And

Iddo Sharon BINKAM,
Department of Civil Engineering,
Federal Polytechnic Nyak, Shendam, Plateau State. Nigeria.

ABSTRACT

This paper critically analyzes the adoption of Artificial Intelligence (AI) in bridge construction in the 21st century, focusing on its transformative potential and emerging challenges. The increased popularity of AI in the construction industry, however, is rather limited in comparison to other industry sectors. Among the numerous fields within construction, bridge construction presents a unique case for AI integration due to its complexity, scale, and critical importance in infrastructure development. The study explores the adoption of AI in bridge construction is not without its challenges. Despite its potential, the integration of AI technologies often encounters resistance due to high implementation costs, lack of skilled personnel, and uncertainty around long-term benefits. This creates a complex landscape where the potential of AI must be balanced against practical limitations. The study concluded that partnering with AI vendors who understand the nuances of bridge construction projects is essential. These partnerships can provide tailored solutions that address specific challenges faced in the industry. The study also recommended that regulatory bodies should work with industry stakeholders to create policies that ensure safety, transparency, and accountability in AI-assisted processes.

KEYWORDS: Artificial Intelligence, Bridge Construction, 21st Century, Prospect and Challenges

INTRODUCTION

The 21st century has witnessed a remarkable transformation in various sectors due to the rapid advancement of Artificial Intelligence (AI). One of the most notable areas undergoing this transformation is the construction industry, where AI technologies are being increasingly adopted to enhance efficiency, accuracy, and safety. According to Regona, Yigitcanlar, Xia, & Li (2022) Artificial intelligence (AI) is a powerful technology with a range of capabilities, which

are beginning to become apparent in all industries nowadays. The increased popularity of AI in the construction industry, however, is rather limited in comparison to other industry sectors. Among the numerous fields within construction, bridge construction presents a unique case for AI integration due to its complexity, scale, and critical importance in infrastructure development. As global demands for sustainable and resilient infrastructure rise, AI emerges as a powerful tool to meet these needs.

Bridge construction involves intricate planning, precision engineering, and rigorous safety standards. AI technologies, such as machine learning, computer vision, and robotics, are being explored and implemented to optimize these processes. From automating design simulations to monitoring structural health in real-time, AI is redefining the traditional approaches to bridge construction. These innovations promise to revolutionize the industry by reducing human error, accelerating project timelines, and improving overall project quality. As stated by Gurko & Miroshnyk (2024) one of the promising uses of AI in the construction industry is to improve the quality of project design and management. AI algorithms process big data and assess possible risks to optimise construction planning, determine the optimal number of materials, and develop logistics, reducing errors in the construction process.

However, the adoption of AI in bridge construction is not without its challenges. Despite its potential, the integration of AI technologies often encounters resistance due to high implementation costs, lack of skilled personnel, and uncertainty around long-term benefits. Moreover, the construction industry, traditionally known for its conservative practices, faces difficulties in adapting to rapid technological changes. This creates a complex landscape where the potential of AI must be balanced against practical limitations. The promise of AI in bridge construction is further highlighted by its ability to enhance decision-making processes. Through predictive analytics and data-driven insights, AI enables engineers and project managers to foresee potential issues before they arise. AI can also help in digital preservation by monitoring and identifying deteriorating content and assisting in the migration of digital formats (Joel, 2025). This proactive approach contributes to risk mitigation and more efficient allocation of resources. AI-driven tools can also support the maintenance and operation phases of bridges, ensuring their longevity and functionality over time.

On the other hand, ethical and regulatory concerns also play a significant role in shaping the adoption of AI in this sector. Questions around data privacy, accountability in AI-driven decisions, and the potential for job displacement must be addressed thoughtfully. As AI systems take on greater responsibility in bridge construction, establishing clear regulatory frameworks becomes essential to ensure their safe and effective deployment. Furthermore, the global disparity in technological adoption poses another challenge. While developed nations may possess the resources and infrastructure to integrate AI effectively, developing countries might struggle with access to these advanced technologies. This digital divide could lead to unequal advancements in bridge construction capabilities, potentially exacerbating global infrastructure inequalities.

CONCEPT OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) refers to the field of computer science dedicated to creating machines capable of performing tasks that typically require human intelligence. This includes functions such as reasoning, learning, problem-solving, perception, and language understanding. According to Russell and Norvig (2020), AI can be categorized into two primary

types: narrow AI, which is designed for specific tasks, and general AI, which aims to replicate human cognitive abilities across a broad range of activities. Narrow AI, seen in applications like voice assistants and recommendation systems, has already had a profound impact on various industries, while general AI remains a long-term goal (Russell & Norvig, 2020).

As mentioned by Craig (2024) Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. As the hype around AI has accelerated, vendors have scrambled to promote how their products and services incorporate it. Often, what they refer to as "AI" is a well-established technology such as machine training. it requires specialized hardware and software for writing and training machine learning algorithms. No single programming language is used exclusively in AI, but Python, R, Java, C++ and Julia are all popular languages among AI developers.

According to Copeland (2025) artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. Since their development in the 1940s, digital computers have been programmed to carry out very complex tasks—such as discovering proofs for mathematical theorems or playing chess—with great proficiency. Despite continuing advances in computer processing speed and memory capacity, there are as yet no programs that can match full human flexibility over wider domains or in tasks requiring much everyday knowledge.

According to Coursera (2024) Artificial intelligence (AI) refers to a computer system that is capable of performing complex tasks that historically only a human could do, such as reasoning, making decisions, or solving problems. Today, the term "AI" describes a wide range of technologies that power many of the services and goods we use every day apps that recommend TV shows to chat bots that provide customer support in real time. Artificial intelligence (AI) is the theory and development of computer systems capable of performing tasks that historically required human intelligence, such as recognizing speech, making decisions, and identifying patterns. AI is an umbrella term that encompasses a wide variety of technologies, including machine learning, deep learning, and natural language processing (NLP). Although the term is commonly used to describe a range of different technologies that we use today, many disagree on whether these actually constitute artificial intelligence.

UiB (2022) said that Artificial intelligence (AI) is a common description of systems that perform actions in the physical or digital dimension by perceiving their environment, processing and interpreting huge amounts of information and data. AI systems have the ability to adapt their behavior by analyzing how the environment and conclusions are affected by previous actions. Artificial intelligence (AI) refers to systems designed by humans that act in the physical or digital world by perceiving their environment, interpreting the collected structured or unstructured data, reasoning on the knowledge derived from this data and deciding the best actions to achieve the given goal. AI systems can also be designed to learn to adapt their behavior by analyzing how the environment is affected by their previous actions.

CONCEPT OF CONSTRUCTION

Construction is the process where contractors build structures that serve a particular purpose, such as residential houses, schools, hospitals, public works such as roads, bridges, water and wastewater infrastructure, dams, and railways. Whether constructing a swimming pool in a

backyard or building a high-rise downtown, construction projects require engineers to design them and contractors to build them. Engineers prepare a set of instructions called construction documents that tell the contractors what the building should look like, where it should be built and how to build it. Construction is the process where contractors build structures that serve a certain purpose. Construction projects require engineers to design them and contractors to build them. Gass (2023).

Construction refers to any project that involves coming up with a design for a structure at a certain location, and then putting together all the different elements to build that structure. Construction projects fall into three broad categories: Buildings and houses. Construction is the process of creating physical structures, usually buildings or infrastructure. It entails systematic planning, design, and execution, alongside a collaborative effort among architects, engineers, contractors, and various skilled laborers (Nuzhu, 2023).

Asserted Chang & Swenson (2025), construction, the techniques and industry involved in the assembly and erection of structures, primarily those used to provide shelter. Construction is an ancient human activity. It began with the purely functional need for a controlled environment to moderate the effects of climate. Constructed shelters was one means by which human beings were able to adapt themselves to a wide variety of climates and become a global species.

CONCEPT OF BRIDGE CONSTRUCTION

Bridge construction involves designing and building structures that span physical obstacles like rivers, valleys, or roads, facilitating transportation. It's a multidisciplinary field involving various engineering disciplines, considering factors like load capacity, environmental impact, and cost-effectiveness. The process includes site preparation, foundation construction, superstructure building (beams, piers, deck), and finishing touches. Bridge construction refers to the systematic process of designing, planning, and assembling structural components to create a passage that spans physical obstacles such as rivers, valleys, or roads, using principles of load distribution, material strength, and dynamic performance, (Zhang & Cai, 2016).

According to Li & Ou (2016), Bridge construction is a domain of civil infrastructure development that involves the technical execution of structural systems designed to connect geographical gaps while ensuring durability, functionality, and environmental adaptability over long service lives. Wang, et al., (2016), further added that, “Bridge construction encompasses the entire lifecycle management of bridge projects, including design, procurement, on-site assembly, material logistics, safety planning, and the integration of automation and digital technologies for efficient project delivery.

Asserted, Samarasinghe & Zhang (2015), stated that, “Bridge construction is the practice of developing transport links using sustainable techniques and materials aimed at minimizing environmental impact, reducing carbon emissions, and ensuring long-term resilience to climate-related challenges. According to Capobianco & Teti (2017), “Bridge construction is a technologically intensive process that incorporates smart materials, sensor-based monitoring, prefabrication, and robotics to enhance structural safety, reduce construction time, and improve cost-effectiveness.”

SOURCE: https://www.istockphoto.com/photos/bridge-construction

CHALLENGES OF AI ADOPTION IN BRIDGE CONSTRUCTION

Adopting Artificial Intelligence (AI) in bridge construction presents several challenges that need to be addressed for successful implementation. Based on recent academic literature, here are five key challenges:

- **Fragmented Industry Structure**

The construction industry, particularly in bridge projects, is often fragmented, involving contractors, consultants, suppliers, and government agencies. This division leads to a lack of standardized workflows and communication protocols, which poses a major challenge in deploying AI-based solutions across the project lifecycle. When stakeholders operate with incompatible systems and data formats, it becomes difficult to build integrated AI models that require seamless data flow (Khan et al, 2024). Fragmentation also limits the continuity of data from design through maintenance. AI thrives on unified systems for decision-making, which is lacking in this context. Overcoming this barrier requires industry-wide collaboration and digital integration strategies.

- **Data Availability and Quality**

Effective AI systems in bridge construction rely on large volumes of high-quality, structured data. However, the sector suffers from inconsistent data collection practices and limited use of

digital sensors or monitoring systems, especially in older bridges. Many projects lack digital records or standardized formats, making historical analysis and machine learning training difficult. Inaccurate or incomplete data can lead to faulty predictions in areas like structural health monitoring or cost estimation. Furthermore, real-time data acquisition is hampered by hardware limitations and environmental challenges. Improving sensor deployment and enforcing data protocols is critical for effective AI use.

- Resistance to Technological Change

Construction personnel, particularly in traditional civil engineering roles, may be skeptical about the effectiveness and reliability of AI. This resistance stems from a combination of unfamiliarity with digital tools and fear of losing jobs to automation. In bridge construction, seasoned engineers might prefer proven conventional methods over newer AI-powered simulations or predictions (Ghukasyan, 2025). Additionally, organizational culture often favors risk-averse approaches, delaying innovation. Lack of AI literacy at both the operational and executive levels further compound the issue. Broad educational initiatives and demonstrative pilot projects are necessary to shift mindsets.

- Ethical and Trust Issues

AI introduces ethical concerns such as bias in algorithms, ownership of construction data, and potential job losses. In bridge construction, trust is particularly critical—automated structural assessments must be transparent and explainable to ensure safety. Yet, many AI tools operate as black boxes, providing little insight into how conclusions are reached. This opacity limits stakeholder confidence and regulatory acceptance. Moreover, data privacy and cybersecurity risks arise when infrastructure data is collected and transmitted digitally. Ensuring explainability, fairness, and data protection is key to fostering ethical AI adoption.

- High Initial Costs

Implementing AI in bridge construction requires significant upfront investment in software licenses, cloud storage, computing infrastructure, and workforce training. For small and medium enterprises (SMEs), these costs may be prohibitive and are often not justified unless return on investment is guaranteed. While AI can optimize material usage, scheduling, and maintenance over time, budget constraints and uncertain long-term benefits delay its adoption. Funding models that focus only on short-term outcomes often discourage digital innovation. Government subsidies and public-private partnerships can help alleviate these financial pressures.

MITIGATING STRATEGIES TO THE CHALLENGES OF AI ADOPTION IN BRIDGE CONSTRUCTION

- Standardization and Integration of Data Systems

To address the fragmented nature of the construction industry, adopting standardized data formats and protocols is essential. Implementing Building Information Modeling (BIM) alongside AI can facilitate seamless integration across various stages of bridge construction. According to Khan et al. (2024), Generative design tools can also be employed to explore multiple design scenarios early in the project, promoting compatibility and collaboration. This integrated approach reduces integration issues and enhances project efficiency. Establishing

common data environments ensures that all stakeholders have access to consistent and up-to-date information. Such standardization is crucial for the successful deployment of AI technologies in bridge projects.

- ❖ Comprehensive Training and Up skilling Programs

Investing in training programs is vital to overcome resistance to technological change. Menon (2024) explained that companies in the Asia-Pacific region that invest in training are 60% more likely to successfully implement AI. Training should focus on practical applications, such as using AI dashboards for equipment monitoring and reviewing AI-driven risk assessments during planning. Up skilling must extend beyond surface-level familiarity; hands-on sessions where operators practice integrating AI recommendations into real scenarios are beneficial. Additionally, fostering a culture of innovation and openness to new technologies can further ease the transition.

- ❖ Promoting Ethical AI Practices

Addressing ethical concerns is crucial for AI adoption in bridge construction. Key ethical issues include job displacement, data privacy, and algorithmic transparency. To mitigate these concerns, it's essential to ensure that AI systems are explainable and that data privacy is maintained. Establishing clear guidelines and regulations can help in managing these ethical challenges. Additionally, involving stakeholders in the development and implementation of AI systems can promote trust and acceptance. Regular audits and assessments of AI systems can also ensure they operate within ethical boundaries.

- ❖ Strategic Pilots Projects and Increment Implementation

Implementing AI through pilot projects allows for testing and refinement before full-scale adoption. Starting small and demonstrating tangible benefits can build confidence among stakeholders (Walega, 2024). For instance, AI can be applied to specific tasks such as structural health monitoring or material optimization, providing clear evidence of its effectiveness. Successful pilot projects can serve as models for broader implementation, showcasing the potential of AI to improve efficiency and reduce costs. This approach also allows for the identification and resolution of potential issues on a smaller scale before they impact larger projects.

- ❖ Collaboration with AI Experts and Technology Providers

Partnering with AI vendors who understand the nuances of bridge construction projects is essential. These partnerships can provide tailored solutions that address specific challenges faced in the industry. Collaborating with technology providers ensures that AI tools are developed with the unique needs of construction projects in mind. Such collaborations can lead to the creation of user-friendly interfaces and functionalities that enhance the adoption of AI technologies. Additionally, ongoing support and updates from technology providers can help in adapting to evolving project requirements and technological advancements.

CONCLUSION

The adoption of AI in bridge construction represents a pivotal shift in the way infrastructure is designed, built, and maintained in the 21st century. While the prospects of AI offer promising advancements in efficiency, safety, and innovation, the associated challenges cannot be

overlooked. A critical analysis of this transition is essential to understand how AI can be harnessed responsibly and equitably, ensuring that its benefits are realized across the global construction landscape.

RECOMMENDATIONS

1. Governments, construction firms, and academic institutions should prioritize investments in R&D to explore and optimize AI applications tailored to bridge construction. This includes developing predictive maintenance models, AI-driven design optimization tools, and intelligent construction monitoring systems.
2. Regulatory bodies should work with industry stakeholders to create policies that ensure safety, transparency, and accountability in AI-assisted processes.
3. Systems must be monitored regularly, and feedback mechanisms should be established to allow continuous improvement and adaptability to new challenges and technological developments.

REFERENCES

Capobianco, S., &Teti, R. (2017). Advanced manufacturing technologies in bridge construction. Procedia CIRP, 62, 3–8. https://doi.org/10.1016/j.procir.2017.03.081

Copeland (2025). Artificial intelligence: https://www.britannica.com/technology/artificial-intelligence.

Coursera (2024) What Is Artificial Intelligence? Definition, Uses, and Types available at: https://www.coursera.org/articles/what-is-artificial-intelligence.

Criag (2024). What is AI? Artificial Intelligence explained: https://www.techtarget.com/searchenterpriseai/definition/AI-Artificial-Intelligence.

Gass (2023). Construction | Definition, Types & Categories: https://study.com/academy/lesson/construction-definition-types.htmlThe

Ghukasyan H. (2025). Artificial Intelligence in Civil Engineering: Transforming the Industry through Innovation. *International Journal of Engineering Research & Technology (IJERT),* 14(4).

Gurko, O., & Miroshnyk, V. (2024). Artificial Intelligence in Road Construction: Prospects and Challenges. Scientific Papers of Silesian University of Technology. Organization & Management/Zeszyty Naukowe Politechniki Slaskiej. *Seria Organizacji i Zarzadzanie*, (210).

Joel, A. P (2025). Prospect and challenges of artificial intelligence technologies in academic libraries in North East Nigeria. *Global Educational Journal of Library and Information Science,* Vol. 12 (1), pp. 1-7.

Khan A., Bello A., Arqam M. & Ullah F. (2024). Integrating Building Information Modeling and Artificial Intelligence in Construction Projects: A Review of Challenges and Mitigation Strategies. *Technologies*, 12(10): 185. https://doi.org/10.3390/technologies12100185

Li, H., & Ou, J. (2016). The state of the art in structural health monitoring of cable-supported bridges. Journal of Civil Structural Health Monitoring, 6, 3–16. https://doi.org/10.1007/s13349-015-0127-1

Menon S. (2024). Key success factors for AI adoption in the construction industry. Retrieved from: https://www.autodesk.com/blogs/construction/ai-adoption-success/?utm_source=chatgpt.com

Pratt K. &Awati R. (2022). ICT information and communications technology or technologies. Available at: https://www.techtarget.com/searchcio/definition/ICT-information-and-communications-technology-or-technologies

Regona, M., Yigitcanlar, T., Xia, B., & Li, R. Y. M. (2022). Opportunities and adoption challenges of AI in the construction industry: A PRISMA review. *Journal of open innovation: technology, market, and complexity*, 8(1), 45.

Russell, S., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach (4th ed.). Person Education.

Samarasinghe, R., & Zhang, G. (2015). Sustainability in bridge design and construction: A review. Sustainable Cities and Society, 17, 1–9. https://doi.org/10.1016/j.scs.2015.03.005

UiB (2022) what is artificial intelligence? Available at: https://www.uib.no/en/ai/152317/what-artificial-intelligence.

Walega R. (2024). Strategies for successful AI adoption in construction. Retrieved from: https://briq.com/blog/successful-ai-adoption-construction?utm_source=chatgpt.com

Wang, J., Wu, P., Wang, X., Chi, H. L., & Chong, H. Y. (2016). BIM-integrated framework for bridge lifecycle management. Automation in Construction, 71, 49–61.

Zhang, Y., &Cai, C. S. (2016). Bridge condition assessment using load testing and structural health monitoring systems: A review. Structure and Infrastructure Engineering, 12(11), 1409–1425. https://doi.org/10.1080/15732479.2015.1137773

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

ARTIFICIAL INTELLIGENCE AIDED BUILDING DESIGN AS THE DETERMINANT OF EFFECTIVE THERMAL COMFORT IN HOUSES. AN ACADEMIC DISCOURSE BY ARCHITECTS IN TERTIARY INSTITUTIONS IN AKWA IBOM STATE

By

Arc. Obamoh Hannah YETUNDE,

Arc. Senior UDOH,

And

Arc. Nsikanabasi Aniefiok CHARLES,
Department of Architectural Technology,
Federal Polytechnic Ukana
Akwa Ibom State.

ABSTRACT

This study examined artificial intelligence-aided building design as the determinant of effective thermal comfort in houses, as an academic discourse. The integration of artificial intelligence (AI) into architectural design has revolutionised the construction industry, particularly in optimising thermal comfort in residential buildings. In the context of carrying out this research, the following subheads were expounded on: the concept of artificial intelligence, the concept of artificial intelligence-aided building design (AIAD) and the concept of thermal comfort. The study mentioned the features of thermal comfort in houses to include temperature regulation, humidity control and air movement/ventilation. The effect of AIAD on thermal comfort in houses, as mentioned in the study, included AI-optimised HVAC systems, AI-controlled shading devices and adaptive building envelopes, to mention a few. AI-driven design optimisation for sustainability, generative AI in built environment planning and integration of AI with building information modelling (BIM), among many others, were mentioned as the strategic ways of adopting AI to develop building design. The study concluded that AI-aided architectural design is transforming residential buildings by optimising thermal comfort and energy efficiency. One of the recommendations made was that architects and engineers should integrate AI-driven simulations and predictive analytics with sustainable building practices.

KEYWORDS: Artificial Intelligence, AI-Aided Building Design, Thermal Comfort and Houses

INTRODUCTION

The integration of artificial intelligence (AI) into architectural design has revolutionized the construction industry, particularly in optimizing thermal comfort in residential buildings. As climate change continues to affect global temperatures, architects and engineers face the challenge of designing energy-efficient and comfortable living spaces. AI technologies, including machine learning algorithms and computational simulations, offer innovative solutions for improving thermal comfort while reducing energy consumption (Boutahri and Tilioua, 2024). These intelligent systems analyze vast datasets, simulate different climatic conditions, and

propose design modifications that enhance indoor temperature regulation, ventilation, and insulation.

Thermal comfort, a crucial factor in housing design, refers to the state in which occupants feel neither too hot nor too cold, influenced by environmental and personal factors such as air temperature, humidity, and metabolic rate (Zhao, Ji, Deng, Wang and Liu, 2024). Traditional methods of achieving thermal comfort rely on standardized heating, ventilation, and air conditioning (HVAC) systems, which often lead to excessive energy consumption. AI-aided design introduces predictive analytics, smart control systems, and adaptive building materials to optimize thermal conditions dynamically. For instance, AI-driven simulations can evaluate window placement, building orientation, and material selection to enhance passive cooling and heating strategies (Manmatharasan, Bitsuamlak and Grolinger 2025).

The application of AI in architectural design goes beyond energy efficiency; it also contributes to sustainability by minimizing the carbon footprint of residential buildings. By leveraging AI, architects can create data-driven models that predict thermal behavior under various climatic scenarios, ensuring buildings remain comfortable throughout seasonal changes (Avci, 2025). AI-based tools, such as generative design software and computational fluid dynamics simulations, enable architects to explore multiple design alternatives rapidly, ultimately leading to more effective thermal comfort solutions. These technologies facilitate the creation of smart homes that automatically adjust internal conditions based on real-time weather data and occupant preferences.

Despite its potential, AI-aided building design faces challenges, including the high cost of implementation, the need for specialized expertise, and concerns over data privacy (Abioye, Oyedele, Akanbi, ... and Ahmed, 2021). Additionally, the effectiveness of AI in ensuring thermal comfort depends on accurate data collection and the integration of AI systems with traditional architectural practices. Some researchers argue that while AI enhances decision-making, human expertise remains indispensable in contextualizing AI-generated insights within the broader scope of architectural aesthetics and functionality (Hasan, 2024). The synergy between AI and human creativity is crucial in striking a balance between technological innovation and sustainable architectural design.

This academic discourse aims to explore the role of AI in enhancing thermal comfort in houses, examining its benefits, limitations, and future prospects. By analyzing case studies and existing literature, this study will provide insights into how AI-driven design methodologies can improve residential architecture. Additionally, it will assess the implications of AI adoption on construction practices, environmental sustainability, and occupant well-being.

Ultimately, the effectiveness of AI in achieving thermal comfort in homes is determined by its integration with architectural principles, environmental considerations, and emerging technological advancements. As AI continues to evolve, its potential to revolutionize building design and enhance thermal comfort in houses remains a promising area of research. This study will contribute to the ongoing discourse on AI-aided architecture, emphasizing the importance of intelligent design strategies in creating comfortable and energy-efficient homes.

CONCEPT OF ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is the study of how the human brain makes decisions, learns new things, and thinks through difficulties. According to Akpan and Essien (2025) Artificial intelligence (AI) is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. Adolf, Umo and Nkanta (2025) defined artificial intelligence (AI) as the study of how the human brain makes decisions, learns new things, and thinks through difficulties. A branch of computer science called artificial intelligence

studies how computers learn, comprehend data, recognize characters in images, analyses pictures, and simulate how the eyes work (Udo-Okon and Akpan, 2024).

Furthermore, Lion and Ekefre (2024) the term artificial intelligence (AI) describes computer programmes that are able to carry out sophisticated operations that were previously limited to human performance, such as problem-solving, thinking, and decision-making. Artificial intelligence (AI), in its broadest sense, is intelligence exhibited by machines, particularly computer systems, as opposed to the natural intelligence of living beings. As a field of research in computer science focusing on the automation of intelligent behavior through machine learning, it develops and studies methods and software that enable machines to perceive their environment and take actions that maximize their chances of achieving defined goals, with the aim of performing tasks typically associated with human intelligence (Ikechukwu and Echerenachukwu, 2024).

Moreover, Akpan and Clark (2024) posited that artificial intelligence (AI) is the study of how the human brain makes decisions, learns new things, and thinks through difficulties. The goal of artificial intelligence is to enhance computer abilities related to human understanding, including language intelligence, learning, reasoning, and problem-solving. Also, Huge and Godwin (2024) stated that artificial intelligence (AI) is the idea and practice of creating computer systems that can do tasks like speech recognition, decision-making, and pattern recognition that traditionally needed human intelligence. Artificial Intelligence can be understood as the collection of technologies that enable machines to sense, comprehend, act, and perform several functions matching those of humans (Bassey and Owushi, 2023).

CONCEPT OF ARTIFICIAL INTELLIGENCE AIDED BUILDING DESIGN (AIAD)

Artificial Intelligence Aided Building Design (AIAD) refers to the integration of artificial intelligence (AI) technologies into the architectural, engineering, and construction (AEC) design processes. AIAD leverages machine learning, generative design, and computational intelligence to enhance building planning, optimisation, and automation. AIAD revolutionises traditional building design by improving accuracy, reducing costs, and enhancing efficiency through intelligent decision-making. AI's predictive analytics is transforming the landscape of healthcare by leveraging vast amounts of historical health data to forecast future outcomes (Godwin, Awofala and Oni, 2023). This prediction has helped in numerous ways to create designs capable of protecting human health.

Fig 1: Sample of AIAD

Source: https://www.e-zigurat.com/en/blog/ai-architecture-design-5-principles/

According to Cudzik and Radziszewski (2018), using artificial intelligence in architectural design is based on calculation and automation. Ao and Duan (2025) mentioned that artificial intelligence-aided design contains all design software offering various automated tools that support the creative process. AIAD enables design labour reduction; it employs AI to understand the mapping relationship between design variables and performance, then constructs an AI surrogate model to assist designers in assessing the impact of design variables on structural performance, effectively simplifying the evaluation process and avoiding design labour explosion in high-iteration situations. Hence, leveraging AIAD not only advances structural design towards greater efficiency and simplification but also streamlines the design workflow.

CONCEPT OF THERMAL COMFORT

Thermal comfort refers to the subjective state of mind expressing satisfaction with the thermal environment, encompassing factors like air temperature, humidity, air speed, and clothing, influencing whether someone feels too hot or too cold. According to Usanga and Isaac (2024) Thermal comfort is a state of mind that expresses satisfaction with the surrounding environment. It is influenced by a range of environmental and personal factors and is a critical consideration in the design and operation of buildings, particularly in heating, ventilation, and air conditioning (HVAC) systems. Understanding thermal comfort involves considering how different variables interact to create a subjective sense of comfort or discomfort. Thermal comfort means feeling comfortable in an interior space which directly impacts people's mood.

Furthermore, Olurotimi and Mfon (2023) mentioned that thermal comfort is the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation. Thermal comfort describes the human satisfactory perception of the thermal environment. It refers to a number of conditions in which the majority of people feel comfortable. Thermal comfort describes the human satisfactory perception of the thermal environment. It refers to a number of conditions in which the majority of people feel comfortable. According to Budaiwa (2006) cited in Ekanem and Akwaowo (2016), thermal comfort is attained when a thermal balance is achieved: a situation in which no heat storage occurs in the body.

FEATURES OF THERMAL COMFORT IN HOUSES

Thermal comfort in homes is influenced by multiple factors, including temperature regulation, humidity control, air movement, insulation, ventilation, and psychological adaptation. These features work together to create an optimal living environment that minimises discomfort and enhances energy efficiency. Below, each key feature is explained in detail:

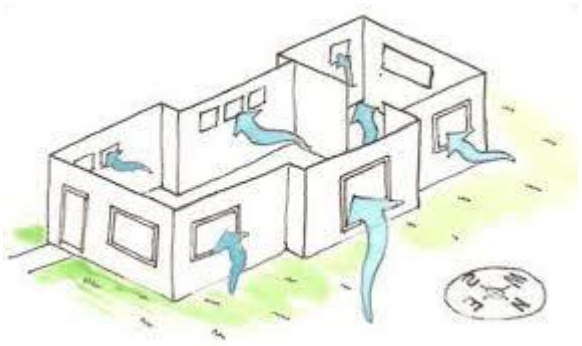
Temperature Regulation: Temperature regulation is the primary factor affecting thermal comfort in homes. The human body functions optimally within a specific temperature range, typically between 18°C and 24°C (64°F to 75°F). Effective temperature control is achieved through heating and cooling systems, passive design strategies, and the use of thermal mass materials that absorb and release heat slowly. Smart thermostats and climate control systems enhance this regulation by automatically adjusting indoor temperatures based on real-time weather conditions and occupant behaviour (Abdel-Salam, 2021).

Humidity Control: Humidity plays a crucial role in thermal comfort, as it affects the body's ability to release heat through perspiration. The ideal indoor relative humidity for comfort is

between 40% and 60%. High humidity levels can make warm temperatures feel hotter by reducing the effectiveness of sweating, leading to discomfort and potential health issues such as mould growth and respiratory problems. Conversely, low humidity can cause dry skin, throat irritation, and increased static electricity.

Air Movement and Ventilation: Air movement influences the perception of temperature and enhances thermal comfort by promoting heat dissipation from the body. Proper ventilation—whether natural or mechanical—ensures fresh air circulation, removing excess heat and indoor pollutants. Cross-ventilation, achieved through strategically placed windows and openings, facilitates effective cooling in warm climates. Ceiling fans, exhaust fans, and HVAC systems also contribute to maintaining air quality and temperature balance.

Fig 2: Image of Air Movement and Ventilation



Source: https://www.building.govt.nz/getting-started/smarter-homes-guides/air-quality-moisture-and-ventilation/passive-ventilation

Insulation Efficiency: Insulation is essential for reducing heat transfer between indoor and outdoor environments, maintaining a stable indoor temperature throughout the year. Well-insulated homes minimize heat loss in winter and prevent heat gain in summer, reducing reliance on artificial heating and cooling systems (Ren, 2022). Common insulation materials include fiberglass, foam boards, cellulose, and phase-change materials (PCMs), which store and release thermal energy.

Adaptive Clothing and Thermal Perception: The way individuals perceive thermal comfort varies based on personal habits, clothing choices, and cultural expectations. People adapt to temperature fluctuations by adjusting their clothing layers, which helps regulate body temperature effectively. For instance, wearing light and breathable fabrics in hot conditions enhances cooling, while layering clothes in cold environments provides warmth.

Radiant Heat Control: Radiant heat exchange affects how heat is absorbed or emitted by surfaces within a home. Heat radiation from walls, floors, ceilings, and windows can significantly impact indoor comfort. For example, dark-colored surfaces absorb more heat, making rooms feel warmer, while reflective or light-colored materials reduce heat absorption. Low-emissivity (Low-E) glass windows and thermal mass materials help regulate radiant heat, preventing excessive heat buildup indoors.

Smart Climate Control and Automation: Technological advancements in smart home automation have revolutionized thermal comfort management. AI-powered HVAC systems, IoT-enabled thermostats, and sensor-based climate control systems optimize temperature, humidity, and airflow based on real-time user preferences. These systems learn occupant

behavior and adjust settings accordingly, ensuring an energy-efficient and comfortable indoor environment.

Fig 3: AI-powered HVAC Systems

Source: https://www.hehellc.com/automated-climate-control/

EFFECT OF AI AIDED BUILDING DESIGN ON THERMAL COMFORT IN HOUSES

Integrating Artificial Intelligence (AI) into building design has significantly enhanced thermal comfort in residential spaces by enabling dynamic and responsive environmental control systems (Ogundiran, Asadi & Gameiro da Silva 2024). The following are the effects that artificial intelligence has on assisting in building design to ensure thermal comfort:

AI-Optimised HVAC Systems: AI technologies have revolutionised HVAC system management by analysing data from sensors that monitor temperature, humidity, occupancy patterns, and external weather conditions. These systems can predict and adjust indoor climates proactively, ensuring consistent thermal comfort while reducing energy consumption. For instance, BrainBox AI's implementation in a Manhattan office building led to a 15.8% reduction in HVAC energy use, resulting in annual savings of over $42,000 and a decrease of 37 metric tonnes in carbon dioxide emissions. This proactive adjustment to temperature changes also enhanced tenant comfort (Ahsan, Shahzad & Arif 2024).

AI-Controlled Shading Devices: In regions with hot and arid climates, AI-controlled shading systems have proven effective in maintaining indoor thermal comfort. A study conducted in Egypt demonstrated that such systems could lower indoor temperatures by up to 4°C and reduce energy consumption by 25%. Additionally, occupant complaints regarding thermal discomfort decreased by 77.78%, and issues related to glare were reduced by 76%. These systems dynamically adjust shading based on real-time environmental data, optimising both thermal and visual comfort.

Adaptive Building Envelopes: AI facilitates the development of adaptive building envelopes that respond to changing environmental conditions. Smart materials and surfaces, such as electrochromic windows or dynamic insulation, can automatically adjust their properties based on AI analysis, maximising insulation efficiency and maintaining thermal comfort (Anber, 2024).

STRATEGIC WAYS OF ADOPTING AI TO DEVELOP BUILDING DESIGN

Integrating Artificial Intelligence (AI) into building design has emerged as a transformative approach to enhance efficiency, sustainability, and innovation in architecture. The following are the strategic ways to adopt artificial intelligence to develop building designs:

AI-Driven Design Optimisation for Sustainability: Implementing AI techniques, such as machine learning algorithms, can optimise building designs to achieve sustainability goals. Surrogate models, for instance, enable rapid evaluation of design alternatives, facilitating energy efficiency and environmental performance enhancements. A study carried out by Song, Wang, Chen, Zhang & Li (2025) highlighted that artificial intelligence is essential in surrogate-assisted design optimisation, emphasising its potential to streamline the design process and improve sustainability outcomes.

Generative AI in Built Environment Planning: Generative AI approaches, particularly deep learning models, can automate and innovate aspects of site layout, interior, and exterior design. These models can generate design alternatives based on specified parameters, allowing architects to explore a broader design space efficiently (Ahmed, Zhang, & Wang, 2024).

Integration of AI with Building Information Modelling (BIM): Combining AI with BIM enhances data management and decision-making processes throughout a building's lifecycle. AI algorithms can analyse BIM data to predict project outcomes, optimise resource allocation, and identify potential issues early in the design phase (Chen, Yu, Zhou, & Sun, 2024).

Machine Learning for Smart Housing and Interior Design: According to Gupta, Singh & Verma (2024), applying machine learning techniques in urban planning and interior design can lead to the development of smart housing solutions. These technologies enable the analysis of user preferences and behaviours, facilitating personalised and adaptive design solutions that enhance occupant comfort and energy efficiency.

AI for Energy Consumption Optimisation: Furthermore, Wang, Patel & Liu (2024) mentioned that utilising artificial intelligence to optimise energy consumption involves the application of algorithms that can predict and manage energy use in buildings. This includes optimising building orientation, window-to-wall ratios, insulation, and HVAC systems. A review discusses how AI can enhance architectural design efficiency by optimising building energy consumption through various strategies and technologies.

Surrogate Modelling for Building Performance Evaluation: Surrogate models serve as efficient approximations of complex simulations, allowing for rapid assessment of building performance under various design scenarios. These models are particularly useful in the early design stages to evaluate factors like energy use, delighting, and thermal comfort. A systematic review delves into the application of surrogate models in sustainable building design optimisation, discussing methodologies and identifying future research directions.

CONCLUSION

AI-aided architectural design is transforming residential buildings by optimising thermal comfort and energy efficiency. As climate change intensifies, architects leverage AI technologies like machine learning and simulations to enhance indoor temperature regulation, ventilation, and insulation. AI-driven design also promoates sustainability by reducing energy consumption and carbon footprints. However, challenges such as high costs, expertise requirements, and data privacy concerns persist. Despite these obstacles, the synergy between AI and human creativity remains essential. As AI continues to evolve, its role in designing intelligent, adaptive, and comfortable homes will be crucial in shaping the future of sustainable architecture.

RECOMMENDATIONS

1. Architects and engineers should integrate AI-driven simulations and predictive analytics with sustainable building practices. By optimising passive design strategies such as building orientation, material selection, and natural ventilation, AI can enhance thermal comfort while minimising reliance on energy-intensive HVAC systems.
2. Governments, universities, and industry stakeholders should invest in AI research and training programs to equip architects and engineers with the skills needed to implement AI-driven solutions.
3. The construction industry should prioritise the development of AI-powered smart homes capable of real-time thermal adjustments based on weather conditions and occupant behaviour.

REFERENCES

Abdel-Salam M., Zaidi A. & Cable M. (2021). *Field study of heating performance of three ground-source heat pumps in Canadian single-family houses.Energy and Buildings*, 247, 110959.

Abioye, S. O., Oyedele, L. O., Akanbi, L., ... and Ahmed, A. (2021). Artificial Intelligence in the Construction Industry: A Review of Present Status, Opportunities and Future Challenges. *Journal of Building Engineering*, 44. https://doi.org/10.1016/j.jobe.2021.103299.

Adolf, N. N., Umo, A. A. and Nkanta, I. O. (2025). Artificial Intelligence Involvement in Research Activities: Exploring its Enhancement in Researches Carried Out by Post Graduate Students in Akwa Ibom State Tertiary Institutions. *GASPRO International Journal of Eminent Scholars*, 12(1), 1-13.

Ahmed, S., Zhang, X., & Wang, Y. (2024). Generative artificial intelligence in the built environment: A state-of-the-art review. *Digital Built Environment,* 2(3), 40. https://doi.org/10.1016/j.dibe.2024.0409

Ahsan, M., Shahzad, W., & Arif, K. M. (2024). AI-Based Controls for Thermal Comfort in Adaptable Buildings: A Review. *Buildings*, 14(11), 3519. https://doi.org/ 10.3390/buildings14113519

Akpan, E. E. and Clark, L. (2024). Artificial Intelligence: An Emerging Technology for Service and Production Enhancement in the 21st Century. *Global Academic Journal of Library and Information Science (GAJLIS*), 3(1), 63-74.

Akpan, E. E. and Essien, F. G. (2025). Artificial Intelligence: A Dependable Tool for Effective Management of Resources in Secondary Schools. *Shared Seasoned International Journal of Topical Issues*, 11(1), 119-130.

Anber, M. (2024). Achieving Indoor Thermal Comfort Using AI-Controlled Shading in Hot Arid Climates in Office Buildings. *International Design Journal*, 14(6), 205-213. https://doi.org/10.21608/idj.2024.305830.1172

Ao, Y., Li, S. & Duan, H. (2025). Artificial Intelligence-Aided Design (AIAD) for Structures and Engineering: A State-of-the-Art Review and Future Perspectives. *Arch Computat Methods Eng*. https://doi.org/10.1007/s11831-025-10264-1

Avci, A. B. (2025). Machine Learning-Based Prediction of Thermal Comfort: Exploring Building Types, Climate, Ventilation Strategies, and Seasonal Variations. Building Research & Information, 1–18. https://doi.org/10.1080/09613218.2025.2462932.

Bassey, M. M. and Owushi, E. (2023). Adoption of Artificial Intelligence in Library and Information Science in the 21st Century: Assessing the Perceived Impacts and Challenges by Librarians in Akwa Ibom and Rivers States. *International Journal of Current Innovations in Education*, 6 (1), 75-85.

Boutahri, Y. and Tilioua, A. (2024). Machine Learning-Based Predictive Model for Thermal Comfort and Energy Optimization in Smart Buildings. Results in Engineering, 22. https://doi.org/10.1016/j.rineng.2024.102148.

Chen, L., Yu, H., Zhou, X., & Sun, J. (2024). Challenges and mitigation strategies of integrating AI with Building Information Modeling (BIM): A review. Technologies, 12(10), 185. https://doi.org/10.3390/technologies1210185

Cudzik, J. and Radziszewski, K. (2018). Artificial Intelligence Aided Architectural Design. *AI for design and built environment*, 1 (36), 77-84.

Ekanem, U. J. and Akwaowo, D. R. (2016). Building Forms and Ventilation as Determinants of Thermal Comfort in Hostel Rooms in University of Port Harcourt. *Intercontinental Aca. Journal of Education, Science & Technology*, 3(2).

Godwin, O. S., Awofala, T. B., & Oni, O. PREDICTIVE ANALYTICS FOR EARLY DETECTION OF DIABETES IN LOW-RESOURCE SETTINGS.

Gupta, R., Singh, A., &Verma, K. (2024). Machine learning in smart housing and interior design for sustainable urban planning. Journal of Built Environment Sustainability, 7(2), 1144. https://doi.org/10.1007/s42107-024-01144-3

Hasan, K. (2024). *The Effectiveness of Artificial Intelligence in the Architectural Design Process*. A Seminar Submitted to the Department of Architecture Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh.

Huge, K. C. and Godwin, O. E. (2024). Adoption of Artificial Intelligence in Curbing Fraud in Public Organisation: Assessing Fraud Detection and Control. *GASPRO International Journal of Eminent Scholars*, 11(1), 44-54.

Ikechukwu, I. B. and Echerenachukwu, O. (2024). Assessment of Artificial Intelligence Roles in Teaching and Learning (ICT) for Problem Solving in Secondary School in Imo State: Investigating the Prospect and Challenges. *GASPRO International Journal of Eminent Scholars*, 11 (1), 108-123

Lion, C. J. and Ekefre, A. E. (2024). Risk Control and Management *in Banking Sector: Investigating the Work of Artificial Intelligence in Mitigating Risks. International Journal of Advancement in Education, Management, Science and Technology*, 7 (I), 82-92.

Manmatharasan, P., Bitsuamlak, G., and Grolinger, K. (2025). AI-driven Design Optimization for Sustainable Buildings: A Systematic Review. Energy and Buildings, 332 (1). https://doi.org/10.1016/j.enbuild.2025.115440.

Ogundiran, J., Asadi, E., & Gameiro da Silva, M. (2024). A Systematic Review on the Use of AI for Energy Efficiency and Indoor Environmental Quality in Buildings. *Sustainability*, 16(9), 3627. https://doi.org/10.3390/su16093627

Olurotimi, O. J. and Mfon, I. E. (2023). Adoption of Natural Ventilation Strategies for Thermal Comfort: A Case Study of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom State. *International Journal of Research in Education, Science and Technology*, 6(1), 123-140.

Ren S., Hu W., Bradbury K., Harrison-Atlas D., Valeri L., Murray B. & Malof J. (2022). Automated Extraction of Energy Systems Information from Remotely Sensed Data: A Review and Analysis Applied Energy, 326, 119876.

Song, H., Wang, W., Chen, B., Zhang, Y., & Li, H. (2025). A systematic review on AI-assisted surrogate modeling for sustainable building design optimization. Energy and Buildings, 300, 1707. https://doi.org/10.1016/j.enbuild.2025.1707

Udo-Okon, T. N. and Akpan, E. E. (2024). The Challenges of Artificial Intelligence in Library management system. *Intercontinental Academic Journal of Library and Information Science*, 6(1), 96-107.

USANGA, A. P. S., & ISAAC, B. E. HALF FENCE: EVALUATING ITS USEFULNESS AND POTENCY IN PROVIDING THERMAL COMFORT AND SECURITY TO OCCUPANTS.

Wang, X., Patel, R., & Liu, Z. (2024). Artificial intelligence for optimizing building energy consumption: Strategies and technologies. Applied Sciences, 15(3), 1476. https://doi.org/10.3390/app15031476

Zhao, H., Ji, W., Deng, S., Wang, Z. and Liu, S. (2024). A Review of Dynamic Thermal Comfort Influenced by Environmental Parameters and Human Factors. *Energy and Buildings*, 318 (1). https://doi.org/10.1016/j.enbuild.2024.114467.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

TRAINING AND DEVELOPMENT: THE PANACEA FOR PRODUCTIVITY AND BUSINESS SUCCESS

By

AKPAN, E. Ebenezer Ph.D. FCICN, AP, PPGDCA, PHDCDPM
Corporate Institute of Research and Computer Science
140 Ikot Ekpene Road
Uyo, Akwa Ibom State

And

Joy Uko EBENEZER
Department of Educational Foundation,
Guidance and Counseling
University of Uyo, Uyo.

ABSTRACT

Training and development have emerged as indispensable tools for enhancing employee performance, increasing organizational productivity, and achieving long-term business success. The paper examined the role of training and development as a panacea for productivity and business success. It underscores how structured training programs not only bridge skill gaps but also foster a culture of learning and adaptability within organizations. The study showed different types of training for entrepreneur which were identified as leadership training, compliance training, on-the-job training etc. Furthermore, the study emphasized the correlation between well-executed training initiatives and measurable business outcomes such as increased efficiency, customer satisfaction, and profitability. It was concluded that training and development are essential drivers of employee performance and organizational productivity. They empower staff with the skills and knowledge needed to meet current and future challenges. A well-trained workforce enhances efficiency, innovation, and adaptability in a competitive market. One of the recommendations made was that organizations should systematically evaluate skill gaps to tailor training programs that address specific employee and organizational needs

KEYWORD: Training, Development, Panacea, Productivity and Business Success

INTRODUCTION

In today's rapidly evolving business environment, organizations face increasing pressure to stay competitive, adapt to technological advancements, and meet ever-changing consumer demands. Amidst these challenges, training and development have emerged as crucial components of strategic human resource management, serving as vital tools for enhancing employee performance and driving organizational success. They are often described as a "panacea" a universal remedy for addressing productivity deficits and achieving business excellence. Training and development refer to the systematic acquisition of knowledge, skills, and behaviors that improve individual and organizational performance. While training focuses on equipping employees with specific skills for their current roles, development is broader, aimed at preparing employees for future responsibilities and career advancement (Armstrong &

Taylor, 2014). These two processes work in tandem to create a more capable, motivated, and agile workforce.

The significance of training and development cannot be overstated. According to the American Society for Training and Development (ASTD), companies that invest in comprehensive training programs enjoy a 218% higher income per employee than those with less comprehensive training (ASTD, 2012). Furthermore, these companies report a 24% higher profit margin. These figures highlight how training directly correlates with organizational performance and profitability. It is no surprise that global leaders such as Google, Microsoft, and IBM place strong emphasis on continuous employee learning and professional growth. Productivity, a key performance indicator in any organization, is heavily influenced by employee competence and motivation. Training boosts productivity by ensuring that employees understand their roles, master the tools of their trade, and keep pace with industry best practices. When employees are properly trained, they work more efficiently, make fewer errors, and contribute to smoother operations (Noe et al., 2020). Moreover, training enhances employee morale and job satisfaction, reducing turnover and associated recruitment costs. Development initiatives, on the other hand, are essential for preparing the workforce for future challenges. Leadership development programs, mentoring, and up skilling ensure a steady pipeline of talent ready to assume critical roles. In an era defined by digital transformation, companies that fail to invest in employee development risk falling behind. According to a report by LinkedIn (2023), 89% of learning and development professionals agree that proactive skill development is crucial to navigating future work disruptions. As the business world continues to evolve, the organizations that will thrive are those that view training and development not as costs, but as investments with exponential returns.

CONCEPT OF TRAINING AND DEVELOPMENT

Training and development (T&D) are integral components of human resource management, focusing on enhancing employees' skills, knowledge, and competencies to improve organizational performance. Over the past decade, the significance of T&D has been increasingly recognized, with organizations investing in structured programs to foster employee growth and achieve strategic objectives.

Training is typically defined as a systematic process aimed at improving employees' current job performance by increasing their skills and knowledge. Development, on the other hand, is a broader concept that focuses on the growth and future performance of employees, preparing them for potential higher responsibilities within the organization. According to Mohammed Abdullahi (2024), training and development are distinct yet interconnected processes that collectively contribute to enhancing organizational performance. Effective T&D programs have been linked to improved employee productivity, job satisfaction, and retention. For instance, a study conducted at the University of Cape Coast, Ghana, found that T&D initiatives promoted peer learning, enhanced technical staff skills, and contributed to improved competencies and productivity.

However, the study also noted challenges in implementation, particularly when staff resumed work after training, highlighting the need for continuous support and adequate resources. he integration of technology into T&D has transformed traditional training methods. Augmented Reality (AR), for example, has emerged as an effective tool for corporate training programs, offering immersive and interactive learning experiences. A systematic literature

review by Martins et al. (2021) indicated a significant increase in AR applications for corporate tra ining, particularly in the automotive and medical sectors. The study highlighted AR's potential in providing on-the-job training and improving skill acquisition. T&D also play a crucial role in achieving Sustainable Development Goals (SDGs) by promoting continuous learning, gender equality, and decent work.

Uddin and Ahmed (2024) emphasized that strategic investment in employee training advances professional growth, fosters innovation, and contributes to workplace well-being, thereby supporting multiple SDGs. Beyond individual benefits; T&D are instrumental in strategy implementation and organizational success. Chinongwa et al. (2022) argued that T&D influence critical success factors such as employee motivation, commitment, and performance, which are essential for effective strategy execution. The study underscored the importance of aligning T&D initiatives with organizational goals to enhance overall performance.

Development, on the other hand, is concerned with preparing employees for future roles and responsibilities. It includes leadership development, succession planning, and lifelong learning. Unlike training, development is more self-directed and long-term in nature. It empowers employees to take initiative in their career advancement. As argued by Chinongwa et al. (2022), development initiatives are crucial for sustaining organizational adaptability and innovation. They ensure that companies can respond to changes in the external environment by cultivating a pipeline of capable leaders and adaptable professionals.

An important evolution in the T&D landscape between 2016 and 2025 is the integration of technology into learning practices. The use of Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI) has enabled immersive and personalized learning experiences. Martins et al. (2021) noted that AR applications in corporate training have become especially prominent in sectors like healthcare and manufacturing, improving skill retention and learner engagement. Learning Management Systems (LMS) have also advanced, allowing organizations to track progress, customize content, and assess training effectiveness in real time.

Furthermore, T&D has been recognized as a driver of sustainable development, contributing to multiple United Nations Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 8 (Decent Work and Economic Growth). Uddin and Ahmed (2024) highlight that training initiatives promoting equality, inclusivity, and innovation create not only a skilled workforce but also a more equitable work environment. T&D programs that integrate sustainability principles prepare employees to think critically about environmental and social issues in their professional practices.

CONCEPT OF PRODUCTIVITY IN BUSINESS

Productivity in business refers to the efficiency with which organizations convert inputs such as labor, capital, and materials into outputs like goods and services. It is a critical measure of organizational performance and competitiveness, influencing profitability and long-term sustainability. Between 2016 and 2025, the understanding of productivity has evolved beyond mere output metrics to include qualitative factors such as innovation, employee engagement, technology adoption, and sustainable practices. Businesses now recognize that improving productivity requires a holistic approach integrating multiple dimensions.

Traditionally, productivity was measured as output per labor hour or unit of input. However, recent research emphasizes that productivity is influenced by human, technological, organizational, and strategic factors. The human dimension focuses on employee skills, motivation, and well-being. Studies have shown that organizations with high employee engagement and continuous training tend to experience higher productivity levels (Singh et al., 2022). Furthermore, fostering adaptive performance where employees can quickly adjust to change has become essential in dynamic markets.

The technological dimension plays a pivotal role in enhancing productivity. The rise of Industry 4.0 technologies, including automation, artificial intelligence, and data analytics, has transformed production processes and service delivery. Research by Aly (2023) highlights that digital transformation improves operational efficiency, reduces waste, and accelerates innovation, all of which drive productivity gains. Businesses that leverage technology to optimize workflows and decision-making maintain competitive advantages in rapidly changing environments.

Organizational culture and work environment also significantly impact productivity. A culture that promotes collaboration, trust, and psychological safety encourages employees to contribute fully and innovate. Ibrahim and Daniel (2023) found a strong correlation between positive organizational culture and employee productivity in Nigerian institutions. This culture aligns individual and organizational goals, increasing motivation and reducing turnover.

Lastly, strategic management practices such as effective time management, goal alignment, and performance measurement ensure resources are optimally utilized. Akpan and Inyang (2021) demonstrated that strategic time management in the banking sector led to better customer satisfaction and higher productivity. Use of key performance indicators (KPIs) and regular feedback mechanisms helps organizations track progress and adapt strategies to maximize output.

The concept of productivity in business has broadened from a narrow focus on output quantity to a comprehensive understanding that integrates human capital, technology, culture, and strategy. Between then and now, scholarly research underscores the importance of a multidimensional approach to enhance productivity sustainably. Organizations that effectively combine these elements position themselves for growth, innovation, and resilience in a competitive global economy.

CONCEPT OF BUSINESS SUCCESS

Business success is a multifaceted concept that reflects the achievement of organizational goals, sustained profitability, market competitiveness, and long-term growth. It encompasses both quantitative outcomes, such as financial performance, and qualitative indicators, including customer satisfaction, brand reputation, and employee engagement. Between 2016 and 2025, scholars and practitioners have expanded the definition of business success to integrate sustainability, innovation, and stakeholder value creation, acknowledging that traditional metrics like revenue and profit, while important, are no longer sufficient to gauge a firm's true performance in the modern global economy.

One of the most fundamental measures of business success remains financial performance, including profitability, return on investment (ROI), and cash flow. These indicators help determine an organization's economic viability. According to Ismail et al.

(2016), firms with strong financial control mechanisms tend to demonstrate higher resilience and growth. However, recent studies suggest that focusing solely on financial gains may undermine long-term success, especially in volatile and socially-conscious markets. Therefore, organizations are now integrating non-financial metrics such as innovation output, customer loyalty, and environmental impact into their success frameworks

Strategic management plays a crucial role in determining business success. Companies that develop clear strategic objectives, conduct market analyses, and adapt to environmental changes are more likely to thrive. As emphasized by Matar and Eneizan (2018), aligning strategic planning with organizational capabilities and market demands increases both competitiveness and customer satisfaction. Furthermore, strategic agility the ability to adapt quickly to disruptions has become a key driver of success in the post-2020 business environment, especially following the COVID-19 pandemic. Organizations that invested in digital transformation and remote operations have outperformed those that remained static.

Another critical component of business success is human capital development. Employee training, engagement, and well-being directly affect productivity, innovation, and service delivery. A study by Uddin and Ahmed (2024) highlights those businesses investing in employee development experience higher retention, creativity, and organizational commitment, all of which contribute to long-term success. Moreover, leadership style and organizational culture significantly shape employee behavior and corporate performance. Transformational leadership, in particular, has been linked with positive organizational outcomes, including adaptability, collaboration, and ethical decision-making.

Sustainability and corporate social responsibility (CSR) have become essential to defining modern business success. Stakeholders now expect businesses to demonstrate environmental stewardship, social inclusion, and ethical governance. According to El-Kassar and Singh (2019), integrating sustainability into core business strategies not only enhances brand image but also reduces risks and opens new market opportunities. Businesses that prioritize ESG (Environmental, Social, and Governance) principles are better positioned to attract investment and maintain a loyal customer base. Thus, success in the 21st century demands a balance between profitability and social impact.

The concept of business success between 2016 and 2025 has evolved into a holistic framework that includes financial performance, strategic alignment, employee development, innovation, and sustainable practices. Businesses that adopt a balanced approach to measuring success—considering both tangible and intangible indicators—are more likely to sustain growth, adapt to change, and create long-term value for all stakeholders. This comprehensive view acknowledges that true success lies not only in what a business achieves, but also in how it achieves it.

TYPES OF TRAINING FOR ENTERPRENEURS

The following are the types of entrepreneurs:

- Leadership training

Without the ability to lead, of course you will find it difficult to direct the team you work with effectively. In fact, the way you lead the team will greatly determine the success of your business performance. So, be sure to also take the time to learn how to be a great leader.

From there, you will find out what things you can develop and how to manage the human resources you employ better than before.

- Compliance Training

Do you still think that training in the field of compliance is only needed by business actors whose businesses are already on a corporate scale? In fact, this assumption is not at all true! You who are MSME actors can also learn a lot if you attend training in the field of compliance. For example, compliance training gives you a lot of knowledge about the basics of making compliant in business, such as licenses and tax provisions that you need. Not only that, you can also run your business more wisely without violating environmental regulations (Cashlez, 2022).

- On-the-job training

On-the-job training is training that happens in the workplace. Employees learn from more experienced colleagues. There are a number of different methods including work shadowing, formal training sessions and computer-based training. On-the-job training has a number of benefits. It is a relatively cheap form of training as there are no travel costs and training are done by another employee, not an expensive external trainer. On-the-job training also allows a business to reduce costs by offering e-learning, a form of on-the-job training which is done via a computer. This can be done by large numbers of employees at the same time. Finally, on-the-job training can be tailored to the needs of the company, such as using the specific machinery that the company uses. However, on-the-job training has a number of disadvantages. As the training is usually provided by other employees, it may mean that more people are unavailable to work as they are both providing and receiving training. It is also unlikely to bring new ideas and skills into the business

- Off-the-job training

Off-the-job training is training that happens away from the employee's workplace. This can include a course at a college, university or at a training provider or studying for a qualification at home. It can be for as little as a few hours or can be done on a part time basis for a number of years. Off-the-job training can bring new ideas into a business. As off-the-job training is expensive, employees who receive it may feel more valued by the company and therefore more motivated and loyal. In addition, the trainer is more likely to provide high quality training, as they will be a skilled expert in this specific area. Disadvantages of off-the-job training include that it is expensive and there is a risk that the newly trained employee will leave the business. In addition to this, the training might not be tailored to the business and the employee is spending time away from the workplace to complete the training (Bitesize, 2025).

- Traditional small-business training

Classroom-based training in basic business practices is the most common approach to training small scale entrepreneurs. The ILO's Start and Improve Your Business programmes are, Freedom from Hunger's programmes for microfinance clients, and the IFC's Business Edge programmes are amongst the best known and most widely implemented classroom-based training programmes. Although, there is a wide variety of classroom business training programmes and approaches, a typical programme involves a trainer teaching a group of 15-to-40 participants over a period of 3-to-12 days. Courses for owners of existing firms looking to

grow cover record-keeping and accounting, marketing, human resources and hiring workers, stock control and inventory management, planning, and operations management. Most of these training programmes reach scale by training a set of master trainers, who in turn train a network of trainers in different countries. The course materials are typically translated and adapted to local contexts. While courses are typically traditional teacher-led, classroom-based training, many also incorporate active learning. Participants take part in exercises or games to gain an understanding of key concepts, and complete assignments between training sessions that apply the content to their own businesses (Lie shout and Mehtha, 2017)

DIMENSION OF PRODUCTIVITY IN BUSINESS

Productivity in business is a multifaceted concept that extends beyond mere output metrics. Recent scholarly works emphasize various dimensions that collectively influence organizational efficiency and performance. These dimensions encompass human factors, technological advancements, organizational culture, and strategic management practices.

- Productivity

Productivity in business refers to the ability of an organization to efficiently transform inputs into valuable outputs. It is a multidimensional concept that incorporates various elements, each influencing organizational performance in distinct ways. Recent research emphasizes that understanding productivity solely in terms of output per labor hour is limiting (Cequea, 2020). Instead, productivity should be analyzed through dimensions such as human factors, technology, organizational culture, and strategic management to ensure sustainable growth.

- The human factor

The human factor is one of the most significant dimensions influencing productivity. It includes employee motivation, engagement, skills, and overall well-being. Cequea et al. (2020) outlined a model where individual (skills, motivation), group (collaboration, communication), and organizational (culture, leadership) factors collectively enhance productivity. Similarly, organizations that invest in training and development, fair compensation, and inclusive leadership tend to see higher employee output and lower turnover (Olaniyan & Lucas, 2022). The psychological contract between employer and employee plays a major role in shaping productivity outcomes.

DIMENSION OF BUSINESS SUCCESS

Business success is a multidimensional concept that extends beyond mere profitability. It encompasses various qualitative and quantitative indicators that determine how well an organization performs in achieving its mission, satisfying stakeholders, and sustaining long-term growth.

- Financial Performance

Financial performance remains a fundamental dimension of business success. It includes metrics such as revenue growth, profitability, return on investment (ROI), and cash flow. A strong financial position enables businesses to invest in innovation, expand operations, and survive market downturns.

- Customer Satisfaction and Retention

Customer satisfaction is crucial in measuring business success, particularly in consumer-facing industries. It influences repeat purchases, brand loyalty, and word-of-mouth referrals.

- Innovation and Adaptability

Innovation capability is vital in today's rapidly changing business environment. Companies that invest in research and development, digital transformation, and new business models are more likely to succeed in the long term.

- Employee Engagement and Development

A motivated, skilled, and engaged workforce contributes significantly to business success. Employee satisfaction, low turnover, and professional development are indicators of a healthy internal environment.

- Operational Efficiency

Operational efficiency refers to the ability to deliver products or services using minimal resources while maintaining quality. It involves optimizing processes, minimizing waste, and leveraging technology.

- Social and Environmental Responsibility

In the era of corporate social responsibility (CSR), social impact and environmental sustainability have become vital dimensions of business success. Stakeholders increasingly expect businesses to contribute to societal development and environmental protection.

- Strategic Vision and Leadership

Visionary leadership and clear strategic direction underpin long-term success. Effective leadership guides organizational culture, strategic alignment, and responsiveness to external changes

EFFECTS OF TRAPINING AND DEVELOPMENT ON PRODUCTIVITY IN BUSINESS

The effects of training and development on productivity in business have been widely studied, particularly in the wake of global economic shifts, technological advancement, and workforce evolution. Below is an extensive explanation of the major effects:

- Enhanced Employee Performance

Training and development significantly improve employee performance by equipping individuals with the latest skills, techniques, and industry knowledge necessary to execute their roles effectively. Well-trained employees are not only more competent, but also more confident in handling job responsibilities with precision, reducing the likelihood of errors and boosting overall work quality. In business environments where speed, accuracy, and innovation are essential, training ensures that employees remain competitive and agile.

- Improved Operational Efficiency

Training streamlines operational processes by instilling best practices, time management skills, and technical proficiencies in employees. When staff are well-versed in workflow procedures, software systems, and communication protocols, the business benefits from faster turnaround times, fewer delays, and minimal supervision. This optimization reduces redundancies and resource wastage, while improving coordination among departments. According to Quinn et al. (2020), Employees trained in problem-solving are more likely to prevent bottlenecks and act proactively.

- Higher Innovation and Adaptability

One of the long-term benefits of training is the cultivation of a more innovative and adaptable workforce. Continuous development fosters critical thinking, creativity, and openness to new ideas, which are essential in fast-paced business environments. Employees exposed to learning are more likely to embrace change, explore alternative solutions, and contribute novel ideas to improve products or services. Especially in the post-pandemic era, adaptability has become a strategic asset as businesses face rapid technological changes and shifting market demands.

- Reduced Turnover and Higher Job Satisfaction

Training and development programs have been shown to significantly reduce turnover rates while enhancing job satisfaction, ultimately boosting productivity in businesses. When employees receive opportunities for skill development and career growth, they are more likely to feel valued and engaged in their work, fostering loyalty and reducing the likelihood of seeking opportunities elsewhere. Furthermore, such initiatives contribute to improved morale, job satisfaction, and a sense of accomplishment, which in turn enhances overall job performance. Organizations that invest in employee development see not only better retention rates but also higher levels of motivation and productivity. A recent study by Sahoo and Mishra (2023) highlights how training programs lead to increased job satisfaction and decreased turnover intentions in organizations, resulting in a more committed and productive workforce

- Compliance, Safety and Risk Reduction

Training and development programs play a crucial role in ensuring compliance, safety, and risk reduction in businesses. By equipping employees with the necessary knowledge and skills, organizations can minimize workplace accidents, maintain regulatory compliance, and reduce operational risks. Well-trained employees are more aware of safety protocols and legal requirements, which helps in preventing costly mistakes and ensuring a safer working environment. A recent study by Patel and Sharma (2023) emphasizes how effective training leads to improved compliance and reduced workplace risks, contributing to overall operational efficiency.

EFFECT OF TRAINING AND DEVELOPMENT ON BUSINESS SUCCESS

The following are the effect of training development on business success:

- Improvement in Employee Performance and Productivity

One of the most immediate and measurable impacts of training and development is the improvement of employee performance. Training enhances the skills, knowledge, and

capabilities of employees, enabling them to perform tasks more efficiently and with greater accuracy. As productivity increases, so does the organization's output and profitability.
For example, Adade (2024) conducted a study at the University of Cape Coast, Ghana, and found that structured training programs significantly improved the competencies and performance of administrative staff. This led to enhanced service delivery and operational efficiency, directly contributing to the institution's goals. Employees with up-to-date knowledge are better positioned to contribute to innovation and problem-solving within their roles.

- Increased Employee Motivation, Retention, and Loyalty

Training and development also serve as a motivational tool. Employees feel valued when organizations invest in their growth. This sense of appreciation translates into increased job satisfaction, organizational commitment, and reduced turnover.

According to Uddin and Ahmed (2024), training improves employee morale and engagement, which are critical drivers of performance. Their research revealed that T&D programs lead to higher levels of employee retention, especially when linked to career advancement opportunities. Organizations that focus on internal talent development are less likely to suffer from brain drain or the high costs of external hiring.

- Enhancement of Organizational Innovation and Adaptability

In today's digital age, the ability to adapt quickly is a key determinant of success. Training programs that focus on soft skills, technology adaptation, and creative thinking help businesses remain agile and competitive.
Martins et al. (2021) found that using Augmented Reality (AR) and digital platforms in corporate training increased learner engagement and accelerated the application of skills in the workplace. These technological advancements in T&D have allowed businesses to enhance innovation capacity, reduce learning curves, and implement new systems more effectively. In an era of constant change, such adaptability is crucial for survival and growth.

- Alignment with Strategic Goals and Organizational Culture

For training and development to have a significant impact, they must align with the organization's strategic vision and values. Strategic T&D ensures that the workforce is prepared to execute business plans, adopt new processes, and contribute toward long-term goals. Chinongwa et al. (2022) emphasized that T&D has a major role in strategy implementation. Their study highlighted that organizations with integrated T&D programs are more likely to meet performance benchmarks and sustain competitive advantage. Moreover, training that reinforces core values helps to create a unified corporate culture, fostering collaboration and shared vision.

- Contribution to Customer Satisfaction and Market Competitiveness

Training is not just internally beneficial it also enhances external outcomes such as customer satisfaction. Well-trained employees provide better customer service, which leads to higher client retention, positive brand reputation, and increased market share.

As noted by Abdullahi (2024), improved employee performance through continuous training leads to fewer customer complaints, faster service delivery, and higher quality outputs. These outcomes collectively strengthen a company's market position, enabling it to thrive in both domestic and global markets.

CONCLUSION

Training and development are essential drivers of employee performance and organizational productivity. They empower staff with the skills and knowledge needed to meet current and future challenges. A well-trained workforce enhances efficiency, innovation, and adaptability in a competitive market. Development initiatives build a strong leadership pipeline and boost employee engagement. Organizations that invest in continuous learning achieve sustainable growth and success. Ultimately, training and development serve as the foundation for long-term business excellence.

RECOMMENDATION

- Organizations should systematically evaluate skill gaps to tailor training programs that address specific employee and organizational needs.
- Training and development initiatives must support the company's long-term objectives; ensuring employees are prepared for future challenges and opportunities.
- Promote a learning culture by offering ongoing programs such as workshops, e-learning, certifications, and cross-functional training.

REFERENCES

Quinn F., Thorsteinsson E. & Weaver N. (2020). U.S. workers weigh-in on the issue of portable benefits. *Journal of Public Affairs, 12(1), e2140.*

Sahoo S. & Mishra M. (2023). Effect of Training and Development on Employee Productivity and Retention. International *Journal of Human Resource Management, 12(1), 34-45.*

Patel R. & Sharma S. (2023). Impact of Training on Safety and Risk Management in Organizations. *Journal of Workplace Safety and Risk Management, 15(2), 98-110.*

Bitesize, (2025), Training – AQA Types of training undertaken by businesses, Available at: https://www.bbc.co.uk/bitesize/guides/zh6cgwx/revision/2

Cashlez, (2022), 6 Types of Training for Entrepreneurs, Have You Participated? Available at: https://www.cashlez.com/en/blog/6-types-of-training-for-entrepreneurs-have-you-participated_774.html

Lie shout V., and Mehtha (2017), "The Next 15 million: Start and Improve Your Business Global Tracer

Study 2011-2015", International Labour Organization: Geneva.

Abdullahi, M. (2024). Training and Development and Its Impact on Organizational Performance. Harvard International *Journal of Research and Advanced Studies*. Retrieved from https://harvardpublications.com/hijiras/article/view/190

Chinongwa, T., Chigusiwa, L., & Chikodzi, D. (2022). The Role of Training and Development in Strategy Implementation: A Review of Related Literature. Retrieved from https://www.researchgate.net/publication/367290346

Martins, V. F., Moraes, C., & Amaral, A. (2021). The Use of Augmented Reality for Corporate Training: A Systematic Literature Review. arXiv preprint. Retrieved from https://arxiv.org/abs/2102.09453

Uddin, M. S., & Ahmed, S. (2024). Employee Training and Development as a Tool for Achieving Sustainable Development Goals. *Journal of Human Resource Studies, 6(1).* Retrieved from https://www.humanresourcejournal.com/archives/2024.v6.i1.B.184

Adade, T. C. (2024). The Impact of Training and Development on Employee Productivity: A Case Study at the University of Cape Coast, Ghana. Asia Pacific *Journal of Cooperative Education.* Retrieved from https://www.tandfonline.com/doi/full/10.1080/14480220.2024.2304821

Singh, S., Yadav, M., & Agarwal, V. (2022). Employee Productivity: An Analysis of Dimensions and Determinants. *Journal of Organizational Behavior, 15(2).*

Aly, H. (2023). Digital Transformation and Its Impact on Business Productivity: Evidence from Smart Manufacturing. *Future Business Journal, 9(1). https://doi.org/10.1186/s43093-023-00189-*

Ibrahim, A., & Daniel, F. (2023). Organizational Culture and Productivity: Evidence from Nigerian Tertiary Institutions. ATBU *Journal of Science, Technology and Education, 11(1).*

Akpan, E. J., & Inyang, B. J. (2021). Time Management and Productivity in the Nigerian Banking Sector. Calaba *Journal of Human Resource Management, 5(2).*

Adade, T. C. (2024). The Impact of Training and Development on Employee Productivity: A Case Study at the University of Cape Coast, Ghana. Asia Pacific *Journal of Cooperative Education. https://doi.org/10.1080/14480220.2024.2304821*

Uddin, M. S., & Ahmed, S. (2024). Employee Training and Development as a Tool for Achieving Sustainable Development Goals. *Journal of Human Resource Studies, 6(1). https://www.humanresourcejournal.com/archives/2024.v6.i1.B.184*

Martins, V. F., Moraes, C., & Amaral, A. (2021). The Use of Augmented Reality for Corporate Training: A Systematic Literature Review. arXiv. https://arxiv.org/abs/2102.09453

Chinongwa, T., Chigusiwa, L., & Chikodzi, D. (2022). The Role of Training and Development in Strategy Implementation: A Review of Related Literature. ResearchGate. https://www.researchgate.net/publication/367290346

Abdullahi, M. (2024). Training and Development and Its Impact on Organizational Performance. Harvard International Journal of Research and Advanced Studies. https://harvardpublications.com/hijiras/article/view/190.

Armstrong, M., & Taylor, S. (2014). Armstrong's Handbook of Human Resource Management Practice. Kogan Page.

ASTD (2012). The Value of Training. American Society for Training and Development.

Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2020). Fundamentals of Human Resource Management (8th ed.). McGraw-Hill Education.

LinkedIn. (2023). Workplace Learning Report. LinkedIn Learning.

Cequea, M. et al. (2020). Design of a productivity management model from a psychosocial perspective. Intangible Capital, 16(1). https://doi.org/10.3926/ic.1593

Aly, H. (2023). Does digital transformation drive productivity? Evidence from smart manufacturing. Future Business Journal, 9(1). https://doi.org/10.1186/s43093-023-00189-9

Olaniyan, D. A., & Lucas, B. (2022). Human capital development and productivity in Nigerian firms. African Journal of Economic Policy, 29(2).

Ibrahim, A., & Daniel, F. (2023). Organizational culture and productivity: Evidence from tertiary institutions in Nigeria. ATBU Journal of Science, Technology and Education, 11(1).

Akpan, E. J., & Inyang, B. J. (2021). Time management and productivity in the Nigerian banking sector. Calabar Journal of Human Resource Management, 5(2).

Al-Debei, M. M., & Al-Lozi, E. (2021). Business model innovation and financial performance. Journal of Innovation & Knowledge, 6(3), 159–168. https://doi.org/10.1016/j.jik.2021.01.003

Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2016). Product design and business model strategies for a circular economy. Journal of Industrial and Production Engineering, 33(5), 308–320. https://doi.org/10.1080/21681015.2016.1172124

Gupta, S., & Sharma, G. (2020). Corporate social responsibility and sustainable business performance. Sustainability, 12(12), 5250. https://doi.org/10.3390/su12125250

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

INSTRUCTIONAL MEDIA AND PUPILS' INTELLECTUAL DEVELOPMENTS IN ITU LOCAL GOVERNMENT AREA

By

Immaculata Gregory UMOH, Ph.D.

EZAK, Lydia-Noyume Odum

And

NWOGU Success Kingsley
Department of Early Childhood and Special Education,
Faculty of Education.
University of Uyo.

ABSTRACT

This study investigated the relationship between instructional media and pupil's intellectual development in Itu Local Government Area. Three research questions and three null hypotheses were postulated to guide the study. Correlational survey research design was adopted and used for this study. Correlational survey research design was adopted and used for the study. The population of the study was 110 teachers and 2,654 ECC pupils in all the 38 public primary schools in Itu Local Government Areas. A sample size of 210 participants selected through multi - stage sampling technique was used to select the respondents for the study. Teachers' Utilization of Instructional Media Questionnaire (TUIMQ) and Pupils Intellectual Development Rating Scale (PIDRS) were used as the instruments for the study. The instruments which yielded reliability was determined. Cronbach's Alpha Statistic was used for instruments reliability coefficients indices of 0.88 and 0.79 respectively. Pearson Product Moment Correlation (PPMC) was used in anwsering the research questions, test the null hypotheses at 0.05 level of significance. The findings showed that there is a strong positive and significant relationship between print, visual and electronic instructional media and pupils' intellectual development in Itu Local Government Area. Based on the findings of the study, it was recommended among others that the government and stakeholders in the education system should give more attention to massive supply of diverse instructional media to all the schools in the federation and supervisors should be assigned to different schools to ensure that teachers are closely monitored to use instructional aid for each topic taught in order to improve pupils' intellectual development.

KEYWORDS: Instructional Media, Pupils Intellectual, Developments, Local Government Area

INTRODUCTION

Intellectual development is the construction of thought processes, including remembering, problem - solving, and decision making, from childhood through adolescence to adulthood. Intellectual development refers to functions of the brain such as thinking, learning, awareness, judgement and processing information (Ken, 2007). These are things healthy children do quite naturally as they learn and grow. The study on intellectual or cognitive

development according to Eneh and Nkang (2011) is characterized with the increasing ability to grasp relationships, solve difficult problems, use abstract reasoning, deal with abstract symbols in mathematics, remember events, use language effectively in communication and use past experiences to solve present and future problems. The Swiss philosopher Jean – Piaget (1896 – 1980) was the first to suggest that from birth, babies begin to actively learn. The gather, sort, and process information from around them, using the data to develop perception and thinking skills. According to Roode (2020) intellectual development refers to how a person perceives, thinks, and gains understanding of his or her world through the interaction of genetic and learned factors. The cognitive domain of learning involved knowledge and the development of intellectual skills. It includes the recognition of specific facts, procedural patterns and concepts that serve in the development of abilities and skills. Among the areas of intellectual development are information processing, intelligence, reasoning, language development and memory. Children's intellectual development, which includes creativity, discovery language skills, verbal judgement and reasoning, symbolic thought and the ability to focus and control behavior are all heavily influenced by so many factors including instructional media.

The place of instructional media in the teaching and learning process is undoubtedly essential if there is going to be improvement in pupils' intellectual development. They are indispensable in the teaching and learning process. In most Nigerian schools, modern instructional materials like language laboratories, computers, word processors and audio – visual aids are not provided because of their cost and personnel to run them. Not using these materials makes teaching and learning process difficult and burdensome.

The term "instructional media", according to Romiszowski (2017), refers to devices and materials employed in the teaching and learning. It includes hardware like blackboards, ratio, television, tape recorders, video tapes and recorders and projectors and soft wares like transparencies, films, slides teacher – made diagrams, real objects, cartoons, models, maps, and photographs (Opoku – Asare, 2014). Similarly, scanlan (2013) indicates that instructional media encompasses all the materials and physical means an instructor might use to implement instruction and facilitate pupils' achievement of instructional objectives. This may include traditional materials such as chalkboards, handouts, charts, slides, overheads, real objects and videotape or film, as well newer materials and methods such as computers, DVDs, CD – ROMs, the Internet and interactive video conferencing.

Talabi (2011) asserts that instructional media are generally designed to provide realistic images and substitute experience to reach curriculum experiences. The media are considered the most efficient facilitators in the education set up. They are not substitutes for the teacher. Their use however, calls for an imaginative approach by the teacher who needs to constantly be on alert for new ideas and techniques to make the lessons prepared with different instructional media achieve effective outcomes. Talabi (2011) further said that some devices are designed to present information of a kind that would not be available in an ordinary school experience. Example include, films, television, sound recordings. Other types of instructional media have the function to help the pupil grasp the underlying structure of a phenomenon. Visual media are primarily for seeing, audio devices for hearing and multi – sensory materials for use via two or more senses.

According to Opoku – Asare (2011), instructional media refers to devices and materials employed in teaching and learning. It includes hardware like blackboards, radio, television, tape – recorders, videotapes and projectors, and software like transparencies, films, slides,

teacher – made diagrams, real objects, cartoons, models, maps and photographs. Scanlan (2003) states that instructional media includes all the materials and physical means an instructor might use to implement instruction and facilitate pupils' achievement instructional objectives. This may include traditional materials such as chalkboards, handouts, charts, slides, overheads, real object, videotapes or films as well as modern materials and methods such as computers, DVD's, CDROM's. The internet and interactive video – conferencing. Nyame – Kwarteng (2006) also holds the view that instructional media are the various materials that appeal to the five senses seeing, hearing, touching, feeling and tasting which enhance teaching and learning. They affect different senses that act as an integral part of the teaching and learning process and also help to bring about meaningful experiences. However, this research is to investigate the influence of instructional media on intellectual development pupils.

Print media are the literary forms of information preserved in autograph or transmitted format. They include exercise books, study guides, handouts, and other print materials. They are important because they provide imagery for both instructors and pupils. They also provide realistic details necessary for visual recognition of important subject material. With these materials teachers are able to often refer to the learning objective, terminologies, learning outcome, exercise on the introductory page in order to have a better picture of what the learner must know. During the lesson, printed materials offer at least one 'example' and one 'try this' to enable learners have hands – on experience in the learning process. They also provide reference materials to offer to at any time (Talabi, 2011 and Nyame – Kwarteng, 2016).

Accordingly, print media helps to enhance pupils' interest and broaden their perspectives towards global activities. Print media is a rather commonly used term referring to the medium that disseminates printed matter. In everyday life, we refer to print media as the industry associated with the printing and mostly with the distribution of news through a network of media, such as newspapers and journals. People also refer to print media simply with the term "press". It is an intermediate communicative channel aiming at reaching a large number of people. Print media include all printed forms of press: Newspapers, newsletters, booklets magazines and pamphlets as well as other printed publications that sell advertising space to raise revenue. Most print media, with the exception of magazines and journal are local or national, while many magazines are international. A complete catalog of print media should also include yearbooks and presentations of events and programmes. Nwike and Onyejegbu (2013) studied the effects of use of instructional material on student cognitive achievement in agricultural science in secondary schools or Orumba South Local Government Area. The findings revealed that students taught with instructional materials performed better than those taught without instructional materials.

Also, Salem (2021) investigated on impact of print media on student's academic performance of Varanasi City, India. The result of the study revealed that percent of the selected students; for the study were accessed print media sources by both public and private school students. The majority of the students from both schools were encouraged by print media to do new and innovate things with their academic projects and assignments and also the majority of the students stated that print media sources were helpful in their academic performance in most of the cases. So, it was concluded from the study that printed sources are useful in their academic because it covers so many educational and informative issues.

According to Okeke (2013) visual media are any visible materials or equipment employed while teaching to aid learning. Okeke further explains that visual aids such as

pictures and photographs facilitate learning by supplementing teacher's verbal information. This underlies a well – founded theoretical underpinning that pictures, images and other visible aids promote better understanding to students than words alone (Mayer, 2005). Over generations, different kinds of visual aids have been used by teachers to enable meaningful learning. Some new form constantly emerges as a result of improvements in educational science and technology (Krukru, 2015). Preference for visual media in educational is natural for human beings. Babies retain visual images long before they recall faces of close people such as parents and other siblings and associate things like fire with pain. As children grow up and mature cognitively, visuals become even more important. Jean Piaget's cognitive development theory describes the years between 2 to 7 as a pre – operational period where the child learns to use and represent objects by images, words, and drawings. Use of concrete objects visual aids such as drawings and illustrations are crucial in teaching children at this stage (Woolfolk, 2014).

Literature support that visual sense is a critical factor for learning. A study conducted by a psychologist and educator Jerome Brunner, cited by Lester (2012), showed that persons remember only 10 percent of what they read, but about 80 percent of what they see and do. According to Gould and Roffey – Barentsen (2018) 83% of our learning is achieved through the sense of sight. 11% comes from the sense of hearing, 3.5% through the sense of smell, 1.5% through the sense of touch and another 1% through the sense of taste. The pre-eminence of visual sense in learning further bears credence in famous Chinese proverbs "one sighted is worth, a hundred words".

In 2017, Harwood and Mc Mahon carried out a study to explore the effects of integrated video media on students' achievement in chemistry. Among the findings was that the treatment students who experienced chemistry course enhanced with structured chemistry video series showed significant higher achievement than control group. It was also found out that students enjoyed learning through videos. Bui and McDaniel (2015) investigated the influence of outlines and illustrative diagrams in enhancing learning, it was found out that illustrative diagrams were instrumental in bringing better performance among students. Likewise, Vaughn and Wang (2009) researched the influence of user – controlled visual aid for improving students' understanding in introductory statistics. Findings showed that the particular animated visual aid significantly improved student's academic performance and confidence in applying – level knowledge. Carpenter and Olson (2011) study examined the effect of teaching new vocabularies through pictures and it was found that there was significant advantage in the recall of Swahili words from pictures compared with English translations. Oladejo *et.al.,* (2011 investigated the effect of using improvised instructional materials on academic achievement of secondary school physics students in Oyo state, it was found out that students exposed to instructional materials with some elements of audio – visual aids achieved better than students taught with standard instructional materials.

Modern technology has expanded from use as technology for communication and online entertainment to tools in education for developing cognitive thinking and enriching academic activities. Among the categories of instructional materials, the electronic media have been described as the most powerful weapon of instruction both in schools and anywhere social knowledge is impacted. The reason is not far – fetched advances in technology have brought electronic media to the forefront as the most radical tools of globalization and social development. Such technological breakthroughs as networked and non – networked; projected and non – projected; visual, auditory, audio – visual electronic media are important landmarks

in knowledge transfer. With them both, teaching and learning become very pleasant experiences. Their power to teach and socialize has been varied as documented in literature.

Electronic instructional media as defined by Okwelle and Alagoa (2014) are the aid whose devices require electricity to produce clear image and give meaning to reality in teaching – learning process. Examples include, specimen slides, computer labs, power point slides, simulations, multimedia, video games, internet systems, overhead projectors, microforms, instructional television among others. The authors added that these materials can help pupils develop functional knowledge of their subject of study as they stimulate learners' interests in curiosity. They enrich the class, save time and overcome classroom barriers (Delma 2010). Okwelle and Alagoa (2014) believed that the modern electronic instructional materials can provide the teacher with meaningful and useful source of information, interesting and competitive platforms for conveying information, helps the teacher overcome physical difficulties in presentations of learners and save time. pupils as well develop functional knowledge, manipulative skills and understanding of their subject as the materials facilitate, stimulate curiosity and different learning styles. More so, Esu, Enukoha and Umoren (2009) found that skillful utilization of these media can transform a dull and difficult class into an exciting class producing effective learning.

Ofili (2012) researched on instructional television utilization for the enhancement of cognitive skills; implication for the challenges of science education in Niger State, Nigeria. The study used quasi experimental design. A sample of 80 students representing SS2 physics students in the research area was used for the study. Physics Achievement Test (PAT) was used as instrument for data collection. Data collected was analyzed using t – test statistics. The findings revealed among other that instructional television enhanced academic performance of physics students. In the same vein, Okworo (2010) reported that television and video – tape motivates and stimulates learners to learn materials, which may not be available in the real environment. Staylor (2010) earlier opined that the use of multimedia, which is the use of two or more instructional media in biology instruction can make difficult and abstract concepts to become real and interesting thereby resulting to meaningful learning.

Nweke, Dirisu and Umesi (2015) corroborating Staylor, examined the effect of synchronized multimedia (MM) on motivation and academic performance of 200 biology students. The study utilized questionnaire and achievement test to collect data. Findings showed a significant difference in the mean score of students taught biology with synchronized MM (M = 51) and students who received lesson without synchronized MM (M = 23). Yuvuv, Servet and Levent (2010) studied the predictors of academic achievement and attitude of secondary school students in Bilgi City of Turkey. Survey research design was used and questionnaire used for data collection. Data collected were analyzed using t – test and one – way analysis of variance. Findings revealed no significant relationship between web – based education and students' academic achievement.

Speaking on the availability and usability of modern electronic instructional media in classrooms and laboratories. Adams (2011) and Udeani (2012) lamented that most public schools in Nigeria may be lacking or not have access to these materials, thus teaching subjects concepts in abstract, the outcome may be poor performance of students in both internal and external examination. Therefore, this study examines the relationship between instructional media and pupils' intellectual development.

STATEMENT OF PROBLEM

Education is a continuous, lifelong process, which starts as soon as one is born. Early childhood is the most important period in the intellectual development of the child. Since preschool education is the basics of formal learning, special attention must be given its implementation and in determining how it can help children to develop. The sad truth of many school buildings is dilapidated and learning facilities are far from being adequate. With these large class sizes, one wonders the frequency at which teachers apply the use of instructional media that facilitate learning. Also, the use of instructional media in primary schools is not encouraging. As a result, it delays pupils' intellectual development. This is because teachers adopt the verbalistic and theoretical method as a way of teaching and learning subjects, mainly due to non – availability of instructional media in schools. The problem of this study therefore put in question from is: what is the relationship between instructional media and pupils' intellectual development in Itu Local Government?

PURPOSE OF THE STUDY

The study investigated the relationship between instructional media and pupils' intellectual development in Itu Local Government Area. Specifically, the study sought to:

i. Ascertain the relationship between print instructional media and pupils' intellectual development.
ii. Determine the relationship between visual instructional media and pupils' intellectual development.
iii. Determine the relationship between electronic interactive instructional media and pupils' intellectual development.

SIGNIFICANCE OF THE STUDY

This study would be useful to classroom teachers, curriculum planners, students, researchers and parents. For teachers, they would be better informed on how to help and guide their pupils to do some of the illustrations during the instructions.

This study would help to develop problem solving skill in pupils and would also help pupils to be more resourceful during lessons. The study could be beneficial to curriculum planners who would design functional curriculum by taking into considerations teacher improvised instructional materials. The findings of this study, if discussed in workshops and seminars would guide the choice of improvised instructional media used in the teaching/learning process in any subject areas. The results of the study could provide information to researchers interested in working on instructional media in any subject areas. This may help them to get more information on the efficacy of instructional media, especially researchers in the area of science and technology.

Parents would be better informed on to encourage and help their wards to produce improvised materials. This may be in form of sourcing local materials and provide fund for those that cannot be found in their environment.

RESEARCH QUESTIONS

The following research questions were formulated to guide the study;

i. What is the relationship between print instructional media and pupils' intellectual development?

ii. What is the relationship between visual instructional media and pupils' intellectual development?
iii. What is the relationship between electronic interactive instructional media and pupils' intellectual development?

NULL HYPOTHESES

The following null hypotheses were formulated and tested at 0.05 level of significance:

i. There is no significant relationship between print media and pupils' intellectual development.
ii. There is no significant relationship between visual instructional media and pupils' intellectual development.
iii. There is no significant relationship between electronic interactive instructional media and pupils' intellectual development.

SCOPE OF THE STUDY

The geographical scope covered the public primary schools in Itu Local Government Area. The present study focused on the instructional media and pupils' intellectual development. The study was delimited to teachers and pupils' in ECC II. The independent variable in the instructional media to include print, visual and electronic while the dependent variable is pupils intellectual development.

RESEARCH METHOD

Research Design

The correlational survey research design was adopted for the study. The study was conducted in Itu Local Government Area of Akwa Ibom State, Nigeria. The population of the study comprised all the 110 teachers and 2,654 ECC pupils in all the 38 primary schools in Itu Local Government Areas (Akwa Ibom State Ministry of Education, 2021). A sample size of 210 participants selected through multi-stage sampling technique was used to select the respondents for the study. For the purpose of this study, two researcher – made instruments were used for data collection known as: Teachers' Utilization of Instructional Media Questionnaire (TUIMQ) and Pupils' Intellectual Development Rating Scale (PIDRS). Face and content validity were established for Teachers' Utilization of Instructional Media Questionnaire' (TUIMQ) and Pupils' Intellectual Development Rating Scale (PIDRS) were given to three experts, one from Educational Technology, one from Early Childhood Education and one from Measurement and Evaluation, Faculty of Education, University of Uyo, who independently assessed the various items to ascertain their relevance to the research questions, hypotheses and language used in developing the items. However, the scored obtained from the validated instruments were used to compute the reliability coefficient using Cronbach's Alpha Statistics that yielded the reliability indices of 0.88 and 0.79 respectively. These high reliability coefficients confirmed that these variables were internally consistent. Pearson Product Moment Correlation (PPMC) was used for answering the research questions by comparing the values with the extent scale of correlation also used for testing the hypotheses by comparing it with the critical – r –value. The entire hypotheses formulated were tested at .05 level of significance.

RESULTS

Answering of Research Questions

Research Question One

What is the relationship between print instructional media and pupils' intellectual development?

Table 1: Pearson's Product Moment Correlation Analysis of the relationship between print instructional media and pupils' intellectual development. (n = 210)

Variables	ΣX ΣY	ΣX² ΣY²	ΣXY		r	R²
Print Instructions media	2376	43366				
			40712	0.72	0.52	
Pupils' Intellectual Development	2241	38735				

$\dot{\alpha}$ = 0.05, R^2 = coefficient of determination.

Results on Table 1 is correlation coefficients of the relationship between print instructional media and pupils' intellectual development. Results showed that the correlation between print and instructional media and pupils' intellectual development was 0.72. This means that there was a strong positive relationship between print instructional media and pupils' intellectual development. The coefficient of determination associated with 0.72 is 0.52. the coefficient of determination (0.52) also known as the predictive value means that 52% of print instructional media accounted for the variation in pupils' intellectual development. This is an indication that 48% of variation in pupils' intellectual development is attributed to other factors other than print instructional media.

Research Question Two

What is the relationship between visual instructional media and pupils' intellectual development?

Table 2: Pearson's Product Moment Correlation Analysis of the relationship between visual instructional media and pupils' intellectual development. (n = 210)

Variables	ΣX ΣY	ΣX² ΣY²	ΣXY		r	R²
Visual Instructional media	2376	43366				
			40737	0.69	0.48	
Pupils' Intellectual Development	2243	38835				

$\dot{\alpha}$ = 0.05, R^2 = coefficient of determination.

Result on Table 2 is a correlation coefficient of the relationship between visual instructional media and pupils' intellectual development. Results showed that the correlation between visual instructional media and pupils intellectual development was 0.69. This means that there was a strong positive relationship between visual instructional media and pupil' intellectual development. The coefficient of determination associated with 0.69 is 0.48. The coefficient of determination (0.48) also known as the predictive value means that 48% of visual instructional media accounted for the variation in pupils' intellectual development. This is an

indication that 52% of variation in pupils' intellectual development is attributed to other factors other than visual instructional media.

Research Question Three

What is the relationship between electronic instructional media and pupils' intellectual development?

Table 3: Pearson's Product Moment Correlation Analysis of the relationship between electronic interactive instructional media and pupils' intellectual development. (n = 210)

Variables	ΣX ΣY	ΣX^2 ΣY^2	ΣXY	r	R^2
Visual Instructional media	2376	43366	43472	0.95	0.90
Pupils' Intellectual Development	2280	43472			

$\dot{\alpha}$ = 0.05, R^2 = coefficient of determination.

Result on Table 3 is a correlation coefficient of the relationship between electronic interactive instructional media and pupils' intellectual development. Results showed that the correlation between electronic interactive instructional media and pupils intellectual development was 0.95. This means that there was a strong positive relationship between electro

nic interactive instructional media and pupils' intellectual development. The coefficient of determination (90) associated with 0.95 is 0.90. The coefficient of determination also known as the predictive value means that 90% of electronic interactive instructional media accounted for the variation in pupils' intellectual development. This is an indication that 10% of variation in pupils' intellectual development is attributed to other factors other than electronic interactive instructional media.

TESTING OF HYPOTHESES

Hypothesis One

There is no significant relationship between print media and pupils' intellectual development.

Table 4: Pearson's Product Moment Correlation Analysis of the significant relationship between
print media and pupils' intellectual development. (n = 210)

Variables	ΣX	ΣX^2 ΣY^2	ΣXY	r-cal.	r – crit.
Visual Instructional media	2376	43366	40712	0.72	0.178
Pupils' Intellectual Development	2241	38735			

$\dot{\alpha}$ = 0.05

The result presented in Table 4 revealed that the calculated r – value of 0.72 is greater than the critical r – value of 0.178 at 0.05 level of significance with 208 degrees of freedom. With this result, the null hypothesis one is rejected. This implies that there is a significant relationship between print instructional media and pupils' intellectual development.

Hypothesis Two

There is no significant relationship between visual instructional media and pupils' intellectual development.

Table 5: Pearson's Product Moment Correlation Analysis of the significant relationship between visual instructional media and pupils' intellectual development. (n = 210)

Variables	ΣX	ΣX^2 ΣY^2	ΣXY	r-cal.	r – crit.
Visual Instructional media	2376	43366	40737	0.69	0.178
Pupils' Intellectual Development	2243	38835			

$\dot{\alpha}$ = 0.05

The result presented in Table 5 revealed that the calculated r – value of 0.69 is greater than the critical r – value of 0.178 at 0.05 level of significance with 208 degrees of freedom. With this result, the null hypothesis two is rejected. This implies that there is a significant relationship between visual instructional media and pupils' intellectual development.

Hypothesis Three

There is no significant relationship between electronic interactive instructional media and pupils' intellectual development.

Table 6: Pearson's Product Moment Correlation Analysis of the significant relationship between visual instructional media and pupils' intellectual development. (n = 210)

Variables	ΣX	ΣX^2 ΣY^2	ΣXY	r-cal.	r – crit.
Visual Instructional media	2376	43366	40737	0.69	0.178
Pupils' Intellectual Development	2243	38835			

$\dot{\alpha}$= 0.05

The result presented in Table 5 revealed that the calculated r – value of 0.95 is greater than the critical r – value of 0.178 at 0.05 level of significance with 208 degrees of freedom. With this result, the null hypothesis three is rejected. This implies that there is a significant relationship between electronic interactive instructional media and pupils' intellectual development.

DISCUSSION OF FINDINGS

The result in Table 1 and 4 revealed a strong positive and significant relationship between print instructional media and pupils intellectual development. This result is based on the fact that during that lesson, printed materials offer at least one 'example' and one 'try this' to enable learners have hands – on experience in the learning process. This was supported by Nwike and Onyejegbu (2013) who studied the effects of use of instructional material on students cognitive achievement in agricultural science in secondary schools. The findings revealed that students taught with instructional materials performed better than those taught without instructional materials. Salem (2021) found the percentage of the selected students' for the study were accessed print media sources by both public and private school students. The

majority of the students from both schools were encouraged by print media to do new and innovative things with their academic projects and assignments and also the majority of the student stated that print media sources were helpful in their academic performance in most of the cases.

The result in Table 2 and 4 also revealed a strong positive relationship between visual instructional media and pupils' intellectual development. This findings is possible that different kinds of visual aids have been used by teachers to enable meaningful learning. The findings of the study was supported by Harwood and McMahon (2017) who found that treatment students who experienced chemistry course enhanced with structured chemistry video series showed significant higher achievement than control group. It was also found out that students enjoyed learning through videos. Bui and McDaniel (2015) also agree with the finding of this study and found that illustrative diagrams were instrumental in bringing better performance among students. Carpenter and Olson (2011) found that there was significant advantage in the recall of Swahili words from pictures compared with English translations.

The results in Table 3 and 6 revealed a strong positive and significant relationship between electronic interactive instructional media and pupils' intellectual development. This finding is in consistent with the earlier findings of Ofili (2012) found that among others that instructional television enhanced academic performance of physics students. In the same vein, Okworo (2010) reported that television and video – tape motivates and stimulates learners to learn material, which may not be available in the real environment. Staylor (2010) earlier opined that the use of multimedia, which is the use of two or more instructional media in biology instruction can make difficult and abstract concepts to become real and interesting thereby resulting to meaningful learning. However, the finding of this study is not in consonance with Nweke, Dirisu and Umesi (2015) who found no significant relationship between web – based education and students' academic achievement.

CONCLUSION

This study has shown a strong positive and significant relationship between electronic instructional media and pupils' intellectual development. There is a significant relationship between print, visual and electronic instructional media and pupils' intellectual development.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

i. Therefore, teachers should utilize media in classroom instruction. Using instructional media in classroom instruction helps pupils to retain and remember what they had learnt as those media appeal to the five sensory organs.
ii. The government and stakeholders in the education system should give more attention to massive supply of diverse instructional media to all the schools in the federation and supervisors should be assigned to different schools to ensure that teachers are closely monitored to use appropriate instructional aid for each topic taught in order to improve pupils' intellectual development.
iii. Visual and electronic interactive instructional media should be made available in schools, help the learners understand lessons. Similarly, teachers' should be able improvised supplementary texts such as newspapers and magazines for lessons since instructional materials help to motivate and improve pupils' attitude towards learning.
iv. Teaching should endeavor to upgrade their skills to make them more competent in the delivery of their jobs. They should also evolve effective and more innovative strategies for teaching so as to develop positive attitude towards the subject amongst the pupils.

REFERENCES

Boor, C.M.H (2013). Impact of projected still visuals on the academic performance of junior secondary school students in social studies in Zaria Inspectorate (Educational) Division in Kaduna State. Unpublished Masters' Thesis of Ahmadu Bello University, Zaria, Nigeria.

Bui, C.D and McDaniel, M.A (2015). Enhancing learning during lecture note – taking using outlines and illustrative diagrams. *Journal of Applied Research in Memory and Cognition, 4 (2): 129.*

Carpenter, S.K and Olson, K.M. (2011). Are pictures good for learning new vocabulary in a foreign language? Only if you think they are not. *Journal of Experimental Psychology: Learning, Memory and Cognition.* 38 (1): 1 – 10.

Delmer, T. (2019). *Modern technologies and students' academic performance.* Ibadan: Freedom Printing Press.

Emes, C. and Velde, B.P (2005). *Practicum in adapted physical activity.* Champaign, IL. Human Kinetics.

Eneh, G. anf Nkang, I (2011). *Psychology of human learning: An introduction.* Uyo: MEF (NIG) Ltd.

Esu, A.E.O., Enukoha, O. I and Umoren, G.U (2009). *Curriculum development in Nigeria for colleges and Universities:* Calabar, Stiffaith Prints.

Gould, J and Roffery – Barentsen, J (2018). *Achieving your diploma in education and training* (2nd ed.) London: Sage Publications Limited.

Harwood, W.S and McMahon, M.M (2017). Effects of Integrated video media on student achievement and attitudes in High School Chemistry. *Journal of Research in Science Teaching.* 34 (6) 121 – 148.

Ken, U. (2007). *Children and toys.* Cambridge, M.A: Harvard University Press.

Krukru. K (2015). *Effects of instrumental materials on student's academic performance on social studies in selected secondary schools in Nigeria.* Lagos: Grin Verlag, 36p.

Lester, P.M (2012). *Visual communication: Images with messages.* (6th Ed.). Boston: Wadsworth Cengage Learning.

Mayer, R.E (2005) *Multimedia leaning.* UK. Cambridge University Press.

Morgan, C.T., King, R.A; Weisz, J. R., Scholper, J. (2002). *Introduction to Psychology.* New York: Tata McGraw-Hill Companies, Inc.

Nweke, O.C, Dirisu, C.W.C and Umesi, N (2015). Effect of synchronized multimedia on motivation and academic performance of students in biology. Proceeding of the 1st International Technology, Education and Environment Conference. *African Society for Scientific Research (ASSR)* 240 – 250 pp.

Nwike, M.C and Onyejegbu, C. (2013) Effects of use of instructional material on students cognitive achievement in agricultural science in secondary schools of Orumba South Local Government Area. *Journal of Educational and Social Research, 3 (5): 103 – 107.*

Nyame – Kwarteng, T. (2016). *Towards effective teaching and learning of environmental and social studies.* Kumasi: Golfin. Hi – Tech Ross.

Ofili, G.S. (2013) Instructional television utilization for environment of cognitive learning skills. Implications for the challenges in Science Education. *International Journal of Educational Research 13 (5), 1 – 7.*

Okeke, C.C (2013). Educational technology and primary science learning: Implications for Nigeria's technology emancipation Jotter 2 (2) Mubu. The Technology Writers Association Of Nigeria.

Okworo, G.A (2010). Effects of teaching strategies in secondary schools students' achievement and retention in Christian Religion using instruction television. Unpublished Ph.D thesis, University of Uyo.

Oladejo, M.A., Olosunde, G.R., Ojebisi, A.O and Isola, O.M (2011). Instructional materials and students' academic achievement in Physics: Some policy implications. *European Journal of Humanities and Social Sciences.* 2 (1): 200 – 215.

Opoku – Asare, C. (2014). Non – Book instructional media usage in Ghanaian primary school. *Journal of Science and Technology,* 24 (2): 1 – 10.

Okwelle, P.C and Alagoa, F.O., (2014). Enhancing teachers' competence in the use of instructional materials in electronics in senior secondary schools in Nigeria. Research in Humanities and Social Science 4 (28): 20 – 26.

Roode, F (2010). Children and toys. New York: Basic Books.

Romiszowski, A.J (1998). The selection and use of instructional media. London: Kogan Page.

Salem, A. (2021). Impact of print media on students' academic performance of Varanasi City, India. *Biomed J Science and Technology Research 33 (5): 26317 – 26321.*

Santrock, J.W. (2010). *Children* (8th Ed.): New York: McGraw – Hill Companies, Inc.

Scanlan, J. (2010). *Basic Principles of multimedia design and development.* San Diego: Communication Inc.

Talabi, Y.K. (2001). *Educational technology.* Accra Universal Press. The world encyclopedia U.S.A Onyx.

Udeani, U.N (2012). Teaching of Understanding and application of science knowledge and processes. *Int'l Journal of Multicultural Education, 1:191 – 203.*

Vaughn, B.K and Wang, P. (2009). The design and development of a user – controlled visual aid for improving students' understanding in introductory statistics. *Journal on School Educational Technology.* 5 (1): 20 – 35.

Woolfolk, A. (2004) *Educational psychology.* (9th Ed.) Boston. Allyn and Bacon publishers.

Yuvuv E, Servet, B and Levent, D. (2010). Factors that influence academic achievement and attitudes in web based education. *International Journal of Instruction,* 1 (1): 31 – 48.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

AN EVALUATION OF THE IMPACT OF COMPOST WASTE ON PUBLIC HEALTH IN MAJOR CITIES IN NIGERIA: INVESTIGATING THE MITIGATING STRATEGIES FOR A HEALTHY SOCIETY

By

Nkechi Udochukwu OTTY-ANYANWU. Ph.D.
Department of Environmental Health Science,
School of Health Technology,
Federal University of Technology,
Owerri, Imo State, Nigeria

ABSTRACT

The rapid urbanization and population growth in major cities across Nigeria have led to an increased generation of waste, particularly organic waste, including compostable materials. This waste, when improperly managed, can have severe implications for public health in major cities in Nigeria. This study investigates the impact of compost waste on public health in major Nigerian cities. It examines how the accumulation and improper disposal of compostable organic waste can lead to environmental and health risks, such as the spread of communicable diseases, air and water pollution, soil contamination and food safety issues. Furthermore, the research explores various mitigating strategies, including community awareness programs, improved waste management systems, and the promotion of composting practices at the household and industrial levels. It was concluded that poor compost waste management in major Nigerian cities significantly endangers public health through pollution and disease transmission. These risks are heightened by weak infrastructure and low public awareness. The research recommended that government agencies such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) and state environmental protection bodies must be empowered to monitor and regulate waste treatment and disposal practices.

KEYWORDS: Compost Waste, Public Health, Healthy Society, Urbanization, Mitigation Strategies, Healthy Society and Nigeria

INTRODUCTION

The rapid pace of urbanization in Nigeria, particularly in its major cities such as Lagos, Abuja, Port Harcourt, and Kano, has significantly amplified the generation of municipal solid waste. Among these wastes, compostable organic materials which include food scraps, agricultural residues, yard trimmings, and other biodegradable substances constitute a substantial proportion. Despite their potential for resource recovery through composting, improper management of these organic wastes poses critical public health challenges. Decomposing compost waste, when left unmanaged or poorly treated, becomes a breeding ground for disease vectors such as flies, rodents, and mosquitoes, and contributes to water and air pollution through leachate runoff and the emission of harmful gases like methane and ammonia.

The environmental health implications of poorly managed compost waste include the spread of communicable diseases such as cholera, dysentery, and typhoid fever, which are often prevalent in densely populated urban slums with inadequate sanitation infrastructure. Moreover, the odor nuisance and the psychological stress associated with living near unmanaged compost waste sites exacerbate the social burden on already vulnerable populations (Ogunjimi & Oyetola, 2020). These health risks are compounded by limited regulatory enforcement, public apathy, and infrastructural deficits in urban waste management systems across Nigeria.

Nevertheless, compost waste, when properly harnessed, can serve as a vital component in urban sustainability. Composting, as a waste-to-resource strategy, offers significant environmental and health benefits reducing landfill reliance, improving soil fertility, and decreasing greenhouse gas emissions. This duality underscores the need to evaluate both the detrimental and beneficial impacts of compost waste on public health in urban Nigeria. More importantly, it highlights the necessity of developing and implementing effective mitigation strategies such as public awareness campaigns, improved waste segregation, decentralization of composting facilities, and the integration of informal waste collectors into formal waste management frameworks (Ogunleye et al., 2023). This research, therefore, seeks to critically evaluate the impact of compost waste on public health in major Nigerian cities, with a view to identifying and recommending sustainable mitigating strategies that can foster a healthier society.

CONCEPT OF COMPOST OF WASTE

The concept of compost of waste refers to the natural and controlled biological process through which organic waste materials—such as food scraps, plant remains, and animal manure—are broken down by microorganisms, fungi, and other decomposers into a nutrient-rich, soil-like substance called compost. This process plays a critical role in sustainable waste management, as it not only reduces the volume of waste sent to landfills but also recycles essential nutrients back into the soil. Composting has been practiced for centuries and is increasingly recognized today as an essential component of circular economy systems aimed at achieving environmental sustainability (Haug, 2018).

Composting involves both aerobic decomposition, which requires oxygen, and in some cases anaerobic methods, which occur in the absence of oxygen. The most common method, aerobic composting, supports the growth of beneficial microorganisms that break down organic matter into simpler components. The process generates heat, which kills pathogens and weed seeds, ensuring that the resulting compost is safe and beneficial for agricultural or gardening use. The balance of carbon-rich (brown) and nitrogen-rich (green) materials, moisture, and regular aeration are critical factors that influence the speed and quality of the composting process (Bernal, Sánchez-Monedero, Paredes & Cegarra, 2018).

One of the most significant benefits of composting is its contribution to soil health. Compost improves soil structure, enhances its water-holding capacity, and supplies it with essential nutrients such as nitrogen, phosphorus, and potassium. This reduces the need for synthetic fertilizers, which are often harmful to the environment. Moreover, composting mitigates greenhouse gas emissions by diverting organic waste from landfills, where it would otherwise decompose anaerobically and produce methane—a potent greenhouse gas (Vaneeckhaute, Meers, Michels & Ghekiere, 2019).

There are various composting techniques depending on the scale and purpose, including backyard composting, vermicomposting using earthworms, and industrial composting which utilizes advanced technologies for faster decomposition. Each method requires a specific balance of inputs and environmental conditions. For instance, vermicomposting is effective for household waste and produces a high-quality compost called vermicast, while large-scale operations often use windrow or in-vessel systems for municipal and agricultural waste (Gea, Barrena, Artola & Sánchez, 2018).

CONCEPT OF PUBLIC HEALTH

The concept of public health revolves around the organized efforts of society to prevent disease, promote health, and prolong life among the population as a whole. Unlike clinical medicine, which focuses on diagnosing and treating illnesses in individuals, public health aims at protecting and improving the health of entire communities or populations. It encompasses a wide range of activities, including disease surveillance, sanitation, vaccination, health education, and policy-making. The primary goal is to create conditions in which people can be healthy, through prevention rather than cure (Winslow, 1920; Schneider & Everts, 2020).

Public health operates on several levels—local, national, and global—and includes a variety of sectors such as healthcare, education, housing, and environmental services. One of the core functions of public health is epidemiology, which involves the study of disease patterns, causes, and effects in populations. Public health professionals use epidemiological data to detect outbreaks, understand risk factors, and guide public policies. For example, during the COVID-19 pandemic, public health strategies such as contact tracing, social distancing, and mass vaccination were implemented to reduce transmission and safeguard public well-being (Heymann, 2021).

Another key aspect of public health is health promotion and disease prevention. This involves encouraging healthy lifestyles, preventing risky behaviors, and implementing screening programs for early disease detection. Education on hygiene, nutrition, exercise, sexual health, and substance abuse are all part of health promotion initiatives. These efforts are often directed at reducing the burden of non-communicable diseases like heart disease, diabetes, and cancer, which are now leading causes of death globally (World Health Organization, 2021).

Environmental health, a branch of public health, focuses on the external factors that affect human health, such as air and water quality, waste disposal, and exposure to hazardous chemicals. Public health authorities regulate pollutants and enforce safety standards to prevent environmental illnesses and ensure communities live in clean and safe surroundings. In recent decades, concerns over climate change, industrial pollution, and urbanization have emphasized the importance of integrating environmental considerations into public health planning (Frumkin, 2021).

CONCEPT OF HEALTHY SOCIETY

Healthy society extends beyond the absence of disease to encompass a state of complete physical, mental, and social well-being for all members of a community. It refers to a societal condition where individuals not only live longer live but also lead fulfilling and productive lives in an environment that supports their overall wellness. A healthy society ensures access to basic necessities like clean water, nutritious food, healthcare, education, shelter, and security. These foundational elements are essential for people to thrive and

contribute meaningfully to the progress of their communities (World Health Organization, 1948; Marmot, 2020).

At the core of a healthy society is health equity, which means everyone has a fair and just opportunity to attain their highest level of health. This involves removing obstacles such as poverty, discrimination, and lack of access to good jobs, education, and healthcare. Inequities in these areas often lead to health disparities that disproportionately affect vulnerable populations. Building a healthy society requires intentional efforts to close these gaps through inclusive policies, targeted health programs, and community engagement (Braveman, Arkin, Orleans, Proctor, & Plough, 2018).

Social determinants of health play a critical role in shaping the well-being of a society. These determinants include factors such as education, income, employment, housing, neighborhood conditions, and social support networks. For example, individuals who have stable housing, quality education, and access to nutritious food are more likely to experience good health. Therefore, efforts to create a healthy society must go beyond the healthcare sector and involve multi-sectoral collaboration across government, civil society, and the private sector to improve the conditions in which people are born, grow, live, work, and age (Solar & Irwin, 2010).

Mental and emotional well-being is also a vital component of a healthy society. It involves promoting mental health, preventing mental illness, and ensuring access to mental health services. Societies that prioritize emotional wellness tend to have lower rates of substance abuse, violence, and suicide, and they foster environments where individuals feel valued and connected. Community cohesion, cultural inclusion, and social justice are important pillars that contribute to collective mental well-being (Patel, Saxena, Lund, Thornicroft, Baingana, Bolton & Unützer, 2018).

Environmental sustainability is another crucial element. A society cannot be truly healthy if its environment is polluted, degraded, or unsafe. Clean air, safe drinking water, green spaces, and a stable climate are essential for human health and the sustainability of future generations. Addressing issues such as climate change, waste management, and environmental justice ensures that all people—regardless of socioeconomic status—can live in a healthy ecosystem. Public policies that enforce environmental protections are vital to achieving and maintaining a healthy society (Watts et al., 2018).

IMPACT OF COMPOST WASTE ON PUBLIC HEALTH

Compost waste, primarily composed of biodegradable organic matter such as food scraps, leaves, agricultural residues, and other natural materials, holds great potential for environmental sustainability when properly managed. However, when mishandled particularly in rapidly urbanizing regions like major Nigerian cities compost waste can become a significant public health hazard. The impact of compost waste on public health is multifaceted, involving direct and indirect exposure pathways that can lead to disease transmission, environmental pollution, and compromised quality of life.

Spread of Communicable Diseases: one of the most immediate health risks associated with improperly managed compost waste is the proliferation of disease vectors. Decomposing organic waste attracts flies, mosquitoes, rats, and cockroaches, all of which are known carriers of infectious diseases such as cholera, typhoid fever, malaria, dysentery, and Lassa fever.

Air and Water Pollution: the anaerobic decomposition of compost waste releases harmful gases such as methane (CH_4), hydrogen sulfide (H_2S), and ammonia (NH_3), which contribute to air pollution and can cause respiratory problems, headaches, nausea, and eye irritation among nearby residents. Methane is also a potent greenhouse gas that worsens climate change. Furthermore, runoff from compost piles can carry pathogens and nutrients into nearby water sources, contaminating drinking water and facilitating the spread of waterborne diseases (Adefemi, 2022).

Soil Contamination and Food Safety Issues: if compost waste is not adequately processed before being used in agriculture, it can introduce harmful pathogens and heavy metals into the soil. Crops grown in such contaminated soil may absorb these toxins, leading to long-term health problems in consumers, including gastrointestinal infections, heavy metal poisoning, and chronic diseases.

Psychological and Social Impacts: living in close proximity to decomposing compost waste piles has been linked to mental stress, stigma, and reduced quality of life. Offensive odors, persistent insects, and the visible presence of decaying waste can cause anxiety, sleep disturbances, and a sense of environmental neglect. These factors can diminish community morale and lead to social tension, especially in high-density urban areas where space is limited and residents feel powerless to influence local waste management decisions (Abdulfatai, 2021).

Occupational Hazards for Waste Workers: individuals involved in the informal handling and processing of compost waste often without protective gear or adequate training are at high risk of exposure to pathogens, toxic substances, and physical injuries. These include waste pickers, compost facility workers, and street sweepers, many of whom operate in hazardous conditions with limited health support. They may suffer from skin infections, respiratory illnesses, and musculoskeletal injuries due to prolonged exposure and manual labor (Ogunleye et al., 2023).

MITIGATING STRATEGIES AGAINST THE IMPACT S OF COMPOST WASTE ON PUBLIC HEALTH

Strengthening Waste Management Regulations and Enforcement: government agencies must enforce existing environmental and waste management laws while updating them to reflect current realities. For example, the National Environmental (Sanitation and Wastes Control) Regulations should be revised to include specific provisions for compost waste, with clear penalties for non-compliance. Regulatory enforcement ensures that composting practices are standardized; waste is properly sorted at source, and health risks from unregulated compost piles areminimized.

Decentralized and Community-Based Composting Systems: establishing small-scale composting facilities within communities, markets, and institutions helps reduce transportation needs and encourages local participation. These systems should use aerobic composting methods to prevent the release of harmful gases and pathogens. This promotes hygienic compost production, reduces vector breeding sites, and encourages community responsibility for sanitation (Oyediran, 2019).

Public Education and Awareness Campaigns: large-scale awareness programs using radio, schools, religious centers, and social media should be deployed to educate citizens on the importance of compost waste segregation, risks of poor handling, and benefits of safe composting. Informed citizens are more likely to adopt safe disposal practices, sort waste at the

source, and avoid dumping organic waste in open areas. This leads to a cleaner environment and lower disease incidence.

Integration of Informal Waste Workers: informal waste pickers and compost handlers should be formally registered, trained, and supported with personal protective equipment (PPE), gloves, and hygienic composting kits. This professionalization not only improves safety but also enhances waste sorting efficiency, reduces occupational hazards, and creates green jobs.

Promotion of Waste Segregation at Source: mandate segregation of biodegradable (compostable) and non-biodegradable waste in households, markets, and public institutions through the use of color-coded bins and civic education. Segregation reduces contamination of organic waste, improves the quality of compost, minimizes leachate production, and simplifies waste processing.

Investment in Sanitary Composting Infrastructure: municipal governments should invest in mechanized and sanitary composting facilities equipped with temperature control, leachate drainage, and pathogen-neutralization systems. Public-Private Partnerships (PPPs) can help fund and operate these systems. This significantly reduces the release of pathogens and offensive gases, protects nearby residents, and produces higher-quality compost for agricultural use.

Health Surveillance and Disease Monitoring: integrate compost waste-related health surveillance into municipal health systems to track outbreaks of waste-related diseases such as cholera and Lassa fever. This data should guide policy decisions and rapid response measures. Early detection and response to public health threats reduce disease burden and allow for evidence-based interventions (Ogunjimi & Oyetola 2020).

Incentives for Safe Composting Practices: provide tax reliefs, subsidies, or recognition to communities and businesses that follow safe composting protocols. Microloans and grants can also be issued to youth-led compost startups. Financial incentives boost participation in composting, encourage innovation, and shift public perception from waste as a nuisance to a valuable resource.

CONCLUSION

The study concludes that poor compost waste management in major Nigerian cities significantly endangers public health through pollution and disease transmission. These risks are heightened by weak infrastructure and low public awareness. However, adopting effective mitigation strategies such as community-based composting, improved sanitation policies, and public education can greatly reduce these impacts. A shift toward sustainable practices will enhance both environmental and health outcomes. Ultimately, proactive and inclusive waste management is essential for building a healthy urban society.

RECOMMENDATIONS

1. Government agencies such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) and state environmental protection bodies must be empowered to monitor and regulate waste treatment and disposal practices.
2. Local governments should invest in small-scale composting hubs and provide training and starter kits for residents and cooperatives. Decentralized composting managed at

community, market, or institu*tional levels can reduce transportation burdens, limit environmental contamination, and promote localized organic waste recycling.

REFERENCES

Abdulfatai, I. A. (2021). Impact of organic waste mismanagement on environmental and human health in Nigeria's cities. *African Journal of Public Health*, 33(2), 129–142.

Adefemi, O. M. (2022). Organic waste, composting, and health: An urban Nigerian perspective. *International Journal of Environmental Health and Urban Development*, 40(4), 203–218.

Bernal, Maria Pilar, Sánchez-Monedero, Miguel A., Paredes, Concepción, & Cegarra, Juan. (2018). "Composting of organic wastes: A review." *Waste Management*, 34(1), 1–20. https://doi.org/10.1016/j.wasman.2018.01.018

Braveman, Paula, Arkin, Elissa, Orleans, Tracy, Proctor, David, & Plough, Robert. (2018). "What is Health Equity? And What Difference Does a Definition Make?" Robert Wood Johnson Foundation. https://www.rwjf.org/en/library/research/2017/05/what-is-health-equity-.html

Frumkin, Howard. (2021). "Environmental Health: From Global to Local" (4th ed.). Jossey-Bass.

Gea, Tania, Barrena, Raquel, Artola, Antoni, & Sánchez, Antoni. (2018). "Composting process optimization: Literature review." *Biodegradation*, 29(4), 345–366. https://doi.org/10.1007/s10532-018-9833-6

Haug, Roger T. (2018). The Practical Handbook of Compost Engineering. Routledge.

Heymann, David L. (2021). "COVID-19: A global and public health perspective." *Public Health*, 198, 31–36. https://doi.org/10.1016/j.puhe.2021.06.005

Marmot, Michael. (2020). Health Equity in England: *The Marmot Review 10 Years*. Institute of Health Equity.

Ogunjimi, L. O., & Oyetola, S. O. (2020). Public health risks of poor waste disposal practices in urban Nigeria. *Journal of Environmental and Public Health Research*, 8(1), 14–24.

Ogunleye, F. A., Lawal, A. R., & Omole, D. O. (2023). Mitigating strategies for compost waste management in Nigerian urban centers: Toward sustainable public health. *Journal of Waste Management and Sustainability*, 5(1), 67–81.

Ogunleye, F. A., Lawal, A. R., & Omole, D. O. (2023). Mitigating strategies for compost waste management in Nigerian urban centers: Toward sustainable public health. *Journal of Waste Management and Sustainability*, 5(1), 67–81.

Oyediran, J. A. (2019). Municipal solid waste management and public health in urban Nigeria: A case study of Lagos. *Nigerian Journal of Environmental Health*, 21(3), 45–58.

Patel, Vikram, Saxena, Shekhar, Lund, Crick, Thornicroft, Graham, Baingana, Florence, Bolton, Paul, & Unützer, Jürgen. (2018). "The Lancet Commission on Global Mental Health and Sustainable Development." *The Lancet*, 392(10157), 1553–1598. https://doi.org /10.1016/S0140-6736(18)31612-X

Schneider, Mary-Jane, & Everts, Henry J. (2020). *Introduction to Public Health* (6th ed.). Jones & Bartlett Learning.

Solar, Orielle, & Irwin, Alec. (2010). *A Conceptual Framework for Action on the Social Determinants of Health*. Geneva: World Health Organization.

Vaneeckhaute, Céline, Meers, Erik, Michels, Evi, & Ghekiere, Geert. (2019). "Nutrient recovery from digestate: Systematic comparison of technologies." *Waste and Biomass Valorization*, 10(8), 2101–2120. https://doi.org/10.1007/s12649-018-0412-z

Watts, Nick, Amann, Markus, Arnell, Nigel, Ayeb-Karlsson, Sonja, Beagley, Jonathan, Belesova, Kristine, ... & Costello, Anthony. (2018). "The 2018 report of the Lancet Countdown on health and climate change: Shaping the health of nations for centuries to come." *The Lancet*, 392(10163), 2479–2514. https://doi.org/10.1016/S0140-6736(18)32594-7

Winslow, Charles-Edward Amory. (1920). "The Untilled Fields of Public Health." Science, 51(1306), 23–33. https://doi.org/10.1126/science.51.1306.23

World Health Organization. (1948). *Preamble to the Constitution of the World Health Organization.* Geneva: WHO.

World Health Organization. (2021). *Global status report on noncommunicable diseases 2021. Geneva*: WHO.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH
FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

A COMPARATIVE STUDY OF THE ADVANTAGES AND DISADVANTAGES OF AI-ENHANCED LEARNING IN THE 21ST CENTURY: THE IMPLICATIONS TO SECONDARY SCHOOL STUDENTS IN IMO STATE

By

UKAH, Genevieve Ngozi Ph.D.
Department of Psychology & Counseling,
Benjamin Uwajumogu State College of Education
Ihitte -Uboma, Imo State.

ABSTRACT

This study compared the advantages and disadvantages of AI-enhanced learning in the 21st century, assessing the implications to secondary school students in Imo State. Comparative survey design was adopted to carry out this research in Imo State. The targeted population comprised all ICT teacher in Imo State. Simple random sampling technique was used to select 140 ICT teachers which formed the sample size used for this research. The instrument used for data collection was a structured questionnaire titled "Advantage and Disadvantage of AI Enhanced Learning Questionnaire (ADAIELQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.84, and was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics to answer the research question. The result of the data analysis revealed that "Personalized Learning" among others was the highest advantage of AI enhanced learning, it also revealed that "Lack of Human Interaction" among others was rated as the highest disadvantage of AI enhanced learning. Furthermore, the result of the data analysis, revealed that "AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback" was the highest effect of AI enhanced learning on students' academic performance. The study concluded that the rapid advancement of artificial intelligence (AI) has significantly impacted education globally. One of the recommendations made was that to bridge the digital divide, it is crucial to invest in improving technological infrastructure, especially in rural areas of Imo State.

KEYWORDS: Artificial Intelligence, Enhanced Learning, 21st Century, Secondary School and Imo State

INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) technologies has brought about transformative changes in various fields, and education is no exception. In the 21st century, AI-enhanced learning tools have become essential in reshaping the educational experience for students worldwide (Fitria, 2021). These technologies, ranging from intelligent tutoring systems to personalised learning platforms, promise to revolutionise how knowledge is delivered, making learning more adaptive, interactive, and efficient. In Imo State, Nigeria, the integration of AI into secondary school education is gaining traction, offering both opportunities and challenges in the classroom.

One of the key advantages of AI-enhanced learning is its ability to provide personalised education. AI systems can adapt to individual student needs, adjusting the pace, content, and difficulty level of lessons according to their learning style and ability (Ayeni, Hamad, Chisom, Osawaru, and Adewusi, 2024). This personalised approach ensures that students receive targeted support, potentially improving learning outcomes. In Imo State, where large class sizes and resource constraints can limit personalised attention, AI presents a valuable solution.

However, the implementation of AI in secondary schools also presents challenges. While AI can cater to individual learning preferences, it may also widen the digital divide, particularly in regions where access to technology is limited. Students in rural or economically disadvantaged areas of Imo State may face barriers such as inadequate infrastructure, low internet connectivity, and the lack of technological devices. These disparities could exacerbate existing educational inequalities, undermining the potential benefits of AI-enhanced learning.

Another significant benefit of AI in education is its potential to enhance the efficiency of teaching and administrative tasks. AI-powered systems can assist educators in managing class activities, grading assignments, and tracking student progress, reducing the administrative burden and allowing teachers to focus more on direct instruction. However, there is concern that reliance on AI for administrative functions could result in the dehumanisation of education, as teachers may become less engaged with the personal development of their students (Abdallah, 2023).

Moreover, the ethical implications of AI in education cannot be overlooked. While AI promises improved learning outcomes, there are concerns about data privacy, surveillance, and the potential for biased algorithms. In a secondary school setting, where students are still developing critical thinking and social skills, the overuse of AI-driven tools may stifle creativity and independent thought. Teachers must strike a balance between incorporating AI and maintaining a human-centred approach to education that fosters holistic development (Tiwari, 2024).

STATEMENT OF THE PROBLEM

The integration of Artificial Intelligence (AI) into educational systems has emerged as a transformative force in 21st-century learning. In secondary schools within Imo State, the adoption of AI-enhanced learning tools is gradually increasing. While these technologies offer promising advantages such as personalized instruction and improved learner engagement, their implications remain inadequately explored. There is growing concern regarding potential drawbacks, including over-reliance on technology, diminished critical thinking skills, and ethical concerns such as data privacy. Furthermore, disparities in access to AI tools may exacerbate existing educational inequalities among students. Despite the global discourse on AI in education, empirical research contextualized to the secondary school environment in Imo State is limited. Educators, policymakers, and stakeholders lack sufficient data to evaluate the overall effectiveness and potential risks of AI-enhanced learning. This gap poses challenges for informed decision-making and strategic implementation in the region's educational sector. A comparative study is therefore necessary to assess both the benefits and limitations of AI applications in secondary education. Such an investigation will provide critical insights into the broader implications for students' academic outcomes and socio-emotional development.

OBJECTIVES OF THE STUDY

The following objectives will guide this study:

1. To examine the advantages of AI enhanced learning

2. To find out the disadvantages of AI enhanced learning

3. To find out the effect of AI enhanced learning on students' academic performance

RESEARCH QUESTIONS

The following questions will be answered in this research

1. What are the advantages of AI enhanced learning?
2. What are the disadvantages of AI enhanced learning?
3. What is the effect of AI enhanced learning on students' academic performance?

LITERATURE REVIEW

CONCEPT OF LEARNING

Learning is the process of acquiring new knowledge, skills, or behaviors. It can be a challenging but rewarding process that helps people grow and understand the world around them. According to Behlol, (2024) learning is a permanent change in behavior as a result of experience, and the behavior includes both of the external and internal actions of the individual which are observed and remain unobserved by the outside world. It also includes the different ways in which people understand or experience or conceptualize the world around them.

Learning is a personal act of individual to make full use of his potential. It is a process of self-actualization to its maximum level. Learning is a process of continuous change in human performance or performance potential. It must come about as a result of the learner's experience and interaction with the world around him. Learning is a way of being. It is an ongoing set of attitudes/temperaments and actions by the individual and groups which they employ to keep abreast of the surprising, novel/new, ambiguous, obtrusive and recurring events. Learning is about a change: the change brought about by developing a new skill, understanding a scientific law, changing an attitude.

Learning is a process that is often not under our control and is wrapped up with the environments we inhabit and the relationships we make. It involves encountering signals from the senses; attending to them; looking for connections and meanings; and framing them so that we may act. Sequeira, (2020). Learning is about a change: the change brought about by developing a new skill, understanding a scientific law, changing an attitude. The change is not merely incidental or natural in the way that our appearance changes as we get older.

CONCEPT OF ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is the science of building machines that can learn, reason, and act in ways that mimic human intelligence. AI uses algorithms, data, and computing power to enable machines to perform tasks that usually require human intelligence. According to Bassey and Owushi (2023), artificial intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence. The term "artificial intelligence" encompasses a broad spectrum of cutting-edge analytics, applications, and logic-based techniques that mimic human behaviour, judgement, and cognitive functions, including learning and problem-solving (Akpan and Lion, 2024).

Artificial intelligence (AI) is a technology that enables machines to simulate human abilities like learning, problem-solving, and decision-making. Artificial intelligence (AI) is technology that enables computers and machines to simulate human learning, comprehension,

problem-solving, decision-making, creativity, and autonomy. Ufot (2024) stated that artificial intelligence (AI) describes computer programs that are able to carry out sophisticated operations that were previously limited to human performance, such as problem-solving, thinking, and decision-making.

CONCEPT OF AI ENHANCED LEARNING

AI-enhanced learning uses computer systems to customize learning experiences for students. AI can help students learn at their own pace, and teachers can focus on more meaningful interactions with students. Chen (2023) suggested that AI could help teachers stay up-to-date with the latest advancements in their field. For example, a biology teacher would have AI update them on the latest breakthroughs in cancer research, or leverage AI to update their curriculum.

According to Kamalov, Calonge & Gurrib, (2023). AI facilitates personalized learning by adapting educational content to meet individual student needs. Intelligent Tutoring Systems (ITS) employ AI algorithms to provide customized instruction and feedback, enhancing student engagement and understanding. These systems analyze student performance data to tailor lessons, thereby promoting a more individualized learning experience.

Furthermore, Holmes, Bialik & Fadel, (2024). Mentioned that, AI tools have been shown to improve both personal and collaborative learning environments in higher education. They enhance personalized learning and assessments, communication and engagement, and scaffolding performance and motivation. Additionally, AI promotes a collaborative learning environment by providing peer-learning opportunities, enhanced learner-content interaction, and cooperative learning support.

Artificial intelligence is already reshaping the educational landscape for students and teachers by revolutionizing learning experiences and enhancing instruction methodologies. Over the next few years, I expect that AI will cement itself as a cornerstone in educational evolution, seamlessly integrating with traditional teaching methods to foster a more dynamic, inclusive and effective learning environment.

TYPES OF AI ENHANCED LEARNING

AI-enhanced learning incorporates various methods and tools that leverage artificial intelligence to improve the learning experience. Here are some of the key types:

Personalised Learning: AI can adapt educational content to enhance the needs of each learner, adjusting the pace, difficulty, and style of teaching based on performance. For instance, platforms like Duolingo adjust language lessons based on how well the learner is doing. Jian (2023) AI-powered chatbots and virtual assistants have further facilitated personalised learning. These tools can act as personal tutors, offering instant feedback, answering queries, and even suggesting supplementary resources based on the student's learning trajectory. Moreover, these students were more consistent in their performance, suggesting that AI tools provided them a steadier learning curve.

Intelligent Tutoring Systems (ITS): These AI systems provide one-on-one tutoring and feedback to learners, simulating human tutors. They can identify areas where students struggle and offer tailored exercises. Intelligent Tutoring Systems (ITS) represent a transformative shift from traditional teaching methods by providing personalised, adaptive learning experiences tailored to individual student needs. Intensify Tutoring System leverages advanced AI techniques, including machine learning, natural language processing, and adaptive algorithms,

to simulate one-on-one tutoring and offer real-time feedback and support, which uses AI to personalise math instruction (Marouf et al., 2024).

Adaptive Learning Systems: AI-based adaptive learning systems refer to those educational technologies that use artificial intelligence to personalise learning experiences considering the needs of individual students. The systems collect and analyse information related to student performance, learning preferences, and progress to create personalised learning pathways. Gyonyoru, (2024). These platforms use AI algorithms to analyse students' learning behaviours and performance to deliver customised learning experiences. For instance, Knewton helps adjust learning materials based on how a student interacts with them.

AI-Powered Assessment and Feedback: AI can assist in grading and providing instant feedback. It can also analyse patterns in responses to suggest areas for improvement. AI-Powered Assessment and Feedback (ASA) is a key component of AI-enhanced learning, which refers to the use of artificial intelligence (AI) to improve educational experiences. AI enhances learning in various ways, not just by assessing students but also by offering personalised and adaptive learning paths, automating administrative tasks, and supporting real-time learning analytics.

CHARACTERISTICS OF AI ENHANCED LEARNING

AI-enhanced learning is revolutionizing education by leveraging artificial intelligence to create more personalized, efficient, and engaging learning environments. The key characteristics of AI-enhanced learning are those elements that make it distinct from traditional learning approaches. These characteristics not only improve learning outcomes but also foster a more interactive and adaptable educational experience.

Personalisation: AI systems assess the individual learning styles, strengths, and weaknesses of students, adapting the content, pacing, and difficulty to each learner's needs. This personalised approach helps ensure that each student gets the right level of challenge and support. Pawar (2023) mentioned that AI provides real-time feedback that is customised for each student, pointing out specific areas where improvement is needed and offering resources that address their unique learning gaps. AI can generate and adjust learning materials like quizzes, assignments, and lessons to suit individual student preferences and progress.

Scalability: AI can manage and assess large numbers of students simultaneously, making it possible to scale personalised learning for large classrooms or online courses. This scalability helps meet the needs of diverse learners, even in large educational settings. AI enables automated grading of tests, assignments, and essays, saving educators time while maintaining consistency in assessments (Moro-Visconti et al., 2023).

Real-Time Data and Analytics: AI-enhanced learning platforms provide instant feedback to students as they progress through tasks and assessments, allowing them to learn from mistakes and correct them in real-time. A recent study carried out by Marr (2024) found that AI collects data on student performance and engagement, providing insights into learning patterns, strengths, and weaknesses. These insights help educators track progress, make informed decisions, and personalise learning experiences further. AI can predict student outcomes based on past performance, offering early warnings about potential struggles and suggesting interventions before issues become significant.

Adaptive learning through AI: AI constantly adapts to the learner's behaviour, adjusting content based on their understanding. For example, if a student struggles with a specific concept, the AI might revisit the topic with simpler explanations or additional practice exercises. As students master topics. Joshi (2022) states that AI increases the difficulty level to provide continuous challenges, keeping learners engaged without overwhelming them.

Automation: AI can generate educational content such as quizzes, practice exercises, and study material based on the curriculum. This allows instructors to focus on higher-level teaching tasks while AI handles routine content creation. AI can streamline administrative processes, like scheduling, tracking progress, and managing assignments, freeing up time for educators to focus on teaching (Voreco 2024).

Accessibility: AI-enhanced learning tools can cater to students with diverse needs, including those with disabilities. For instance, AI can provide text-to-speech for students with visual impairments or adjust the pace for students with learning disabilities. AI can support learners in multiple languages, translating content and providing instruction in a way that makes education more accessible to non-native speakers (Marouf et al., 2024).

Continuous Improvement: Over time, AI systems learn from interactions and performance data, improving their ability to personalise learning experiences. As AI collects more data, its recommendations, assessments, and learning paths get more refined and accurate. AI-based systems continuously evolve based on student feedback, usage patterns, and advances in educational theories, ensuring they stay relevant and effective.

ADVANTAGES OF AI ENHANCED LEARNING

Artificial Intelligence (AI) is transforming nearly every sector, and education is no exception. With its increasing influence, AI-enhanced learning is emerging as a revolutionary force in shaping the future of education. AI provides innovative solutions that address many challenges in traditional learning systems, offering personalized, adaptive, and efficient learning experiences for students and teachers alike

Personalized Learning: AI can tailor the learning experience to the individual needs of each student. By analyzing data on students' learning styles, preferences, and progress, AI systems can adjust content delivery, difficulty levels, and even teaching methods to better suit each learner. This personalization helps to ensure that students are not left behind or bored, as they can engage with material that matches their pace and ability level. Studies have shown that personalized learning powered by AI can improve retention and comprehension, enabling students to master subjects more efficiently (Shute & Ventura, 2013).

Enhanced Learning Efficiency: AI-powered tools can streamline learning processes, offering students access to educational resources 24/7. For example, AI-driven chatbots or virtual tutors can provide instant support, answer questions, and assist students outside of traditional classroom hours. This continuous learning model helps reinforce lessons and enables students to work at their own pace. Additionally, AI can automate administrative tasks for educators, allowing them to spend more time focusing on teaching, mentoring, and providing feedback to students (Baker & Siemens, 2014).

Scalability of Education: AI has the potential to democratize education by making quality learning accessible to a larger number of students, regardless of location or socioeconomic status. In regions where traditional educational resources are scarce or inadequate, AI-driven platforms can provide affordable and scalable solutions, offering educational content that can reach students anywhere with an internet connection. This scalability is particularly important in addressing educational disparities and ensuring that more learners can benefit from high-quality educational experiences (Popenici & Kerr, 2017).

Data-Driven Insights and Continuous Improvement: AI-powered systems can collect and analyze vast amounts of data related to student performance, learning behaviors, and engagement levels. Educators can use these insights to identify struggling students early on, track their progress, and adjust teaching strategies accordingly. This data-driven approach

enables more informed decision-making in the classroom and helps teachers provide targeted interventions. AI also helps identify trends and patterns in learning that could guide future curriculum improvements (Siemens, 2013).

Interactive and Immersive Learning Experiences: AI can create engaging and immersive learning environments, particularly in fields such as science, technology, engineering, and mathematics (STEM). Through the use of AI technologies like virtual reality (VR), augmented reality (AR), and simulations, students can experience complex concepts in a more hands-on and interactive manner. For example, medical students can practice surgeries in virtual environments, or history students can "visit" ancient civilizations through immersive simulations. These types of interactive learning experiences help improve understanding and retention of difficult concepts (Freina & Ott, 2015).

Support for Special Needs Learners: AI can provide valuable support for students with special needs by adapting learning experiences to their specific requirements. For instance, AI-powered tools can assist students with dyslexia, visual impairments, or autism by offering tailored resources such as speech recognition, language translation, or customizable learning interfaces. These technologies ensure that students with disabilities receive a more inclusive education, allowing them to participate more effectively in the learning process (Almalki & Aziz, 2021).

Improved Teacher Support and Professional Development: AI can also support teachers by providing tools for continuous professional development. AI-based systems can offer real-time feedback on teaching methods, suggest new resources, and even recommend personalized development plans for educators. Furthermore, AI can automate administrative tasks such as grading, lesson planning, and scheduling, allowing teachers to focus on instruction and student engagement. This increased efficiency helps reduce teacher burnout and provides more opportunities for educators to innovate in the classroom (VanLehn, 2011).

Global Collaboration and Learning Communities: AI enables students and educators to connect globally, transcending geographical boundaries and fostering international collaboration. Through AI-powered platforms, students can collaborate with peers from different cultures and backgrounds, enhancing their global awareness and communication skills. These collaborative opportunities enrich the learning experience and encourage the sharing of diverse perspectives and ideas, preparing students for an interconnected world (Cobo, 2015).

DISADVANTAGES OF AI ENHANCED LEARNING

AI-enhanced learning refers to the integration of artificial intelligence tools and systems in educational processes, aiming to personalize, streamline, and improve the learning experience. However, despite its advantages, AI-enhanced learning brings with it a range of challenges and disadvantages that must be considered.

Lack of Human Interaction: One of the most significant disadvantages of AI-enhanced learning is the reduction in human interaction. Traditional learning environments rely heavily on face-to-face interactions between students and teachers, which can help develop critical social skills, emotional intelligence, and provide personalized guidance. AI systems, no matter how sophisticated, cannot replicate the empathy, encouragement, and nuanced understanding that human teachers provide. The absence of such interactions may lead to feelings of isolation, especially for younger students or those who rely on emotional support from educators to succeed.

Bias in AI Algorithms: AI systems learn from data, and if this data is biased, the AI can perpetuate and even amplify these biases. In the context of learning, this can affect the fairness and inclusivity of educational opportunities. For instance, AI-powered platforms might favor certain learning styles, demographic groups, or backgrounds, while marginalizing others. Research has shown that AI algorithms can reinforce racial, gender, and socio-economic biases, leading to unequal learning experiences and outcomes for different groups of students (O'Neil, 2016).

Data Privacy Concerns: AI-powered learning platforms collect vast amounts of data about students, including their academic performance, behavior patterns, and even personal preferences. This data collection raises serious privacy concerns, particularly for minors. There is a risk that this data could be misused or fall into the wrong hands, leading to security breaches or identity theft. Moreover, students and parents may not always be fully aware of the extent to which their personal information is being used or shared, raising ethical issues around consent and transparency (Zeng et al., 2021).

Dependency on Technology: AI-enhanced learning can lead to an over-reliance on technology. This can become problematic when students face technical issues such as hardware malfunctions, poor internet connectivity, or limited access to necessary devices. In areas with limited resources or during emergencies (such as the COVID-19 pandemic), students from disadvantaged backgrounds may struggle to access AI-powered learning tools, widening the educational gap between socioeconomic groups. Furthermore, students may become overly dependent on AI systems for learning, neglecting the development of critical thinking and problem-solving skills that do not rely on technology.

Job Displacement and Teacher Roles: AI in education may contribute to the displacement of educators or changes in their roles. While AI can support teachers by automating administrative tasks or providing personalized learning experiences, it may also lead to reduced job opportunities, especially in environments where AI can replace basic teaching functions. This shift can diminish the role of human educators, potentially reducing the personal and professional satisfaction that many teachers find in direct interactions with students (Brynjolfsson & McAfee, 2014). The fear of job loss could also discourage teachers from adopting AI-enhanced tools.

Limited Creativity and Innovation: While AI can facilitate the learning process by offering personalized experiences, it often does so within predefined parameters. This means that AI systems are typically designed to follow specific algorithms and patterns, which can limit students' opportunities for creative thinking and innovation. Education, especially in fields like the arts and humanities, thrives on creativity, exploration, and the development of new ideas, and AI's tendency to optimize for efficiency might stifle these aspects of learning (Schwab, 2016).

Unequal Access to AI Resources: Access to AI-enhanced learning tools is not universal. Students from wealthier families or schools with larger budgets may have access to the best AI-powered tools, while others may not. This inequality further deepens the digital divide, creating disparities in learning experiences across different regions and socioeconomic statuses. The availability of AI-enhanced learning resources depends heavily on infrastructure, such as high-speed internet and modern devices, which are not accessible to everyone, especially in rural or underserved areas.

EFFECTS OF AI ENHANCED LEARNING ON STUDENT'S ACADEMIC PERFORMANCE

AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback: AI-driven personalized learning improves students' academic performance by adapting content to individual needs. AI systems analyze student progress and provide targeted feedback, ensuring mastery of concepts before moving to advanced topics. This personalized approach leads to higher grades and better retention. AI-powered tools also reduce frustration by breaking complex subjects into manageable steps. The study found that AI-driven language learning significantly boosted students' proficiency and exam performance. Personalized learning systems foster better engagement, translating to improved academic outcomes.

AI-Enhanced Learning and Cognitive Development: AI-driven learning environments significantly enhance students' cognitive abilities, leading to better academic performance. Jaksa and Margerum-Leys (2024) found that AI technologies support students in developing problem-solving skills, analytical thinking, and information processing. AI-based platforms provide real-time feedback, allowing students to correct mistakes instantly. Additionally, AI enhances metacognition by encouraging students to reflect on their learning strategies. The study highlighted that students exposed to AI-supported cognitive training demonstrated improved test scores. AI also assists in reducing cognitive overload by presenting information in digestible formats.

AI in STEM Education contribute to better conceptual understanding and academic Success: AI has had a profound impact on student performance in science, technology, engineering, and mathematics (STEM) subjects. Research by Wang et al. (2023) found that AI-based tutoring systems help students grasp complex STEM concepts faster. AI simulations and virtual labs provide hands-on learning experiences, leading to better conceptual understanding. AI-powered problem-solving tools enhance students' analytical abilities, resulting in higher test scores in mathematics and physics. The study also noted that AI-assisted coding platforms improve programming skills, making students more proficient in computational thinking. These improvements contribute to overall academic success in STEM disciplines.

AI-Driven Feedback and Student learning Improvement: One of the most significant advantages of AI-enhanced learning is its ability to provide immediate and personalized feedback. AI-driven assessments allow students to understand their mistakes instantly and improve upon them. Traditional feedback methods often delay student learning, whereas AI systems provide corrections in real time. This rapid feedback loop enables students to learn more efficiently and achieve higher academic performance. The study found that students who received AI-generated feedback demonstrated greater progress in writing, mathematics, and critical reasoning tests. This suggests that AI plays a crucial role in academic improvement.

METHODOLOGY

In carrying out the study, a comparative study design was adopted. The study was carried out in Imo State. The targeted population for the study comprised all ICT teachers in Secondary school in Akwa Ibom State. A simple random sampling technique was used to select 140 ICT teachers in Secondary Schools in Imo State and this formed the sample size used to carry out this study. The instrument used for data collection was a structured questionnaire titled "Advantage and Disadvantage of AI Enhanced Learning Questionnaire (ADAIELQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient

obtained was 0.84 and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such percentage analysis to answer research questions.

Research Question 1

The research question sought to find out the advantages of AI enhanced learning. To answer the research percentage analysis was performed on the data, (see table 1).

Table 1: Percentage analysis of the advantages of AI enhanced learning

ADVANTAGES	FREQUENCY	PERCENTAGE
Personalized Learning	37	26.43**
Enhanced Learning Efficiency	28	20
Scalability of Education	19	13.57
Data-Driven Insights and Continuous Improvement	16	11.43*
Interactive and Immersive Learning Experiences	14	10
Support for Special Needs Learners	12	8.57
Improved Teacher Support and Professional Development	8	5.71
Global Collaboration and Learning Communities	6	4.29
TOTAL	140	100%

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field survey

The above table 1 presents the percentage analysis of the advantages of AI enhanced learning. From the result of the data analysis, it was observed that the advantage tagged "Personalized Learning" 37(26.43%) was rated as the highest advantages of AI enhanced learning, while "Global Collaboration and Learning Communities" 6(4.29%) was rated the least. The result therefore is in agreement with the research findings of Shute & Ventura, (2013), who noted that personalized learning powered by AI can improve retention and comprehension, enabling students to master subjects more efficiently. AI can tailor the learning experience to the individual needs of each student. By analyzing data on students' learning styles, preferences, and progress, AI systems can adjust content delivery, difficulty levels, and even teaching methods to better suit each learner.

Research Question 2

The research question sought to find out the disadvantages of AI enhanced learning. To answer the research percentage analysis was performed on the data, (see table 2).

Table 2: Percentage analysis of the disadvantages of AI enhanced learning

DISADVANTAGES	FREQUENCY	PERCENTAGE
Lack of Human Interaction	36	25.71**
Bias in AI Algorithms	31	22.14
Data Privacy Concerns	27	19.29
Dependency on Technology	24	17.14*

Job Displacement and Teacher Roles	22	15.71
Limited Creativity and Innovation	17	12.14
Unequal Access to AI Resources	16	11.43
TOTAL	140	100%

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field survey

The above table 2 presents the percentage analysis of the disadvantages of AI enhanced learning. From the result of the data analysis, it was observed that the disadvantage tagged "Lack of Human Interaction" 36(25.71%) was rated as the highest disadvantages of AI enhanced learning, while "Unequal Access to AI Resources" 16(11.43%) was rated the least. The result therefore is in agreement with the research findings of Brynjolfsson & McAfee (2014) who mentioned that the shift to artificial intelligence can diminish the role of human educators, potentially reducing the personal and professional satisfaction that many teachers find in direct interactions with students.

Research Question 3

The research question sought to find out the effects of AI enhanced learning on students' academic performance. To answer the research percentage analysis was performed on the data, (see table 3).

Table 3: Percentage analysis of the effects of AI enhanced learning on students' academic performance

EFFECTS	FREQUENCY	PERCENTAGE
AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback	46	32.86**
AI-Enhanced Learning and Cognitive Development	40	28.57
AI in STEM Education contribute to better conceptual understanding and academic Success	31	22.14*
AI-Driven Feedback and Student learning Improvement	23	16.43
TOTAL	140	100%

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field survey

The above table 3 presents the percentage analysis of the effects of AI enhanced learning on students' academic performance. From the result of the data analysis, it was observed that the effect tagged "AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback" 46(32.86%) was rated as the highest effects of AI enhanced learning on students' academic performance, while "AI-Driven Feedback and Student learning Improvement" 23(16.43%) was rated the least. The result

therefore is in agreement with the research findings of Xu (2024) who mentioned that AI-powered personalized learning systems allow students to study at their own pace, increasing engagement and interest in subjects. AI-driven personalized learning improves students' academic performance by adapting content to individual needs. AI systems analyze student progress and provide targeted feedback, ensuring mastery of concepts before moving to advanced topics.

CONCLUSION

The result of the data analysis concluded that "Personalized Learning" among others is the highest advantage of AI enhanced learning, it also revealed that "Lack of Human Interaction" among others is the highest disadvantage of AI enhanced learning. Furthermore, revealed that "AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback" is the highest effect of AI enhanced learning on students' academic performance. The rapid advancement of Artificial Intelligence (AI) has significantly impacted education globally. AI-enhanced learning tools, including intelligent tutoring systems and personalized learning platforms, promise to make education more adaptive, interactive, and efficient. In Imo State, Nigeria, the integration of AI into secondary schools offers opportunities to address challenges like large class sizes and limited resources, providing tailored support for students. However, there are concerns about widening the digital divide, especially in rural areas with limited access to technology. Additionally, reliance on AI in administrative tasks could reduce teacher-student interaction. Striking a balance between AI use and personal engagement is key to maximizing its benefits.

RECOMMENDATIONS

1. To bridge the digital divide, it is crucial to invest in improving technological infrastructure, especially in rural areas of Imo State. Ensuring that students have access to devices and reliable internet connectivity will enable equitable access to AI-enhanced learning tools, enhancing the learning experience for all students.
2. Teachers should be provided with training on how to effectively integrate AI tools into their teaching practices. Professional development programs that emphasize AI literacy will empower educators to balance technology with personal engagement, ensuring AI complements rather than replaces human interaction in the classroom.
3. Schools should adopt a balanced approach to AI-enhanced learning by ensuring that AI tools are used to complement, not replace, traditional teaching methods. Teachers should maintain a human-centered approach, fostering critical thinking, creativity, and social skills, while AI handles personalized learning and administrative tasks.

REFERENCES

Abdallah, M. (2023). Ethical Considerations of AI in Education: Balancing Technology and Human Touch. Available at: https://edumaged.com/2023/05/21/ethical-considerations-of-ai-in-education-balancing-technology-and-human-touch/

AKPAN, E. E., FCICN, P. D., AP, P., & Lion, C. J. (2024). Artificial Intelligence: An Emerging Technology for Service and Production Enhancement in the 21st Century. *Information science (GAJLIS)*, 3(1).

Almalki, A., & Aziz, M. (2021). The Role of AI in Supporting Special Needs Education. *Journal of Educational Technology & Society*, 24(3), 98-112.

Ayeni, O. O., Hamad, N. M., Chisom, O. N., Osawaru, B. and Adewusi, O. E. (2024). AI in education: A review of personalized learning and educational technology. *GSC Advanced Research and Reviews*, 18(2), 261-271.

Baker, R. S., & Siemens, G. (2014). Educational Data Mining and Learning Analytics." In Cambridge Handbook of the Learning Sciences (pp. 253-276). Cambridge University Press.

Bassey, M. M., & Owushi, E. (2023). Adoption of artificial intelligence in library and information science in the 21st century: assessing the perceived impacts and challenges by librarians in Akwa Ibom and Rivers States. *International Journal of Current Innovations in Education*, *6*(1), 75-85.

Behlol G. M. (2024). Concept of Learning. *International Journal of Psychological Studies.* 2(2)232.

Bognar L., Agoston G., Bacsa-Ban A., Fauszt T., Guban G., Joos A., Juhasz L., Kocso E., Maczo E., Kollar A. & Strauber G. (2024). Re-Evaluating Components of Classical Educational Theories in AI-Enhanced Learning: An Empirical Study on Student Engagement. *Education Sciences,* 14(9): 974: https://doi.org/10.3390/educsci14090974

Brynjolfsson, E., & McAfee, A. (2014). The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies. W. W. Norton & Company.

Cobo, C. (2015). The Future of Education: A Global Collaboration. *International Journal of Educational Research,* 35(6), 20-31.

Fitria, T. N. (2021). *Artificial Intelligence (AI) In Education: Using AI Tools for Teaching and Learning Process*. A conference paper presented at the Proceeding Seminar Nasional 2021.

Freina, L., & Ott, M. (2015). A Literature Review on Immersive Virtual Reality in Education: State of the Art and Perspectives. *Informatica*, 39(4), 467-477.

Jaksa A. & Margerum-Leys J. (2025). Enhancing Cognition through Affect within Ai-Driven Technology. *ICERI2024 Proceedings*, pp. 8250-8254.

Jian, O. (2023). Personalized learning through AI, *Advances in Engineering Innovation* 5(1)

Joshi, A. (2024). Adaptive Learning through Artificial Intelligence. *International Journal on Integrated Education (IJIE)* 7(2).

Marouf, A., Al-Dahdooh, R., Abu Ghali, M., Mahdi, A., Basem S., Samy S., Abu-Naser (2024) Enhancing Education with Artificial Intelligence: The Role of Intelligent Tutoring Systems. *International Journal of Engineering and Information Systems (IJEAIS)* 8(8).

Marr, B. (2024). What Are Real-Time Data Analytics (And Why It's So Important)? Future business success. Available at: https://bernardmarr.com/

Moro-Visconti, J., Rambaud, S. & Pascual, J. (2023). Artificial intelligence-driven scalability and its impact on the sustainability and valuation of traditional firms. *Humanities and Social Sciences Communications* 10 (1).

Mutambik I. (2024). The Use of AI-Driven Automation to Enhance Student Learning Experiences in the KSA: An Alternative Pathway to Sustainable Education. *Sustainability,* 16(14): 5970.

O'Neil, C. (2016). Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy. Crown Publishing.

Pawar, P. (2023). AI-Enhanced Education: Personalized Learning and Educational Technology. *Journal of Interdisciplinary Social Sciences Review (JISSR)* 1 (1).

Popenici, S. I., & Kerr, S. (2017). The Impact of Artificial Intelligence on Learning, Teaching, and Education. *European Journal of Education Studies*, 3(5), 2-9.

Schwab, K. (2016). The Fourth Industrial Revolution. Crown Business.

Sequeira, A. H. (2020) Introduction to Concepts of Teaching and Learning. Available at: https://www.researchgate.net/publication/272620585_Introduction_to_Concepts_of_Teaching_and_Learning

Shute, V. J., & Ventura, M. (2013). Measuring and Supporting Learning in Games: A Review of the Literature. Educational Testing Service.

Siemens, G. (2013). Learning Analytics: The Emergence of a Discipline. *American Behavioral Scientist*, 57(10), 1380-1400.

Tiwari, H. P. (2024). Artificial Intelligence in the Classroom: Revolutionizing English Language Teaching. *Journal of English Teaching and Linguistics Studies (JET Li)* 6(1):42-59. DOI: 10.55215/jetli.v6i1.9757.

Ufot, S. I. (2024). Artificial Intelligence and Digital Marketing: Assessing the AI Enhancing Tools for Effective Marketing in Akwa Ibom State. *Global Academic Journal of Library and Information Science (GAJLIS)*, 3(1), 87-95.

VanLehn, K. (2011). The Relative Effectiveness of Human Tutoring, Intelligent Tutoring Systems, and Other Tutoring Systems. *Educational Psychologist*, 46(4), 197-221.

Voreco (2024). The Role of Artificial Intelligence in Enhancing Accessibility Features for

Individuals with Disabilities. Available at: https://vorecol.com/blogs/blog-the-role-of-artificial-intelligence-in-enhancing-accessibility-features-for-individuals-with-disabilities-172066

Wang X., Li L., Tan S., Yang L. & Lei J. (2023). Preparing for AI-enhanced education: Conceptualizing and empirically examining teachers' AI readiness. *Computers in Human Bahviours,* 146, 107798.

Wu D., Zhang S., Ma Z., Yue X. & Dong R. (2024). Unlocking Potential: Key Factors Shaping Undergraduate Self-Directed Learning in AI-Enhanced Educational Environments. *Systems,* 12(9): 332. https://doi.org/10.3390/systems12090332

Xu Z. (2024). AI in education: Enhancing learning experiences and student outcomes. Proceedings of the 4th International Conference on Signal Processing and Machine Learning DOI: 10.54254/2755-2721/51/20241187

Zeng, D. (2021). Ethical Issues of AI in Education: A Literature Review. *International Journal of Educational Technology in Higher Education*, 18(1), 30-45.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

ECOWAS and Democratic Sustainability in West Africa: A Critique of Protocol 2001

By

Manasseh E. BASSEY, Ph.D.
Department of Political Science
University of Uyo, Uyo,

Aniefiok F. ESETANG, Ph.D.
National Open University (NOUN)
Abuja

And

EFFIONG N. Thompson
Akwa Ibom College of Education
Afaha Nsit, Akwa Ibom State

ABSTRACT

The wide spread enthusiasm exhibited by both the signatories of Protocol 2001 as well as ordinary citizens of their various countries following the signing of the treaty in 2001 stemmed from their belief that at long last various governments of members states of ECOWAS are committed and sincere in instituting democracy and good governance in their countries and this would usher in peace and development of all ECOWAS states. However, after 23 years of its execution, the goal which the treaty sought to achieve is even more illusive today than then. The objective of this paper is to show that the achievement of democracy and good governance in ECOWAS member states using Protocol 2001 as their road-map is not only infeasible but also unrealizable. Employing Hamza Alavi's theory of State in Post Colonial Societies as analytical tool, assessing the background colonial legacy and character of ECOWAS member states and relying on secondary sources of data, the paper argues that democracy and good governance as enunciated in Protocol 2001 is floundering in member states because post-independence political leaders who assumed political control of member states and their orientation to colonial anti-democratic policies such as deception in acquisition of colonial territories, primitive exploitation and accumulation of wealth, authoritarianism in governance and post-independence policies such as sit-tightism in office by heads of government, creation of family dynasty, judiciary dependence on executive and frequent coups are factors militating against the successful implementation of the tenets of the protocol. The paper avers that since democratic foundation was not properly laid at independence of member states; it is difficult for member states to successfully implement various articles of the protocol. The paper recommends that for conductive atmosphere to be created for democracy to thrive, member states should vigorously fight against the twin-evil of poverty and corruption as well as exercise tight control over population growth in their countries.

KEYWORDS: ECOWAS, Democratic Sustainability, West Africa, Critique of Protocol 2001

INTRODUCTION

Economic Community of West African States (ECOWAS), an inter-governmental Organisation (IGO) was founded in 1975 when its treaty was signed by the heads of state and

government of all the 15 member states in Lagos, Nigeria. This initial treaty restricted the organization to purely economic and developmental pursuits. Perhaps realizing that economic integration and development of the sub-region cannot be achieved in an environment characterized by political instability, conflict and war, the treaty was, in July 1993, revised to address these problems. In other words, the revised 1993 treaty goes beyond economic issues to, among others, involve ECOWAS in political, security and peace-keeping imperatives including power to impose sanctions on recalcitrant member states. As these measures did not go far enough to create necessary atmosphere for development to thrive a new agreement known as Protocol on Democracy and Good Governance 2001 was introduced as Supplementary to the protocol relating to the Mechanism for Conflict Prevention, Management, Resolution, Peacekeeping and Security. The protocol literarily forced member states to subscribe to the adoption and execution of democratic processes in the governance of their respective home-states and out-lawed forceful take-over of government. It also prescribes sanctions for violation of the tenets of the protocol by member states.

Since 2001, West Africa has not witnessed much significant improvement in the method adopted by signatories of this protocol in the governance of their respective states. According to Ukase and Atime (2017) countries in the sub-region are still witnessing threats to lives and properties, terrorism, blatant violation of human rights, electoral malpractices and violence, bloody civil strife and regimes that lack legitimacy. All these undemocratic acts are what the 2001 Treaty sought to prevent but they are still being perpetrated in member states.

The founders of ECOWAS modeled the organization after the then European Economic Commission (EEC), now European Union's (EU) example. In appreciation of the success story recorded by EU in fostering the integration and development of the economy of Europe, the founders of ECOWAS sought to duplicate such feat in West Africa. They failed to take cognizance of the fact that the enabling environment in Europe which ensured the success of EU as a regional economic body is different from the situation in West Africa and indeed the entire Africa. For example, while states in Europe are firmly democratically established and stable having evolved naturally from the dynamics of the European society, the states in Africa, on the other hand, are too weak and too internally compromised to stabilize the society for needed development having been imposed by European colonial masters. After centuries of occupation of African territories, the governance legacy which they bequeathed to post-colonial African leaders was anything but democracy. On what foundation then does ECOWAS seek to grow democracy in West Africa?

OBJECTIVE OF THE STUDY

This paper seeks to present a critique of ECOWAS self-imposed responsibilities of instituting and sustaining democracy and good governance among member states. We intend to show that achievement of democracy and good governance in ECOWAS states through Protocol 2001 is not feasible owing to the economic and political backgrounds as well as other legacies which these states inherited from their colonial masters. We also intend to show that the post-colonial African leaders who took charge of political affairs since independence are/were not amenable to democratic pursuits whether viewed from the prism of ECOWAS laid down principles or other western democratic standards. Constant ECOWAS intervention in political disputes so far since the protocol 2001 was signed are the evidence supporting the premise that ECOWAS objective in this context is not realizable.

CONCEPTUAL AND ANALYTICAL DISCOURSE

- Conceptual Issues

Democracy and Good Governance are important concepts in our discourse. It is therefore necessary to have an indept understanding of the context they are used in this paper.

- Democracy

The term democracy is derived from two Greek words: "demos' meaning "people" and "kratia' signifying "rule of or by". According Leeds (1976) the first kind of democracy occurred in ancient small Greek City-States where it was possible for all the citizens to meet together in one place to discuss issues concerning their community and also govern themselves. Today democracy is widely regarded as being synonymous with liberal democracy (Adejumobi, 2004). There are however other forms of democracy such as social democracy and socialist democracy. The type of democracy practiced in small ancient Greek city states, above mentioned (direct or social democracy) is regarded by Ake (2000) as signifying popular power where authority was not delegated but the power of the people was expressed. To him popular power is the essence of democracy because it seeks the realization of human potentialities through active participation in rulership and brings about positive and activist freedom to citizens. However popular democracy (also known as social or direct democracy) cannot be adopted by modern states owing to large population and geographical size. Representative democracy therefore becomes inevitable. It is a government by the consent of the people (Adejumobi, 2004). This is characterized by the people's choice of their political leaders through competitive elections, a guarantee of extensive civil and political rights, the rule of law and public accountability (Diamond; 1997). Liberal democracy is a form of representative democracy that gained ascendancy with the emergence of capitalism in western world. According to Adejumobi (2004), it became necessary at that era to engineer a political system and mode of polity that will service and protect the base of society which was the capitalist economy. That partly explains why liberal democracy is compatible with a market economy. Ake (2000) agrees that the values of capitalist market are the same with core values of liberal democracy which are: egotism, property, formal freedom, and equality. In other words, issues concerning private property and its accumulation are emphasized and well protected under liberal democratic constitution while that of equality and socio-economic rights are only in theory than real for the majority of the people. Adejumobi (2004) put it this way, "... the market, private property and accumulation come first, distribution and the issues of equality and rights come later in a liberal democracy. This partly explains why social tensions and contradictions reflected in aggression, violence, murder and arson are part of the social culture of western liberal democracies." It is clear from our analysis so far that liberal democracy is characteristically violence prone and conflictual and as such cannot support democratic stability especially where the actors or practitioners are discipline deficient to respect the rules of the game or had no good prior orientation to the culture of the system among others.

Although the Protocol 2001 of ECOWAS has not directly defined what it regards as democracy, however from the review of Articles 1 to 18 of the treaty it is clear that it regards democracy as a civilian-led government installed through free and fair election competed for by political parties. This is akin to western liberal democracy which emphasise universal adult suffrage; competitive elections, equality of citizens before the law; freedom of speech, press and religious freedom, a government responsible to the majority voters, among others (Gould and Kold: 1964). Although the principles of liberal democracy enunciated above are important, they do not guarantee good governance. The electorates do not have real control over what the elected leaders use the state for after the ritual of election. The ruling political leaders can for example, decide to ignore the wishes and aspirations of the people and pursue their selfish class interests (Esetang: 1987). In line with the thinking of Nnoli (1981) we propose that a true democratic state should ensure that all obstacles, both human and non-human are removed on

the path of man to enable him to acquire the capacity to muster, manipulate, conquer, transform and control his physical, biological and socio-economic environment for his benefit and that of his fellow human. This can be done by creating free channels for him to acquire and exercise his capacity. The free channels can be created by ensuring the equitable distribution of the society's wealth, adhering to laws and regulations of the state, and encouraging mass participation is the productive and political processes of the state. It is such democratic government that can effectively create and sustain the conductive environment for integration and development envisioned by ECOWAS.

To achieve this needed environment, the leadership class presiding over the democratic state must be ready to commit class suicide by deliberately formulating and executing programmes and policies aimed at favouring majority of the people such as fighting poverty and corruption to the discomfort of the ruling class. Such leadership is very rare in Africa. When it eventually emerges, it is quickly annihilated either by fraction/faction of its class or opposing class as for example Thomas Sankara of Burkina Faso. That partly explains why genuine democracy is hard to achieve in West Africa.

Good Governance

As with other social science concepts, there is no generally agreed definition of governance. Its myriads of definitions can be categorized into two groups; the restrictive conception of governance which borrows directly from the corporate world as propagated by the World Bank, and the holistic version that transcends the state and institutions as advanced by United Nations Economic Commission for Africa (UNECA) and United Nations Development Programme (UNDP). According to Adejumobi (2004) restricted variant regards governance as involving efficient management of state institutions, public accountability, transparency in government procedure, rule of law among others. Advocates of this point of view seek to run government institutions with corporate or private sector mentality characterized by strict discipline and minimum government control. For the holistic version, governance, with the major governance actors being the state, the civil society and private sector, is seen as the process of steering state and society towards the realization of collective goals. Thus while United Nations Economic Commission for Africa (UNECA) defines governance as a process of social enjoyment between the rulers and the ruled in a political community, the United Nations Development Programme (UNDP) on the other hand views governance as the totality of the exercise of authority in the management of a country's affairs, comprising of the complex mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights and mediate their differences. (Adejumobi (2004).

The two conception of governance afore-mentioned are not without their drawbacks. While restrictive version of governance tends to align with liberal governance with the implication of promoting the welfare of the rich in the society, the holistic variant has only a semblance of inclusiveness as it still favour the privileged members of the society. As argued by Adejumobi (2004), the private sector, which is small and limited in Africa, are more emphasized to the detriment of the bulk of majority rural population. Moreover, the Civil Society Organisations (CSOs) which are urban-based are prioritized in this conception of governance. What then is the much sought after good governance that is needed in West Africa to promote democracy.

Governance is good when, according to Mohideen, it is operated in accordance with legal and ethical principles as conceived by society (Mohideen 1997). It is good if such principles steer the state and society towards serving the interest of the greatest number of the

people in society through collective participation of the citizens. In translating this collective participation into practice, it means the holding of free, fair and frequent elections, representative legislatures that make laws and provide oversight function and an independent judiciary to interpret those laws (Atakpa and Udoms, 2015). This is similarly prescribed in section 7 of ECOWAS protocol 2001. The protocol presuppose that ECOWAS member states should see the adoption western liberal democracy as the only way to secure good governance for member states. It has earlier been argued that liberal democracy cannot guarantee good governance with the background which Africans have found themselves.

Theoretical Discourse

The theoretical framework that can best be used to explain the politico-economic dynamics of various states in West African sub-region is the theory of State in Post Colonial Societies as promoted by Hamza Alavi (1972). As a variant of Marxist postulations, the theory was originally used to study post-colonial societies in Pakistan and Bangladesh.

According to him, states in most post-colonial societies exhibit certain characteristics such as being; too weak and too internally compromised to stabilize society and economy; imposed by the colonial powers thereby making it to be alien to African society; so pervasive that its alien rules and regulations are unfamiliar to indigenous political actors; a state where post-colonial indigenous leaders imitated the departing colonial powers in the use of state institutions and personnel as instruments to suppress opposing groups and to divert state funds into their private use in order to enrich themselves and establish their economic base; a state where ruling classes have no economic power and only play marginal role in the production process; a state where this marginal role makes them to be highly undisciplined in respecting "the rules of the game' in democratic process of the state they control, and lastly a state where factions and fractions of the ruling classes mostly use state power to further the interests of their faction or fraction and paying little or no attention to the interests of other factions nor that of the majority of the masses.

From the review of Alavi's postulation about states in post-colonial societies above, the following conclusion can be drawn:

- The states are economically weak and dependent having suffered centuries of colonial exploitation,
- The nature of colonial state and its rules and regulations are alien to African environment;
- Colonial legacy of exploitation of local resources is replaced, after independence, by amassment of state resources for self-enrichment of post-colonial leaders;
- Instability in post-colonial societies are caused not only by indiscipline of the political leaders but also by their use of state's resources to further their interests only while ignoring interests of majority of the people;

Alavi's postulation can be effectively applied to West African states. West African states have no strong foundation that can carry and sustain democracy and good governance for their states. Their economies are weak; the governmental systems and the rules and regulations governing them are alien to them; their indigenous political leaders are involved in cut throat competition to control state power for their selfish interests, and constant instability in governance and coup d'etat stem from the indiscipline of the political class in their quest to control state power at all cost for their selfish interests.

BACKGROUND LEGACY AND CHARACTER OF ECOWAS MEMBER STATES

The quest by ECOWAS that member states should enthrone and sustain democracy and good governance in their countries through its Protocol on Democracy and Good Governance of 2001 and the challenges arising therefrom since its enactment cannot be understood except by looking at the background and character of member states of the organization. In this section we intend to study the characters and legacies of West African States with a view to determining whether they provided the needed foundation for democracy and good governance or not.

COLONIAL ERA

Legacy of Deception in Acquisition of Territories

All member states except Liberia were once colonial territories of France, Britain or Portugal. The quest by Europe to colonise Africa stemmed from, among other things, to secure sources of raw materials for their home industries as well as market for their industrial products (Ubani et al, 2013). Owing to stiff competition among them, the colonialists employed crude and undemocratic methods to acquire as many African territories as they could. In Nigeria, the British authorities entered into dubious treaties of unequal relationship with indigenous chiefs which, according to them, was to protect Africans from other European competitors which later turn out to be a deception to seize territories from African chiefs (Abia, 2003). After King Kosoko of Lagos, for example, signed the so-called protective treaty with the British colonialists in 1861, his attempt to trade with Brazilian merchants earned him a deposition by the British Consul by name John Beecroft who accused him of insubordination (Ubani et al, 2013). Similarly in the French territory of Cote D'Ivoire (Ivory Coast), French colonial administrators trickishly forced chiefs to sign treaty of protection with them. In the execution of these treaties Governor Gabriel Angoulvant in 1908 tried to bring about effective control of the sections of Cote D'lvoire through *method rigoureuse*. This brought constant fighting between French forces and the indigenous African people (Uwechue, 1991). The situation was not different in the Portuguese West African territories of Guinea Bissau and Cape Verde.

In the post-colonial era, colonial deception for acquisition of territories became replaced by deception for acquisition of political power by indigenous political actors. This forms the background of the current widespread culture of deception regularly used by politicians through their empty promises in electioneering campaigns which they intend not to fulfill during their tenure in office.

Legacy of Primitive exploitation and accumulation of wealth

European colonialists were the first people to demonstrate to Africans that power can be used as an instrument for wealth acquisition. Thus, the colonialists used their political control of various territories of Africa to exploit the natural resources of the occupied areas and repatriate them to their home countries at a price determined by them, an action which they initially openly declared that they had no intension to do. They in turn exported their industrial products back to Africa of a price also determined by them (Dumont, 1988). In this process of unequal relationship, the colonialists amassed huge profits which they used to develop their European home countries to the detriment of Africa. (Offiong, 1980). Indeed, colonies were not free to sell their primary products to markets offering higher prices or to buy manufactured goods from markets offering cheaper prices. This was particularly the case with France under the obnoxious programme of Colonial Pact which involved the policy of economic assimilation or exploitation of her West African colonies. The situation in the British West African colonies, although a little more liberal in this regard, were still restrictive as similar policy in the

1930s barred the importation of cheap Japanese cloth and other goods in her West African colonies (Onwubiko, 1973).

It is clear from our analysis above that the main motive for colonization of African territories by the European colonialists was to accumulate wealth from the exploitation of African natural resources which they repatriated back to their home countries and not to develop African countries or encourage democracy. Indeed, although European colonialists practiced democracy at their home countries, it became imperative for them to use undemocratic methods of administration to hold down the conquered African people in order for them to succeed in their policy of resource exploitation and wealth accumulation.

This became the legacy which many post-colonial African political leaders imbibed which now forms the background of the present-day uncontrolled competition for corrupt wealth acquisition which is anathema to democracy and good governance.

Legacy of Authoritarian Governance

The three colonial powers of West African States viz: France, Britain and Portugal bequeath a legacy of authoritarianism on post-colonial political leaders of their colonial states. Although it is claimed that Britain was a little more liberal in running the affairs of its colonial territories (Onwubiko, 1973), France and to a greater extent Portugal were repressive in their style of governing their territories. The British colonial authorities first introduced indirect rule which worked in some areas (Hausa/Fulani areas of Northern Nigeria, Asante federation of Ghana and the protectorate areas of Sierra Leone and Gambia) (Onwubiko, 1973). It however failed in the Fante and Ga regions of Ghana, the Igbo and Ibibio family areas of Eastern Nigeria and partly successful in the Yoruba region of western Nigeria. Indirect Rule, in its conception and practice, was antithetical to democracy for it promoted traditional institutions and enhanced the powers of traditional rulers who were not amenable to democratic processes. It also sowed the seed of ethnicity which later on impeded smooth practice of true democracy in Nigeria. That partly explains why nationalists and other educated Africans overwhelmingly opposed the policy.

In the French territories, France adopted the policy of Assimilation and Association. Based on French notion that their colonies are overseas provinces and as such extension of France, they adapted Assimilation policy. The policy involved the adoption of French culture, enjoyment of French citizenship rights, the introduction French system of local and central government including representation of the colony in the French National Assembly. All these were for Africans living in the communes only such as Darkar, St. Louis, Goree and Rufisque all in Senegal (Senghor, 1975). Apart from these four communes majority of Africans living in the rest of the French territories including the interior of Senegal were not assimilated. They were subjected to the humiliation of the *code indegement* (that is trial without a jury and without defence by lawyers; arbitrary taxation and forced labour, no rights of representation in the French National Assembly) (Onwubiko, 1973). Following the failure of this policy owing to its rejection by both French scholars and most Africans of the territories who kicked against its discriminatory principles, the policy was substituted with that of Association. The policy of Association sought to respect and preserve the colonial people's tradition, institutions, religions, customs and ways of life of the African people under an indissoluble French empire. An assessment shows that in theory this policy gave liberty to indigenous people to run their affairs using their traditional institutions. However, in practice French colonial authorities continued with its direct centralized rule using French officials who deposed many paramount chiefs who

opposed French rule and created artificial chiefs to replaced them. Those appointed were subordinate to local French authorities (Onwubiko, 1973).

The above analysis shows that the three colonial powers in West African states practiced authoritarianism instead of democracy. As the foundation of authoritarianism was laid in these states it is difficult for post-colonial indigenous political leaders to be familiar with the practice of democracy.

POST COLONIAL ERA

Sit-Tightism

Sit-tightism or tenure elongation is a practice whereby a head of state, owing to his dictatorial control over key institutions of government, tampers with the state's constitution to remove tenure limit to his office to allow him to stay in office indefinitely. Although it is an aberration in democracy, it is however widely embraced by some heads of state in Africa. This stem from repressive and authoritarian colonial past where colonial authorities regarded themselves as demi-gods. Example of such sit-tight heads of state in West Africa were: Leopold Sedar Senghor of Senegal, Gnassingbe Eyadema of Togo, Felix Houphouet-Boigny of Ivory Coast, Mathieu Kerekou of Benin, Yahya Jammeh of Gambia among others.

Creation of Family Dynasty

Family power inheritance mostly occurs in states where the head of state mostly a former military man, has tampered with the constitution in other to elongate his tenure. Inclination to do this is probably being influenced by African tradition of perpetual chieftaincy family succession and its encouragement by colonial policy of indirect rule which strengthened the power of traditional chiefs. Creation of family dynasty or succession is a violation of democratic principle of free choice whereby citizens are empowered to choose their leaders from among many contestants who present themselves before voters. The propensity to resort to this kind of practice by some African and West African leaders in particular is an indication that it may be difficult to achieve widespread democracy and good governance in West Africa. Togo is an example of a country where the son Faure Gnassingbe succeeded his father Gnassingbe Eyadema in 2005.

Judicial Dependency

Independence of the judiciary has severely several in many post-colonial West Africa states in both civilian-led and military regimes. The weakness of the judiciary in upholding its independence is blamed on such factors as the methods of appointing and removing judges from office which is left to the discretion of the chief executive and the legislature; the funding of the judiciary and general poor condition of service of judicial officers (Nigeria: Report of the Political Bureau 1987). In many ECOWAS member states these problems have not been thoroughly addressed in order to ensure that the court is indeed the last hope of the common man. That explains why it is very rare for the court to pronounce judgement against the government in ECOWAS states especially in the French speaking states. In Franco-phone West African states, constitutional courts almost always rule in favour of the person in power.

Frequent Military Coups

The military usually blame their intervention in politics on corruption and unpopularity of the ousted civilian government. This is mostly self-serving excuse because many military regimes have also been overthrone by fellow military for performing very poorly for example

Abacha in Nigeria and Yahya Jammeh of Gambia. Military intervention in politics is a result of cut throat competition between the civilian and the military to control state power at all cost for their selfish interests. As long of this competition ensues democracy and good governance cannot be attained.

These are the colonial and post-colonial political weaknesses that formed the background upon which ECOWAS member states enacted and signed protocol 2001 with a view to instituting democracy and good governance in ECOWAS states.

DEMOCRATIC SUSTAINABILITY IN ECOWAS STATES: A RE-ASSESSMENTS OF PROTOCOL 2001

ECOWAS Protocol 2001 titled "Protocol on Democracy and Good Governance" premised on the assumption that since all member states signed up to it, they will adopt and pursue all its principles and this will in turn bring about enthronement and sustenance of democracy and good governance in all member states. In this section we intend to critically assess this assumption with a view to identifying its flaws which could militate against the success of the protocol.

Separation of Powers

Article 1 (a) prescribes that the constitution of member states should contain the principle of separation of powers between the executive, legislative and judicial arms of government. The article prescribes that states under military administration such as Guinea, Burkina Faso and Niger and those of civilian-led ECOWAS states provide for separation of powers between the three arms of government for example in Nigeria, Ghana, Senegal among others. This provision has not however ensured democracy and good governance in these civilian-led countries owing to some factors. These are the undisciplined character of African political leaders and authoritarian legacy they inherited from their colonial masters. Their undisciplined nature is exemplified by inability to respect and adhere to democratic rules and regulations as practiced by advanced democracies world-wide while their authoritarian nature ensures that chief executive of each member state subjugate the other two organs of government under them to protect their interest. In Nigeria for example, the 1999 constitution provides for separation of powers but under the Obasanjo civilian-led administration (1999-2007) Senate Presidents (Legislative branch) were installed and deposed in quick succession at the influence of President Obasanjo (executive branch). A typical example was Dr. Chuba Okadigbo, the second Senate President of the 4th Republic who "... brought legislative independence (and also)... his assertive style of leadership brought about a frosty relationship with the executive (President Obasanjo) who instigated internal division and disloyalty among members. He (Dr. Chuba Okadigbo) was impeached along with his deputy after only 11 months in office". (Ubani, et al, 2013).

Similar infractions also occur in French-speaking and Portuguese speaking ECOWAS countries where their legislatures cannot legislate against the President's interest nor can their constitutional courts enter judgement against their presidents.

The doctrine of separation of powers, even if stipulated in the constitution, cannot therefore guarantee democracy and good governance in ECOWAS states.

Preparation, Conduct and Announcement of Election Results

Article 6 recommends transparency on the part of electoral body in the preparation, conduct and announcement of election results in each member state. The fact that complaints of absence of transparency in the conduct and announcement of election results is still

widespread in many ECOWAS member states shows that this provision has largely been ignored. This could be traced to constitutional powers bestowed on the president to appoint the head and members of electoral bodies as well as the high premium which members of these electoral bodies place on wealth acquisition which make them susceptible to manipulation by the ruling party. Electoral bodies in Nigeria and Sierra Leone are recent examples of those of accused of lack of transparency in their activities. The recent attempt to shift general election date in Senegal by President Macky Sall which ignited protest from citizens of that country is another. These complaints are evidence that democracy is not grounded in these countries.

Concession of Defeat by Losers of Election

Article 9 recommends that losers of election should concede defeat to the winners within the deadline stipulated by the law. This apparently is an advisory clause which have been largely ignored by political actors. It is because control of state and its apparatuses is the prime prize of post-colonial leaders and it is the quickest means of amassing enormous wealth and property through corrupt means. (Uwak and Esetang, 2023). Consequently, losers of competitive election often employ all means lawful and unlawful) to achieve their goal of controlling state power. In Ivory Coast for example, in 2011 civil war broke out which led to the intervention of ECOWAS to restore normality when former president Laurent Gbagbo was defeated in a general election by Allasan Quatarra but Gbagbo refused to accept result and declared himself winner resulting in a civil war.

Intimidation and Harassment of defeated candidates and their Supporters

Article 10 prescribes that all holders of power at all levels of government should refrain from intimidating and harassing defeated candidates or their supporters. Many ruling political actors in Africa generally and in ECOWAS countries in particular have occasionally intimidated and harassed opposition or defeated candidates and their supporters having witnessed and experienced same authoritarian tendencies from colonial administrators who presided over West African territories. In other words, authoritarian tendencies exhibited by the ruling political leaders in ECOWAS states is rooted in the colonial foundations of these states which may not be easily wished away by signing of treaty.

Dispersal of Non-Violent Demonstrations/Protests

Article 22 forbids member states from using security forces to execute cruel, in-human and degrading punishments to non-violent demonstrators/protesters and when demonstration becomes violent only minimum force should be employed. In most member states constitutional provisions guiding the appointment of heads of security forces by heads of government constrains the appointed officers to exhibit overzealousness in carrying out their responsibilities in order to ingratiate themselves to their chief executives with a view to keeping their jobs. As long as such constitutional provisions and such gullible heads of security organizations exist, harassment, intimidation and use of crude tactics by security forces will not abate for example #End SARS protest in Nigeria under Buhari's administration.

Execution of Poverty Alleviation Programmes and Promotion of Social Dialogue.

Articles 25, 26, 27 & 28 indicates that member-states have agreed that social peace is predicated on the execution of poverty alleviation programmes such as equitable distribution of income and resources of the society to meet the basic human needs of their populations and to promote social dialogue with various ethnic groups, labour unions and association in their countries.

Many ECOWAS countries have instituted their poverty alleviation programmes and allocated stupendous sums of money for their execution for example National Social Investment Programme (NSIP) in Nigeria and Poverty Eradication Programme (PEP) in Ghana. However, these programmes have so far failed to have significant impact on the huge poverty profile of these countries owing to their corrupt abuse in the hands of their executors. In Nigeria, for example, the minister for Humanitarian Affairs and Poverty Alleviation under Buhari administration and her successor under Tinubu administration who were alleged to have embezzled billions of the programme fund were subjected to probe by Economic and Financial Crime Commission (EFCC) in 2024.

Government rarely voluntarily holds dialogue with social, economic and labour groups in their countries except there is threat to peace. This is an example of authoritarian disposition which does not promote democracy.

Respect for Rule of Law and Human Rights

Articles 32, 33 and 34 stipulate that member states are in agreement that press freedom, rule of law, human rights and justice strengthen democracy. The protocol directs ECOWAS Executive Secretary to take practical measures to enforce them. There is no gainsaying that rule of law, press freedom, human right and justice are essential principles of western liberal democracy but in most ECOWAS countries they are observed in the breach. Rule of law favours the rich and mighty in the society; press freedom is abused by the population through sharing of fake news in the social media while print and electronic media are either self-censored or tightly regulated by the government. This is the vestigial remains of authoritarian colonial legacy of these countries which political leaders, including those who signed protocol 2001, are not in a hurry to abandon.

Corruption Fight

Article 38 indicates the undertaking of member-states to fight corruption and manage national resources in a transparent and equitable manner. The protocol directs ECOWAS Executive Secretary to establish appropriate mechanism to address the menace. The prevalence of corruption in governance of most member states are the usual excuse bandied by the military for seizing power for example in Mali in 2012. However, experience have shown that this is a mere ruse design to conceal the main aim of controlling state power which is to use it to establish their personal and friends economic base through corrupt means. This legacy of deception inherited from colonial past have not been abandoned despite many years of independence. Experience has shown that both civilian and military governments are susceptible to corruption. Some military governments may be more corrupt than civilian government for example Abacha Loot in Nigeria.

Women, Children and the Youth

Articles 40, 41 and 43 confirm the agreement of member states to promote the welfare and rights of women, children and youth in their countries with a view to achieving progress and peace in the society. In this case some success stories co-exist with some humiliating failures. Age qualification for political contest has been lowered for the youths in many countries. Women are offered free election nomination forms in many countries while they are being offered more political appointments. In some countries children are enjoying free education and free school feeding. However, Africa, including ECOWAS countries, are still suffering from high illiteracy rate, high number of out-of-school children and street children

than other continents. Many qualified youths still remain unemployed thereby being available as ready reservoir for recruitment into terrorism gangs.

It should be noted that if key principles of Protocol 2001 such as respect for separation of powers, transparency in the conduct and announcement of election results, concession of defeat by candidates, stoppage of intimidation and harassment of defeated candidates/supporters, use of inhumane methods to disperse protests and demonstrations, implementation of poverty alleviation programme/social dialogue, respect for the rule of law and human rights, fighting of corruption, and lastly the prioritization of the welfare and rights of women, children and youths, were sincerely implemented they could have stabilized the polity and sustained democracy. We have shown that the implementation of these programmes has however suffered in the hands of post-colonial African leaders of various ECOWAS member states because of colonial legacies they inherited and their related post-independence out-growths such as sit-tightism, setting up of family dynasty, judicial dependency and frequency of military coups. As long as these factors are prevalent among member-states, democratic sustainability and good governance may not be achieved.

CONCLUSION AND RECOMMENDATIONS

As long as there is continuous prevalence, in modern days, of such debilitating factors in ECOWAS states as political deception, primitive accumulation of wealth and corruption, authoritarianism in governance, sit-tightism, creation of family dynasty among political leaders as well as judicial dependence, and frequent military coup d'etat, the right foundation does not exist to establish and sustain democracy. Consequent upon this, Protocol 2001 may not succeed in instituting and sustaining democracy and good governance in ECOWAS states. Indeed, the recent decision by the so-called Alliance of Sahel States – Mali, Burkina Faso and Niger (all controlled by the military) to break away from ECOWAS underscores this point. They chose to break away because ECOWAS instructed them to respect the spirit and letters of Protocol 2001 and restore civilian government in their countries. Some member-states criticizing these three recalcitrant states are themselves not implementing the treaty wholeheartedly for example in the area of sincere fight against poverty. There is therefore the need for strategic rethink on the part of ECOWAS if its objectives concerning democracy are to be achieved.

Our findings have clearly shown that sustained democratic governance cannot thrive in the sub-region owing to its tensed socio-economic and political environments as extensively discussed in this paper. To reverse the situation, we recommend that member-states should deploy a higher proportion of the wealth of their countries to enhance the welfare, security and comfort of ordinary citizens of their countries through the following programmes: fight against poverty, fight against corruption and control of population growth.

Fight against Poverty

Member states should fight poverty through:

(a) engagement of youths in farming and other agro-allied businesses;
(b) intensive training and equipping of all unemployed youths including degree holders in skill acquisition ventures;
(c) provision of technical guide and interest free loans to entrepreneurs;
(d) improvement on the ease of doing business to attract foreign investors.

Fight Against Corruption

Member states should fight corruption through:

(a) provision of free education to children at all levels,
(b) free medical treatment to all citizens,
(c) good condition of service, good salary and good pension to public service workers; and
(d) upgrade in the investigative powers of code of conduct officers, the police and financial crime bodies.

Control Over Population Growth

Member states should, depending on the severity of the situation in their countries, limit the number of children per man to 4 and per women to 4 also. This will, in the long run, ensure that population does not outstrip resources.

It is postulated that sincere and scrupulous implementation of these recommendations by each member state can reduce tension among their citizens and create conducive environment for democracy and good governance to grow.

REFERENCES

Abia, V. (2008). *Understanding Nigerian Government and Politics, Lagos*: Gofaflesh Publications Ltd. Pg.11

Adejumobi, S. (2004) *Democracy, Good Governance and Constitutionalism in Africa in Odion-Akhanine, S. (Ed.) Governance: Nigeria and the World, Lagos*: Centre for Constitutionalism and Demilitarization (CENCOD) pg. 11-22.

Ake, C. (2000) *The Feasibility of Democracy in Africa, Dakar: CODESRIA* pg.7.

Alavi, H. (1972) "The State in Post Colonial Societies – Pakistan and Bangladesh', *New Left Review* 74 (2): 60-70.

Atakpa, O. and Udoms, B. (2015) *Revolution against Bad Governance: Lessons of Arab Spring for Nigeria and West African Countries, in Eminue, O. and Dickson, M. (Eds.) Key Issues in International Relations*, Nsukka: University of Nigeria Press. Pg. 219-236.

Diamond, L. (1997) *In Search of Consolidation" in Diamond, L, Plattner, M; Chu Y. and Tien, H. (Eds.) Consolidating Third Wave Democracies*: Themes and Perspectives, Baltimore: John Hopekins University Press pg. 231-240.

Dumont, R. (1988) *False Start in Africa, London: Earthscan Publication* pg. 40-41.

Effiong, D. (1980) *Imperialism and Dependency, Enugu*; Fourth Dimension Publishing Co.Ltd. pg. 107.

Esetang, A. (19870 Political Leadership and Instability in Nigeria (1960-1986), Nsukka: Unpublished MSc Thesis, Dept of Political Science, UNN, pg.52.

Gould, J. and Kold, W. (1964) *Dictionary of Social Sciences, UNESCO* pg. 19-187.

Leeds, C. (1976) *Political Studies, London*: Macdonald and Evans Ltd. Pg.89.

Mohidden, A. (1997) *Stock Taking and Assessment of Democracy and Good Governance" in Proceedings of the Development Policy Management Forum DPMF) Conference of Democracy, Civil Society and Governance in Africa*, Addis Ababa pg. 15.

Nnoli, O. (Ed.) (1981) *Path to Nigerian Development,* Darkar CODESRIA pg. 36.

Onwubiko, K. (1973) *School Certificate History of West Africa, Onitsha:* Africa Publishers Ltd. Pg.287. Report of the Political Bureau 1987 pg. 101.

Senghor, L. (1975) *What is Negritude?" in Mutiso, G. and Rohio, S. (Eds.) Reading in African Political Thought, London:* Heinemann Educational Books Ltd. Pg. 83

Ubani, E. Ehiodo, C. and Nwaorgu, O. (2013) *Nigeria Government and Politics: A study in Governance, Aba:* Cheedal Global Prints Ltd. Pg.6.

Ukase, P. and Atim, B. (2017) *Economic Community of West African States: Challenges and Prospects in Democratization of the West African Sub-Region*, in Eminue, O; Dickson, M. and Ojie, P. (Eds.) International Organisations: A Reader, Calabar: University of Calabar Press. Pg.183-202.

Uwak, U. and Esetang, A. (2023) Africa's Refugee Crises: An Appraisal of their causes, Effects and Prospects", *International Journal of Social Sciences* 15(1):13-25.

Uwechue, R. (1991) *Africa Today*, London: Africa Book Ltd. Pg.781.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

ADOPTION OF AI EFFECTIVE TEACHING AND LEARNING FOR IMPROVED ACADEMIC PERFORMANCE OF SSS3 STUDENTS OFFERING ECONOMICS: A CASE STUDY OF SECONDARY SCHOOL STUDENT IN IMO STATE

By

Francis M. ANTHONY, Ph.D.
Faculty of Education
University of Texas
Austin, Texas
AUnited State

And

CHIEKEZI Chienyenwa. U.
Department of Economics
Benjamin Uwajumogu (State)
College of Education
Ihitte Uboma Owerri.

-ABSTRACT

The integration of Artificial Intelligence (AI) into education has revolutionized teaching and learning methodologies, offering new opportunities for personalized learning and improved academic performance. This study examines the adoption of AI-driven teaching and learning strategies to enhance the academic performance of Senior Secondary School (SSS3) students studying Economics in Imo State, Nigeria. Using a case study approach, the research explores how AI-powered tools—such as adaptive learning platforms, intelligent tutoring systems, and data-driven assessment techniques—impact student engagement, comprehension, and retention of Economics concepts. The study employs a mixed-methods research design, incorporating both quantitative surveys and qualitative interviews with teachers and students across selected secondary schools in Imo State. Findings indicate that AI-enhanced teaching methods lead to greater student participation, improved problem-solving skills, and higher academic achievement compared to traditional instructional approaches. However, challenges such as limited digital infrastructure, teacher training gaps, and resistance to technology adoption were identified as barriers to AI implementation. The study concludes that bridging the digital divide will ensure that students in both urban and rural areas benefit from AI-driven education. Teachers must also be equipped with the necessary digital skills to integrate AI effectively in classrooms. The study also recommended that Special attention should be given to rural and underserved schools in Imo State to ensure they have the necessary technological infrastructure, preventing disparities in learning outcomes.

KEYWORDS: Artificial Intelligence, Effective Teaching, Learning Strategies, Academic Performance, Economics Education, Secondary School, Imo State, Nigeria

INTRODUCTION

The integration of Artificial Intelligence (AI) into the education system has significantly transformed the teaching and learning process, particularly in subjects such as economics. AI-driven tools provide personalized learning experiences, automate grading, and enhance

students' understanding of complex economic theories through simulations and data analysis. With the increasing demand for technology-driven education, the adoption of AI in secondary schools, especially among SSS3 students in Imo State, is becoming essential for improving academic performance and preparing students for the evolving digital economy (Chinasa & Onyinyechukwu, 2022).

Effective teaching in economics requires engaging instructional methods that enhance comprehension and retention. AI-powered educational platforms offer adaptive learning experiences by tailoring content to individual students' learning needs. These platforms analyze students' progress and provide customized feedback, which has been shown to improve academic performance (Yusuf & Ola-Awo, 2023). Additionally, AI-based economic simulations allow students to explore market behaviors, government policies, and financial decision-making in real-world scenarios, fostering critical thinking and problem-solving skills.

The adoption of AI in education, particularly in Imo State, is also helping to bridge the gap between urban and rural schools by providing digital learning resources that can be accessed remotely. AI-powered virtual tutors and automated assessment tools have made learning more accessible, ensuring that students in resource-constrained areas receive quality education. However, challenges such as inadequate technological infrastructure, limited access to AI tools, and teachers' digital literacy levels must be addressed to maximize the potential of AI in improving learning outcomes (Nkweke, 2023).

Despite the challenges, the adoption of AI for effective teaching and learning in economics holds great promise for secondary school students in Imo State. The ability of AI to provide data-driven insights, automate repetitive tasks, and facilitate a more interactive learning environment makes it a valuable tool for enhancing students' academic performance. As AI continues to evolve, policymakers and educators must work towards creating a conducive environment that supports AI-driven education while addressing the ethical and practical concerns associated with its implementation (Obiora, 2023).

CONCEPT OF ARTIFICAL INTELLIGENCE

Artificial intelligence (AI) is a technology that allows computers to perform tasks that typically require human intelligence. AI systems can learn from experience, adjust to new inputs, and improve over time. According to Huge and Godwin (2024) artificial intelligence (AI) is the idea and practice of creating computer systems that can do tasks like speech recognition, decision-making, and pattern recognition that traditionally needed human intelligence. Natural language processing, machine learning, deep learning, and other technologies are all included under the broad term artificial intelligence (AI) (NLP). Udo-Okon and Akpan (2024) defined artificial intelligence as a branch of computer science called artificial intelligence studies how computers learn, comprehend data, recognize characters in images, analyses pictures, and simulate how the eyes work. In addition, artificial intelligence refers to the research and programming of computers to carry out intelligence tasks that require human intervention.

Furthermore, Hanson and Okorie (2024) explained that artificial intelligence (AI) is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. Bassey and Owushi (2023) mentioned that artificial intelligence is the collection of technologies that enable machines to sense, comprehend, act, and perform several functions matching those of humans. Major components of the Artificial

Intelligence bucket are machine learning, big data, natural language processing, decision logic, data visualization, and data analytics.

Moreover, Akpan and Clark (2024) cited in Nathan and Isuaiko (2025) mentioned that artificial intelligence (AI) is the study of how the human brain makes decisions, learns new things, and thinks through difficulties. The goal of artificial intelligence is to enhance computer abilities related to human understanding, including language intelligence, learning, reasoning, and problem solving. The term artificial intelligence (AI) describes computer programmes that are able to carry out sophisticated operations that were previously limited to human performance, such as problem-solving, thinking, and decision-making (Lion and Ekefre, 2024).

CONCEPT OF EFFECTIVE TEACHING

Effective teaching is the practice of helping students learn and understand information in a way that is engaging and maximizes their comprehension. It involves a variety of strategies, including clear communication, assessment, and relationship building. According to Ebirim, Amah and Obi (2023) effective teaching is the capability of teachers to teach in such a manner that they achieve success and bring about the desired change in the students' behavior.

Udo and Jackson (2023) defined effective teaching as the skills, plans, methods, and conduct of effective teachers are those that result in positive student results. Teacher effectiveness refers to the impact of high-quality teaching on student learning, measured in terms of achievement gains. It encompasses the dynamic and interactive process of creating, adapting, and negotiating learning environments that support all students in activities that improve learning. Teacher effectiveness can be assessed through outcomes such as achievement test scores and ratings of teachers' performance in the classroom. Effective teaching is the knowledge, strategies, processes, and behaviors that lead to good student outcomes (Atakpa, Umoh and Ikoh, 2023).

Effective teaching is the process of facilitating meaningful learning experiences that enable students to acquire knowledge, develop critical thinking skills, and apply concepts in real-world situations. It involves clear communication, engaging instructional strategies, and the ability to adapt to diverse learning styles. An effective teacher creates a structured yet flexible learning environment, uses relevant examples to clarify complex ideas, and encourages active participation. Additionally, they employ formative assessments to monitor student progress and provide constructive feedback, ensuring continuous improvement in learning outcomes.

Beyond delivering content, effective teaching fosters a positive and inclusive classroom culture that motivates students to explore and express their ideas confidently. It incorporates modern educational technologies, differentiated instruction, and problem-solving approaches to make learning interactive and accessible. A great teacher not only imparts knowledge but also serves as a mentor and guide, inspiring students to become lifelong learners. By establishing strong relationships, demonstrating enthusiasm, and setting high yet achievable expectations, effective teaching empowers students to reach their full potential academically and personally.

CONCEPT OF EFFECTIVE LEARNING

Effective learning refers to the process of acquiring and retaining knowledge or skills in a way that is efficient and lasting, involving active engagement with the material, utilizing various

strategies to optimize understanding and retention, and ultimately leading to meaningful application in different contexts; it emphasizes not just memorization but deep comprehension and the ability to transfer learned concepts to new situations. Effective learning occurs when students take ownership of their education, utilize diverse learning strategies, and adapt to new information with curiosity and persistence.

According to Ebirim, Amah and Obi (2023), effective learning refers to a teaching and learning process that not only focuses on the results achieved by students but also emphasizes the understanding, intelligence, perseverance, and quality of learning. It involves creating a comfortable and conducive learning environment, providing necessary facilities and resources, and incorporating research components into the curriculum. Effective learning is characterized by the ability to generate positive feelings and favorable attitudes towards learning, which in turn promotes active engagement and proactive behavior in the learning situation.

Furthermore, Udo, Obi and Iwuji (2023) explained that effective learning occurs when the intended learning objectives are accomplished through the teaching-learning process, learning is considered successful. Effective learning is the process through which individuals actively engage with, understand, and retain knowledge in a way that enhances their ability to apply it in various contexts. It goes beyond rote memorization, emphasizing critical thinking, problem-solving, and the practical application of concepts. It is facilitated by a supportive environment, clear learning objectives, and continuous feedback, allowing learners to reflect on their progress and make necessary adjustments. Ultimately, effective learning leads to long-term knowledge retention, skill development, and the ability to think independently and creatively. The phrase "effective learning" refers to teaching and learning strategies that actively include kids in their own education and growth as people (Okonobong and Owushi, 2023).

CONCEPT OF ACADEMIC PERFORMANCE

Academic performance refers to the measurable outcomes of a student's learning process, typically assessed through grades, standardized tests, coursework, and other evaluation methods. It serves as an indicator of a student's comprehension, knowledge retention, and ability to apply concepts in various academic disciplines. According to Chukwu (2025), academic performance is often associated with cognitive ability, motivation, and the quality of education received. However, it is not limited to mere grades; it encompasses skills such as problem-solving, critical thinking, and adaptability to new learning environments. This broad definition recognizes that academic success is influenced by multiple internal and external factors.

The concept of academic performance has evolved beyond traditional grading systems. Researchers now emphasize the role of psychological and emotional well-being in student success. Pecherkina, Katkalo, and Borisov (2025) suggest that academic performance is not solely about intellectual capacity but also includes psychological resilience, emotional stability, and social adaptability. A high-performing student is one who can balance academic demands with emotional and social development. This perspective shifts the focus from mere academic achievement to a more holistic understanding of educational success, taking into account the students' mental and emotional health.

Another crucial dimension of academic performance is the role of technology and innovative teaching methods in enhancing learning outcomes. Studies have shown that digital learning tools and personalized learning environments can significantly improve student

engagement and academic performance (Juárez-López et al., 2025). Digital interventions, such as game-based learning and artificial intelligence-driven tutoring, allow for more adaptive learning experiences that cater to individual student needs. This indicates that academic performance is increasingly being shaped by advancements in technology, making education more accessible and effective for diverse learners.

Social and environmental factors also play a significant role in shaping academic performance. Onebunne (2025) argues that family background, socioeconomic status, and peer influence contribute to students' ability to excel academically. In many cases, students from privileged backgrounds have better access to quality education and resources, which positively impacts their academic performance. Conversely, students facing economic or social challenges often struggle to meet academic expectations, highlighting the importance of equitable access to education. These findings emphasize that academic performance cannot be viewed in isolation but must be understood within a broader social and economic context.

EFFECT OF AI ON EFFECTIVE TEACHING OF ECONOMICS

The integration of Artificial Intelligence (AI) into economics education is transforming teaching methodologies, making learning more interactive, efficient, and personalized. AI-driven tools enhance engagement, automate grading, and provide real-time simulations that improve students' grasp of economic theories.

- AI-Powered Personalized Learning

AI algorithms tailor economics course content to students' learning styles and progress levels, ensuring that instruction is adapted to their individual needs. This has significantly improved engagement and knowledge retention (Latifah & Ajie, 2025).

- Real-Time Economic Simulations and Data Analysis

AI-driven simulations allow students to experiment with economic models, analyzing market trends and policy impacts in real time. These tools enhance students' critical thinking and decision-making abilities in economic scenarios (Srinivasan & Davanageri, 2025).

- Automated Grading and Feedback Systems

Machine learning models enable automated assessment of students' work, providing immediate feedback and freeing up instructors to focus on complex teaching tasks. This efficiency has improved learning outcomes in economics education (Adebayo et al., 2025).

- AI-Assisted Research and Economic Forecasting

AI facilitates economic research by processing large datasets, identifying trends, and offering predictive analysis, thereby supporting both educators and students in academic research (Prajapati et al., 2025).

- AI and Equitable Access to Economics Education

AI-driven platforms have expanded access to high-quality economics education, especially in remote and underserved areas, by providing digital learning resources and AI tutors (Dugbartey, 2025).

EFFECT OF AL ON EFFECTIVE LEARNING OF ECONOMICS

Artificial Intelligence (AI) has revolutionized the learning of economics by offering personalized learning experiences, real-time data analysis, and intelligent tutoring systems. These AI-powered tools have enhanced students' engagement, improved accessibility to economic resources, and facilitated more in-depth understanding of complex economic models. However, concerns remain about AI-driven biases, privacy issues, and the digital divide that affects equal access to AI-based learning tools.

- **Personalized and Adaptive Learning**

AI-driven platforms tailor economics lessons to individual students, adjusting difficulty levels and recommending supplementary resources based on student progress. This customization enhances comprehension and retention of economic principles (Latifah & Ajie, 2025).

- **AI-Powered Simulations and Forecasting**

Economics students benefit from AI-powered simulations that model real-world economic phenomena, such as inflation, trade policies, and labor market fluctuations. These interactive learning environments deepen students' understanding of economic theories and their real-world applications (Mandon, 2025).

- **AI-Enabled Research and Big Data Analysis**

AI assists students in analyzing large economic datasets, identifying patterns, and making economic predictions. This capability enhances students' research skills and prepares them for data-driven decision-making in professional settings (Prajapati et al., 2025).

- **Accessibility and Equity in Economics Education**

AI has facilitated remote learning and expanded access to economic education for students in underserved regions. AI-driven platforms bridge educational disparities by providing cost-effective and interactive learning solutions (Dugbartey, 2025).

- **Automated Assessment and Feedback**

AI enhances efficiency in economics education by automating assessments and providing instant feedback. AI tools analyze students' responses to essay questions and problem sets, offering detailed explanations and suggestions for improvement (Srinivasan & Davanageri, 2025).

EFFECT OF AL ON ACADEMIC PERFORMANCE OF ECONOMICS STUDENT

The application of Artificial Intelligence (AI) in education has significantly influenced the academic performance of economics students by personalizing learning experiences, automating assessments, and improving engagement with complex economic models. AI-powered tools, such as adaptive learning systems, intelligent tutoring, and economic forecasting models, enhance students' comprehension and analytical skills. However, concerns remain regarding algorithmic bias, ethical considerations, and the risk of over-reliance on AI in academic learning.

- Personalized Learning and Adaptive AI Systems

AI-driven educational platforms adapt to students' learning styles, providing customized learning paths and targeted resources. This personalization improves students' understanding of economic concepts, leading to higher retention rates and academic performance (Oyinloye & ACETISE, 2025).

- AI-Powered Economic Simulations and Decision-Making

AI-enhanced simulations allow economics students to experiment with real-world scenarios, such as market fluctuations and policy changes, in a controlled environment. These tools foster critical thinking and problem-solving skills, preparing students for real-world economic analysis (Sikorskyi, Zablotska, & Mariia, 2025).

- Automated Grading and Feedback Mechanisms

AI-based grading systems streamline assessment processes, offering instant feedback on assignments and exams. This helps students identify their weaknesses and improve their understanding of economic theories (Srinivasan & Davanageri, 2025).

- AI as a Tool for Enhancing Research Skills

AI assists students in conducting economic research by analyzing large datasets, identifying trends, and suggesting relevant literature. This reduces research time and enhances the quality of academic work in economics (Masunda, 2025).

- AI and Equity in Economics Education

AI tools provide access to high-quality educational resources, bridging the gap for students in underserved areas. AI-driven learning solutions support economically disadvantaged students by offering cost-effective and scalable education models (Boshnjaku, Krasniqi, & Kamberi, 2025).

CONCLUSION

The adoption of AI in teaching and learning has significantly improved the academic performance of SSS3 economics students in Imo State by enhancing personalized learning, engagement, and assessment. AI-powered tools provide adaptive learning experiences, real-time simulations, and automated feedback, making economics education more interactive and efficient. However, challenges such as digital infrastructure, teacher training, and equitable access must be addressed to maximize AI's potential. Bridging the digital divide will ensure that students in both urban and rural areas benefit from AI-driven education. Teachers must also be equipped with the necessary digital skills to integrate AI effectively in classrooms. Policymakers should invest in AI education frameworks that support sustainable technology adoption in schools. With proper implementation, AI will continue to revolutionize the learning experience and prepare students for a technology-driven economy. The future of economics education in Imo State depends on embracing AI as a transformative tool for academic success.

RECOMMENDATIONS

- Schools should be equipped with AI-powered learning tools, including smart classrooms, digital textbooks, and virtual tutoring platforms, to enhance the teaching and learning process.
- The government should collaborate with private organizations and tech companies to fund AI-driven education initiatives, ensuring that all schools have access to AI resources.
- Special attention should be given to rural and underserved schools in Imo State to ensure they have the necessary technological infrastructure, preventing disparities in learning outcomes.

REFERENCES

Adebayo, D.H., Ajiboye, J.A., & Okwor, U.D. (2025). Optimizing Energy Storage for Electric Grids: Advances in Hybrid Technologies. ResearchGate.

Atakpa, A. O., Umoh, I. and Ikoh, N. F. (2023). Cloud Computing and Effective Teaching of Children: The Prospect and Challenges. *Universal Journal of Library and Information Science*, 4 (1), 73-86.

Bassey, M. M. and Owushi, E. (2023). Adoption of Artificial Intelligence in Library and Information Science in the 21st Century: Assessing the Perceived Impacts and Challenges by Librarians in Akwa Ibom and Rivers States. *International Journal of Current Innovations in Education*, 6 (1), 75-85.

Chinasa, O. I., & Onyinyechukwu, N. P. (2022). The Role of ICT Adoption in Secondary Education: A Case Study of SSS3 Students. *Journal of Educational Research and Policy Studies*, 2(2), 55-78. https://journal.escetjerps.com

Chukwu, M. A. (2025). Marital instability in students' academic performance in Nigerian universities. *International Journal of Humanities and Social Sciences.*

Dugbartey, A.N. (2025). Systemic Financial Risks in an Era of Geopolitical Tensions, Climate Change, and Technological Disruptions: Predictive Analytics, Stress Testing, and Crisis Response Strategies. *International Journal of Science and Research.*

Dugbartey, A.N. (2025). Systemic Financial Risks in an Era of Geopolitical Tensions, Climate Change, and Technological Disruptions: Predictive Analytics, Stress Testing, and Crisis Response Strategies. ResearchGate.

Ebirim, U. E., Amah, K. O. and Obi, P. N. (2023). Artificial Intelligence for Effective Teaching and Learning of Science in Colleges of Education in Imo State: The Prospect and Challenges. *Shared Seasoned International Journal of Topical Issues*, 9(1), 101-111.

Hanson, E. D. and Okorie, U. U. (2024). *The Roles of Artificial Intelligence in Library Automation: The Prospects and Challenges.* Erudite Compendiums in Education, 13-23.

Huge, K. C. and Godwin, O. E. (2024). Adoption of Artificial Intelligence in Curbing Fraud in Public Organisation: Assessing Fraud Detection and Control. *GASPRO International Journal of Eminent Scholars*, 11(1), 44-54.

Juárez-López, J. A., Juárez-Moreno, C. A., et al. (2025). The image of the mathematics teachers in high school students. *Journal of Research in Mathematics Education.*

Latifah, N., & Ajie, B. (2025). Analysis of the Impact and Benefits of Technology Trends in Global Accessibility and Customized Learning. ResearchGate.

Lion, C. J. and Ekefre, A. E. (2024). Risk Control and Management in Banking Sector: Investigating the Work of Artificial Intelligence in Mitigating Risks. *International*

Journal of Advancement in Education, Management, Science and Technology, 7(1), 82-92

Mandon, P. (2025). Beyond the AI Divide. World Bank Open Knowledge.

Masunda, O.C. (2025). Peace Education 4.0: A Curriculum Framework for Africa. ResearchGate.

Nathan, N. A. and Isuaiko, O. N. (2025). Artificial Intelligence Involvement in Research Activities: Exploring its Enhancement in Researches Carried Out by Post Graduate Students in Akwa Ibom State Tertiary Institutions. *GASPRO International Journal of Eminent Scholars*, 12(1), 1-13.

Nkweke, D. (2023). The Influence of AI-Powered Learning Tools on Student Performance in Economics. Journal of Resourcefulness and Distinction.

Obiora, M. (2023). Education and Development: AI Integration in Economics Teaching. National Open University of Nigeria.

Okonobong, A. A. and Owushi, J. N. (2023). Montessori Way of Teaching Preschoolers: the Panacea for Effective Learning and Swift Comprehension of the Subject Matter by Preschoolers in Akwa Ibom and Abia States. *Shared Seasoned International Journal of Topical Issues*, 9(1), 49-63.

Onebunne, J. I. (2025). The influence of Nwanekunwa on the academic performance of a child. Nnadiebube Journal of Education in Africa.

Oyinloye, L.M., & ACETISE, L. (2025). AI and Curriculum Development for Higher Education. GOUNI Repository.

Prajapati, C.S., Priya, N.K., Bishnoi, S., & Vishwakarma, S.K. (2025). The Role of Participatory Approaches in Modern Agricultural Extension: Bridging Knowledge Gaps for Sustainable Farming Practices. ResearchGate.

Prajapati, C.S., Priya, N.K., Bishnoi, S., & Vishwakarma, S.K. (2025). The Role of Participatory Approaches in Modern Agricultural Extension: Bridging Knowledge Gaps for Sustainable Farming Practices. ResearchGate.

Sikorskyi, Y., Zablotska, R., & Mariia, Z. (2025). The Impact of Artificial Intelligence on the Global Competitiveness of Labour Markets. *Journal of Theoretical and Applied Information Technology*. pp 102(4)

Srinivasan, S., & Davanageri, M. (2025). Accessibility and Inclusivity in Machine Learning. River Publishers.

Udo, E. E. and Jackson, G. J. (2023). Assessment of Library Science and Technology as a Panacea for Effective Teaching Science Subjects. *Intercontinental Academic Journal of Library and Information Science*, 5(1), 80-90.

Udo, E. E., Obi, P. N., and Iwuji, F. I. (2023). Availability and Utilization of Adequate ICT as Correlates of Effective Learning of Basic Science. *International Journal of Advancement in Education, Management, Science and Technology*, 6(1), 13-21.

Udo-Okon, T. N. and Akpan, E. E. (2024). The Challenges of Artificial Intelligence in Library Management System. *Intercontinental Academic Journal of Library and Information Science*, 6 (1), 96-107.

Yusuf, I., & Ola-Awo, A. W. (2023). Impact of Digital Learning on Academic Performance in Nigerian Secondary Schools. Hummingbird Publications.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

ASSESSMENT OF THE EFFECT OF THE OPERATIONAL EXPOSURE TO SHIPPING, CUSTOMS CLEARANCE AND LOGISTICS

By

Henry M. DANIEL, Ph.D.
Golden Gate University
536 Mission Street
San Francisco, Ca 94105
California
United States of America.

ABSTRACT

The internship was undertaken at a shipping agency in Chennai, focusing on key operational areas such as shipping, logistics, customs clearance, and transportation. The objective of the program was to bridge the gap between academic theory and practical business operations, providing valuable exposure to real-world business practices. The internship served as a core requirement for the Master of Business Administration degree, aiming to develop a deeper understanding of business processes in a dynamic commercial environment. The participant was assigned to the import and export department, where extensive knowledge was gained in ocean freight procedures, including customs clearance for both import and export operations. Emphasis was placed on familiarization with documentation processes, particularly electronic filing systems required for cargo movement. Exposure to various logistics procedures and international shipping documentation enabled the development of technical and operational competencies relevant to the global trade sector. The experience included a combination of hands-on tasks and the study of industry-related materials, contributing to enhanced skills in compliance, documentation, and regulatory procedures. Overall, the internship provided meaningful insights into the functioning of the shipping and logistics industry and played a crucial role in equipping the intern with essential skills applicable to a career in global trade and supply chain management.

KEYWORDS: Core Equipment, Theoretical Work, Relevant Materials, Export Department, Clearances Process, Electronic Filing, Enhance Skills

INTRODUCTION

Transportation is the movement of goods, while logistics is the management of the inward and outward flow of goods from the manufacturer to the end user. Though often used interchangeably, these two concepts form distinctly different segments of the supply chain. Logistics and transportation together ensure that products and services are delivered from one location to another in a systematic and efficient manner (TP. Krishna Kumar, 2020). Logistics involves the integration of several key components such as storage, transportation, cataloging, handling, and packaging of goods. In contrast, transportation specifically addresses the movement of products from one place to another (Ramu, 2020). Together, logistics and supply

chain play a crucial role in ensuring effective transportation and distribution. Logistics refers to the comprehensive process of managing how resources are acquired, stored, and transported to their final destinations. Logistics management includes identifying suitable distributors and suppliers and evaluating their effectiveness and accessibility. Professionals working in this domain are commonly referred to as logisticians (TP. Krishna Kumar, 2020). The supply chain involves the management of goods and services as they move between businesses and locations, encompassing the storage of raw materials, work- in-process inventory, and finished products. It also includes the fulfillment of orders from the point of origin to the point of consumption.

A crucial step in international trade is the customs clearance process. It involves preparing and submitting the paperwork needed to import or export items into a nation. In addition, this procedure includes assessing duties, collecting the goods after clearance, paying any required fees, and representing clients during customs inspections. Here, the person who sends the goods is called the exporter, and the one who receives them is called the importer. For seamless international corporate operations, this process' accuracy and efficiency are essential. With particular relevance to shipping agencies, the study focuses on efficient customs clearing procedures. It seeks to examine the difficulties associated with customs clearance as well as the methods used by shipping companies to expedite these procedures. A clearer grasp of the overall effectiveness and possible areas for improvement can be attained by examining the current customs clearing processes. In addition to shipping companies, this aids students and newcomers to the logistics industry in understanding the operational structure and expanding their knowledge.

This study looks at the roles and duties involved in handling import and export activity and provides insight into the real-time customs clearance procedures. It determines the different tasks and paperwork needed for approval using data collecting and real-world experience. It also emphasizes how shipping organizations' import and export divisions oversee the logistics process and handle any difficulties that may come up during clearance. The report also clarifies how logistics managers work with customs officers, produce required paperwork, and make sure all legal and procedural criteria are met. Building operational excellence and cutting down on delays in international shipments require a realistic understanding of the customs procedure. To improve the efficiency and traceability of the operations, the study investigates the integration of automated platforms, electronic documentation, and digital file systems into contemporary customs clearing procedures.

The study also explores how technology is changing the customs clearance process. Many manual processes have been expedited with the use of digital platforms and electronic file systems, which has improved data accuracy and decreased errors. Faster clearance, real-time cargo tracking, and improved coordination amongst import and export process players are all made possible by these technology improvements. As a bridge between importers, exporters, and government officials, shipping companies are essential to the customs clearance process. International trade depends on their capacity to handle intricate regulatory frameworks and enable efficient clearing procedures. This study sheds light on how shipping agencies

operate, with particular attention on how they manage document processing, cargo tracking, duty assessments, and adherence to international trade regulations. Additionally, the study's conclusions are crucial in pinpointing areas in which these organizations may raise employee happiness. Recommendations to improve service delivery and work conditions can be made by examining internal facilities and operational difficulties. The agencies gain from this as well because it makes it possible for them to implement strategic adjustments meant to improve operational effectiveness and performance. Students and recent hires joining the logistics industry may find the study's conclusions very helpful (Muhamed Rafi, Jabir Moosa, 2023). It offers a comprehensive overview of the real-world applications of customs clearance processes and provides a practical understanding of the skills and competencies required in this domain. It serves as a learning resource for those pursuing a career in logistics and supply chain management. Furthermore, the study aids shipping agencies in evaluating their performance in handling customs clearance. It enables them to identify strengths and weaknesses in their existing systems and adopt best practices from industry standards. This self- assessment can lead to significant improvements in turnaround time, compliance, and customer satisfaction (S. Sailakumar and K. P. Naachimuthu, 2017). Through firsthand experience and direct involvement in the import and export department, practical knowledge was gained about ocean import and export customs clearance processes and procedures. This exposure helped understand how import and export operations are conducted and the critical documentation involved. A thorough understanding of electronic filing systems for import and export cargo was developed, highlighting the importance of accuracy and compliance in document handling (P. K. Maroju, 2023).

The experience also provided valuable insights into the roles of different departments within a shipping agency and how they collaborate to ensure successful customs clearance. The coordination among departments, attention to detail, and prompt communication with customs officials are essential for seamless operations. Understanding these internal workflows and their impact on the overall logistics process was a key learning outcome of the study. In the study of effective customs clearance processes at a shipping agency in Chennai provided a deep understanding of logistics and transportation operations. It emphasized the distinction between logistics and transportation, highlighted the complexities of customs clearance, and showcased the significance of documentation and procedural compliance. The practical exposure to import and export procedures enhanced professional competencies and contributed to a better grasp of how theoretical knowledge is applied in real-world scenarios. The study serves as a valuable reference for future research, academic purposes, and operational improvements in the field of logistics and supply chain management.

Materials And Methods

The term "methodology" refers to the strategies used for the study and encompasses the procedure of gathering information from multiple sources. It serves as the cornerstone for methodical research, guaranteeing that the work is planned and structured. The scientific and rational use of processes and techniques utilized in a study is known as methodology. Even

before the work starts, it entails careful planning and the careful selection of instruments and methods. A wide definition of research is the methodical, scientific search for knowledge. It is a methodical procedure designed to locate pertinent data pertaining to a particular issue or subject. According to Clifford Woody, research involves defining and redefining problems, formulating hypotheses or suggested solutions, collecting, organizing, and evaluating data, drawing conclusions, and finally testing those conclusions to determine their validity and relevance to the hypothesis.

The research design outlines the structure of the study and the procedures for data collection and analysis. It indicates how the research is planned and executed with respect to available data, observations, and sampling methods (R. Shrivastava, 2021). The design of this project follows a descriptive research model. Descriptive research seeks to accurately and systematically describe a population, situation, or phenomenon. It is primarily focused on fact-finding and is used to describe the characteristics of the current situation. Such methods are extensively applied in physical and natural sciences and are equally common in the social sciences, especially in socio-economic surveys and activity analyses. The sampling design adopted for the study is simple random sampling. In this technique, subjects are chosen randomly from a larger population where each subject has an equal chance of being selected. This randomness ensures that the sample is unbiased and representative of the population (V. M. Aragani, 2024). The population for this study consists of experts, employees, and students pursuing internships in the logistics sector. Data was collected from a sample size of 121 respondents, carefully selected from the target population. An appropriate sample size is essential to ensure accuracy and reliability in research findings, and it must meet criteria such as efficiency, representativeness, and flexibility.

The method of data collection included both primary and secondary sources. Primary data was gathered firsthand during the study, mainly through direct communication with respondents via a questionnaire. This questionnaire was designed with the research's core objectives (R. K. Dahal, 2020). The data collection process was structured to ensure that the responses accurately reflect the opinions and experiences of the target group. Secondary data, on the other hand, refers to information already collected and analyzed by others. These sources help to supplement primary data and provide a broader context for analysis. Collecting and analyzing both types of data contributed to a comprehensive understanding of the subject under study.

CONCEPT OF SHIPPING

Shipping refers to the process of transporting goods, commodities, and sometimes people from one location to another, primarily via sea routes but also including land and air transport in broader logistics contexts. Traditionally, the term “shipping” is closely associated with maritime transport, which involves the movement of cargo by ships across oceans, seas, and other navigable waters. Shipping plays a vital role in international trade, enabling the global exchange of raw materials, manufactured goods, and food products. Over 80% of global trade

by volume is carried by sea, making it one of the most critical components of the world economy (UNCTAD, 2022). Shipping is a major driver of globalization and economic development, accounting for over 80% of global trade by volume (UNCTAD, 2022).

However, it also poses environmental challenges, such as greenhouse gas emissions, marine pollution, and the risk of invasive species through ballast water discharge. Efforts are underway to address these issues through regulatory frameworks like the IMO's MARPOL Convention and initiatives promoting decarburization. Modern shipping is a complex industry involving various types of vessels such as container ships, tankers, bulk carriers, and roll-on/roll-off ships, each designed for specific types of cargo. It also encompasses a range of services and activities, including freight forwarding, logistics coordination, customs clearance, and port operations. The concept of shipping encompasses a multifaceted system that is vital to global commerce, economic development, and connectivity. While it has evolved significantly over time, the industry continues to adapt to technological, environmental, and geopolitical challenges. As the world moves toward more sustainable practices, the shipping sector will play a crucial role in shaping the future of international trade.

The shipping industry has embraced various technological innovations to improve efficiency and sustainability. Containerization, introduced in the 1950s, revolutionized cargo transport by enabling standardized, high-volume shipping (Levinson, 2016). In recent years, digitalization, automation, and the use of big data have further optimized logistics and navigation, while alternative fuels and green technologies aim to reduce the environmental footprint of shipping. Shipping is not just a means of transportation but a foundational pillar of global commerce, connecting producers and consumers across continents through a vast and dynamic network.

CONCEPT OF CUSTOMERS CLEARANCE

Customs clearance refers to the set of procedures required to allow goods to enter or leave a country legally. It includes the submission of necessary documentation, payment of duties and taxes, inspection of goods, and compliance with the country's import and export regulations (Grainger, 2008). Customs clearance is not merely a bureaucratic necessity—it plays a strategic role in the facilitation of trade. Efficient customs processes reduce transaction costs, improve supply chain reliability, and encourage investment and trade (OECD, 2018). Furthermore, customs authorities serve as gatekeepers to national security, preventing the entry of prohibited items, counterfeit goods, and biohazards.

Moreover, effective customs operations enhance a country's trade competitiveness. For instance, countries that implement modern customs techniques—like electronic filing and pre-arrival processing—often perform better on indices such as the World Bank's Logistics Performance Index (World Bank, 2023). Customs clearance is a vital element of international trade, acting as a gateway through which goods legally move between nations. It encompasses complex procedures involving documentation, inspections, tax payments, and regulatory compliance. As global trade continues to expand and become more complex, modernizing

customs clearance through technology and international cooperation becomes imperative. By enhancing efficiency and transparency in customs processes, countries can unlock economic growth, promote legal trade, and ensure national security

Literature Review

Several bureaucratic issues, including Brazilian, federal, and international legislation, are involved in the processes of importing and exporting goods in Brazil. The owner or company is required to go through customs clearance in order to release an item when it arrives from abroad, along with the necessary property certificate documentation. Many dispatch businesses have to rethink their internal operations because of the changes to import and export declarations. Simplifying the Brazilian bureaucratic process of importing and exporting (K. Kashyap and V. Sharma, 2022) will have both positive and negative effects on customs clearance, which is why this study is set out to examine them. There was a window of opportunity to conduct an empirical study on the effects on business operations of Brazil's policy of streamlining import and export procedures. This study aims to analyse the situation encountered by the BrasilienseCommissária de Despachos enterprise in Campinas, São Paulo, Brazil, through qualitative and descriptive research. It gives a case study in this regard. Import and export procedures were simplified, leading to shorter, more centralised, and transparent international trade (K. Kashyap and V. Batwara, 2022). The company that was part of the study was able to save time and money by using DU-E, which allowed them to attend more processes in the same period. By providing other international trade companies with insight into the mapping of activities that have been reorganised to meet the new simplifications, this paper aims to make a practical impact on society through the case study. According to the hypothesis, future scholars will be able to make use of the current and operational data on Brazil's import and export system.

More trade facilitation with the global economy is something developing nations should make possible if they want to open up new possibilities for growth in the Global South (S. Akram and Z. Pervaiz, 2024). Ensuring regulatory compliance and efficiently processing a high volume of consignments and goods are often competing concerns for customs personnel, who are at the front line and operate as gatekeepers for market access (S. Akram and Z. Pervaiz, 2025). Developing nations face the double whammy of having to deal with the increasing problem of illicit or unlawful commerce and customs procedures that slow down the global supply chain and charge exporters and traders too much. When combined with automated risk-based selectivity, postclearance audits (PCAs) offer a powerful tool for risk management (S. Akram, M. U. Hassan, and M. F. Shahzad, 2024). When it comes to customs processing, this method offers a comprehensive strategy for risk control. Furthermore, PCAs can aid customs in facilitating the rapid release of products while maintaining strict control over high-risk shipments. Within the context of Bangladesh's local regulatory structure, this essay analyses the shortcomings and difficulties of applying PCAs. In order to accomplish this goal, this research has analysed and derived insights into incorporating PCA into the regulatory framework of Bangladesh by collecting primary evidence from prominent stakeholders, such as Bangladesh

Customs. Developing greater technical capacity through skilling-up the workforce, establishing online connectivity among relevant agencies, customs-to-customs cooperation, and automating risk-based selectivity are all obstacles that this article will examine. The logistics business has been seeing modest growth in popularity in recent years, thanks to the fast expansion of the Internet of Things and the profound integration of the two. Logistics customs clearance can be made more efficient with the use of radio frequency identification (RFID) technology and the development of an RFID-based logistics customs clearance information platform. This will make the jobs of administrative departments like customs, taxation, inspection, and quarantine much easier and faster. In light of this, "the design and realisation of RFID-based logistics clearance information platform" (V. M. Aragani, and P. K. Maroju, 2024) is the primary focus of this study. Layers of applications, system interfaces, data platforms, and perceptions make up the logistics clearance information platform that is planned out in this article. The article's major functions are designed using RFID technology. Testing has shown that the platform's page jump latency has an average value of approximately 1 s, which is sufficient for verifying the platform's effectiveness. This demonstrates the platform's stability, responsiveness, and outstanding parallel computing capabilities. Aiming to identify elements impacting supply chain efficiency, the study set out to do just that. Data were gathered from relevant existing literature, indicating a qualitative research approach. All businesses that imported or exported goods via the Jeddah port were included in the study's population (V. M. Aragani, and P. K. Maroju, 2024). You may find the samples in Al-Dawliya Watches & Jewellery and IKEA. Import and export businesses face a potential bottleneck in the customs clearance process, which is both essential to international trade and supply chain management and a potential Achilles' heel. As the global economy evolves, this process can undergo adjustments. Increased lead times, less product availability, and a decline in customer service quality were all consequences of the company's inability to clear shipments within defined periods. Businesses and government officials involved in customs clearance can both add unnecessary delays to the clearance process.

According to recent research, merchants and other intermediaries make international trade easier by lowering the fixed trade costs faced by producers that bypass these middlemen and deal with exports and imports directly. Firms that utilise customs brokers instead of self-declaring have lower fixed costs of clearing products through customs, according to this study. Customs brokers are an understudied sort of middleman in economics. In this work, we use panel data on Norwegian trade transactions to show that these brokers are used by most manufacturing firms who engage in international trade, and that these brokers often manage substantial trade values on behalf of many producers (P. K. Maroju, 2024). The proportion of a producer's market-specific trade that is self- declared as opposed to handle by brokers grows in direct proportion to the traded value, according to an econometric study. This persists even after accounting for both known and unknown producer, national, and product-level variables, which is consistent with the predictions of theoretical models on trade intermediaries. The results for importing and exporting are comparable, suggesting that brokers help in both types of trade. The prosperity of nations has been greatly influenced by their foreign commerce.

Every country has its own set of goals and policies that it updates from time to time in an effort to boost trade. When shipping goods abroad, you run the danger of encountering a number of serious issues (K. P. Naachimuthu, S. Bhuvaneshwari, 2024). Both the buyer and the shipper in India are dealing with minor issues; the main one is the inefficiency of the customs clearance and documentation processes. Policies and duty plans put in place by the government are subject to periodic revision. Knowledge of documentation and efficient documentation work are so crucial. Complete paperwork is done by the clearing agents and the authorised licence holder. The clearing agency acts as an intermediary between the buyer and the shipper, handling the necessary paperwork and clearance processes. This article examines the improvement of customs' traditional legal functions as well as the import/export documentation and clearance process. It stresses the significance of customs house agents (CHAs) who document quickly and efficiently. New kinds of documentation have emerged as a consequence of technology advancements, which are highlighted in this study. The paper may fail to include the characteristics and analysis of the document, as well as the consequences of various bills used in commercial transaction. Still, there's plenty of need for greater research in this area. A general review style paper is this one. The lack of prior research on this topic is what prompted us to conduct this study. Nonetheless, this research does make use of a number of secondary sources and pertinent literatures.

This paper delves into the importance of customs policy coherence and coordination in easing trade. It explores the potential of trade facilitation measures like integrated border management and single-windows to enhance customs control, management, and coordination in Latvia and other EU countries (K. Ashifa, 2022). Businesses and governments alike can reap the rewards of trade facilitation programs. Finding a middle ground between trade security and trade facilitation means ensuring that legitimate goods and travellers can cross borders without excessive obstacles and that the international commerce supply chain is protected against organised criminal threats. The purpose of this article is to assess Latvia's, an EU member state, real requirements for an Integrated Customs Control System. The research is grounded in a thorough examination of relevant literature and the first-hand knowledge of customs officials. Open-source information and statistics data about Latvian customs support empirical research.

Many international organisations have been thinking about how to use ICT to improve customs administration processes and trade facilitation for a while now. These include the European Union, the World Bank, the World Customs Organisation, the World Trade Organisation, and the Organisation for Economic Cooperation and Development (OECD). In light of the present worldwide economic slump, governments, businesses, and individuals are all seeking to improve their personal financial situations. A country's customs services are a part of its commercial profile, which is essential for boosting economic success (K. Ashifa, 2022). All customs operations can be made more efficient and, in turn, national finances can be improved via careful use of information and communication technology. This study defines information and communication technology (ICT) and highlights its significance in customs settings. Customs must reevaluate its business model in light of recent changes to the technological and commercial landscape in which it operates. Traditional ideas like

declarations and "regimes" with an emphasis on imports and, for many nations, revenue, continue to form the basis of Customs' operations, despite the prevalence of modern risk management approaches, commercial business systems, and Electronic Data Interchange (EDI). We need to reevaluate our mission and get back to the fundamentals. We confirm collecting money, facilitating commerce, protecting society, and collecting trade statistics in the United Kingdom (UK) (K. Ashifa, 2022). However, we are putting the outdated Customs textbooks to rest and are instead investigating how we may optimise the utilisation of electronic data that is inherent to businesses' day-to-day operations in order to evaluate risks related to security, compliance, admissibility, and revenue. This necessitates a cooperative effort to increase compliance and crack down on non- compliance through the use of information technology systems and risk management based on intelligence. An even more revolutionary notion is to evaluate the consignor's responsibility in providing reliable information to an electronic data pipeline, rather than focusing on the point of importation. This transition would occur as early in the supply chain as possible.

CONCEPTUAL & THEORETICAL REVIEW

Custom clearance procedures encompass a range of activities required to facilitate the legal import and export of goods into or out of a country. This process primarily involves the preparation and submission of relevant documentation that helps in assessing and permitting the movement of cargo. It includes representing the client during customs inspection, verifying and evaluating the shipment, payment of duties, and finally, securing the release of cargo once all regulatory requirements are met. The documents required for customs clearance differ slightly between export and import processes. In export documentation, essential records include the purchase order from the buyer, the sales invoice, a packing list, a shipping bill, a bill of lading or air waybill, and a certificate of origin. For imports, the necessary documents consist of the buyer's purchase order, the supplier's invoice, the bill of entry, the bill of lading or airway bill, the packing list, and a certificate of origin. These documents serve as evidence and support in identifying the nature of the goods, their value, and their country of origin, which are all important aspects for customs officers during clearance (S. Shahzad, and S. Zareen, 2024). The initial and one of the most vital stages of the customs clearance process is the filing of the bill of entry. This document is essentially a declaration by the importer or their agent that provides detailed information about the imported goods. It is filed in four copies, one original and three duplicates. One copy is retained by customs, another is meant for the bank handling remittance, the third copy is given to the importer, and the last is retained in customs records. With modernized procedures, this bill is now often computerized. The customs officer assigned will inspect the paperwork for accuracy, verifying whether the goods comply with regulations and if all documentation has been properly submitted (Shbool, Mohammad & Yousef Al-Abdallat, 2021).

The next step in the customs clearance process is the assessment of the goods. This task is performed by the assessing officer, whose role is to determine the appropriate duty liability for the shipment. The assessment includes verifying whether any exemptions or

incentives under various export promotion schemes apply to the shipment. The assessing officer must also ensure that the goods are correctly classified according to customs tariff schedules and that there are no restrictions or prohibitions on the items being imported or exported (Shbool, Mohammad & Yousef Al-Abdallat, 2021). They take into account the invoice details, supporting documents, and declarations provided with the bill of entry. Furthermore, they refer to valuation data available with customs to ensure consistent valuation practices. The aim is to ensure legal compliance while facilitating legitimate trade. The Electronic Data Interchange (EDI) system has modernized the customs clearance procedure by digitizing many of the assessment and evaluation processes. In this system, cargo declarations and duty calculations are managed by software, significantly reducing the need for manual intervention (K. Kashyap and M. Chaudhary, 2023). Once the assessment is completed in the EDI system, the assessed bill of entry is printed at the service center. Notably, in many instances, the examination of physical documents coincides with the actual inspection of goods. The EDI system often has built-in appraisal functions that can automatically calculate duty liabilities, eliminating the need for an assessment officer in some cases. It also allows for queries to be raised and processed electronically, making communication between customs and traders more efficient. Additionally, a telephone inquiry facility is available at certain customs stations to track the status of documents, and any queries can be printed using fax facilities (U. F. Arain, and M. M. Afzal, 2024).

Modifications to the bill of entry may be required if discrepancies or errors are found during the assessment. The customs officer may initiate changes, but these can only be made with permission from the Deputy or Assistant Commissioner of Customs. It is crucial for the accuracy of customs records and proper duty calculation that such changes are authorized and documented. Once the bill of entry is finalized, the importer or exporter must proceed with the payment of duty. Duties are generally paid using a specific challan known as the TR-6. Customs houses have designated branches of authorized banks where these payments must be deposited. Importers and exporters need to verify the correct bank branch to avoid any delays in the clearance process. In certain scenarios, importers may choose to file the bill of entry in advance, even before the arrival of goods. This provision, known as prior entry, allows for faster processing upon the arrival of the cargo. The bill of entry filed under this scheme is valid only if the goods arrive within thirty days of the date of submission. This provision helps save time in urgent trade operations. For goods imported under specialized schemes like the Duty Exemption Entitlement Certificate (DEEC) or Export-Oriented Units (EOUs), customs clearance requires the execution of bonds. These bonds serve as guarantees that the importer will fulfill certain obligations, such as re-exporting the goods or utilizing them according to the scheme guidelines. In case of default, the importer is liable to pay the full amount of duty that was originally exempted. The bond value is usually equivalent to the total duty that would have been payable, and importers must furnish a bank guarantee alongside. The value of this guarantee often depends on the track record and status of the importer, with reputed importers sometimes being given relaxation.

Another category in customs clearance is related to warehousing. When goods are not immediately required for use or sale, importers may opt to store them in bonded warehouses. This requires the submission of a different form of bill of entry specific to warehousing. The evaluation of such goods is carried out just like in a standard import, but the payment of duty is deferred until the goods are withdrawn from the warehouse. Upon withdrawal, the importer must file a new document known as the ex-bond bill of entry. This document reflects the portion of the warehoused goods being taken out and ensures duty is paid only on that quantity. This process helps businesses manage cash flow more effectively, especially when goods are to be used or sold in stages. The final stage in the customs clearance process is the actual delivery of goods. Once all formalities, assessments, payments, and document verifications have been completed, and the customs officer has confirmed clearance, the port officials are notified. The importer can then arrange to receive the cargo. In the case of warehoused goods, the ex- bond bill of entry must be submitted to obtain permission to remove the items from storage. It is only after fulfilling all the necessary legal procedures and receiving confirmation from customs that the delivery of goods is authorized. Altogether, the customs clearance process is a detailed and regulated procedure that ensures legal compliance, proper valuation, and safety in cross-border trade. It is critical for governments to maintain revenue integrity, protect national interests, and support fair trade practices. At the same time, with technological advancements such as the EDI system and improved infrastructure, the process has become more streamlined, enabling traders to experience reduced delays and increased efficiency in their import-export operations.

RESULTS AND DISCUSSION

The study reveals several important insights based on the responses collected. A significant majority of 93% of the respondents were male, and 66% were within the age group of 18 to 25 years. Educationally, 56% had completed their undergraduate degrees. Additionally, 66% of the participants were employed, and the same percentage affirmed their employment status. When asked about a multiple-option question, 67% of the respondents chose “All of the above” as their response. About 40% of the participants were engaged in export customs clearance activities.

Regarding documentation, 43% of the respondents agreed that preparing documents for customs clearance requires considerable time. Meanwhile, 51% expressed that customs clearance zones are specifically focused on containerized cargo. However, 37% agreed that the customs clearance procedures and time required are simple. Furthermore, 67% of the employed respondents strongly agreed that they were satisfied with the services provided by the customs clearance zone. Half of the respondents found the cost of customs clearance to be affordable, and 69% indicated their preferred mode of cargo transportation. The study also found that 63% of the respondents agreed that customs clearance expenses depend on the shipment’s location. When asked about independent brokers, 47% viewed their involvement in customs clearance positively. Interestingly, 27% of the respondents stated that they faced both types of problems during the clearance process, while 29% highlighted those live inspections posed challenges. In terms of duty payments, 69% confirmed that charges depend on the

variety of goods. Additionally, 74% believed that every item must undergo lab testing during live inspections.

The study further showed that 46% of the respondents believed that both the procedures and documentation involved in customs clearance are the same for air and sea transport. When asked how long it typically takes for imported goods to clear customs, 38% reported a duration of 1 to 2 days. Lastly, 44% of the respondents affirmed the possibility of achieving IT-based clearance.

Based on these findings, several suggestions were proposed to improve the customs clearance process. The company is advised to fully computerize its documentation process to enhance efficiency. It should also preplan for potential challenges during the customs clearance process. Freight forwarding and multimodal transportation should receive equal attention as customs clearance. The adoption of modern marketing techniques is also recommended to enhance the company's visibility and outreach. The agency should consider expanding the range of customs services offered to clients and hire more talented personnel to improve service quality. More focus should be given to air transportation, and the company should consider opening new branches in less competitive areas such as Karaikal Port and Nagapattinam Port. Expanding into Gulf countries and offering 24/7 customer service would also be beneficial.

However, the study has some limitations. The sample size was restricted to only 121 respondents, which may not fully represent the broader population. Time constraints posed challenges to the depth of analysis. There were also difficulties in analyzing the collected data. Moreover, the study considered only the opinions of employees, students, and experts in the field of logistics, which may limit the diversity of perspectives included in the findings.

CONCLUSION

During the course of this project, insights were gained into the various challenges encountered in the customs clearance process. A major issue observed in both export and import activities revolves around documentation. Inaccurate or incomplete documentation often leads to delays and penalties. Therefore, it is essential to ensure that all legal documents required for export and import are complete, accurate, and neatly prepared. According to the survey conducted, some of the most common challenges faced by shipping agencies include difficulties in file assessment, forwarding to the accounts department, and live inspections. These challenges are often exacerbated by minor errors and instances of carelessness. Through careful analysis and understanding, several solutions can be proposed to address these issues. For example, proper planning for customs inspections can help avoid penalties. Additionally, issues in the transportation department, such as inefficiencies in loading and unloading, non-availability of trailers and trucks, and less-than-truckload shipment problems, should be addressed. By resolving these operational inefficiencies, the shipping industry can improve its efficiency and contribute to a more reliable future. The study was enriched by exposure to the operations of shipping agencies, which provided valuable learning opportunities. This environment allowed for a deeper understanding of the real-world challenges in logistics and customs clearance. The experience gained from working with shipping agencies not only

enhanced knowledge but also significantly contributed to the practical understanding of the customs clearance process.

REFERENCES

A. Hoti and A. Dermaku, "Corporate governance in the banking industry of Kosovo: does board size and board independence matter?" *International Journal of Finance & Banking Studies*, vol. 7, no. 3, pp. 20-34, 2018.

A. Muthulakshmi, J. Tamilselvi, and S. S. Hameed, "Moderating effects of challenges on self-efficacy and satisfaction of women street vendors," Int. J. Electron. Finance, vol. 13, no. 3, pp. 386–402, 2024.

B. A. Haddad, M. Chuman, R. Kouki, "Clearance process and its effect on the supply chain performance in jeddah port," in effat university business and management papers, vol. 18, no. 12, pp. 31-39, 2021

Bäckström, K. (2011). Shopping as leisure: An exploration of manifoldness and dynamics in consumers' shopping experiences. Journal of Retailing and Consumer Services, 18(3), 200-209.

Bloch, P. H., Ridgway, N. M., & Dawson, S. A. (1994). The shopping mall as consumer habitat. Journal of Retailing, 70(1), 23-42.

Chaffey, D. (2019). Digital Business and E-Commerce Management (7th ed.). Pearson Education.

D. B. Acharya, B. Divya, and K. Kuppan, "Explainable and fair AI: Balancing performance in financial and real estate machine learning models," IEEE Access, vol. 12, no.10, pp. 154022–154034, 2024.

D. B. Acharya, K. Kuppan and B. Divya, "Agentic AI: Autonomous Intelligence for Complex Goals—A Comprehensive Survey," in IEEE Access, vol. 13, no.1, pp. 18912-18936, 2025.

D. Qehaja, F. Zeka, and A. Hoti, "The effect of foreign direct investments on trade balance in southeast Europe during the period 2000–2018," *International Journal of Applied Economics, Finance and Accounting*, vol. 13, no. 1, pp. 29-39, 2022.

Grewal, D., Roggeveen, A. L., & Nordfält, J. (2020). The future of retailing. Journal of Retailing, 96(1), 69–76.

H. Medin, "Customs brokers as intermediaries in international trade," Rev. World Econ., vol. 157, no. 2, pp. 295–322, 2021.

Hausman, A. (2000). A multi-method investigation of consumer motivations in impulse buying behavior. Journal of Consumer Marketing, 17(5), 403–419.

Hofstede, G. (2001). Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations (2nd ed.). Sage Publications.

Jones, P. (2010). Retailing and Retail Operations. Goodfellow Publishers.

K. Kashyap and P. Rathore, "Regulating competition and cartelisation in the corporate real estate sector: The emerging market case," Otoritas: J. Ilmu Pemerintahan, vol. 11, no. 2, pp. 63–77, 2021.

K. Kashyap and V. Batwara, "Legal analysis of real estate investment trust regulation in India," BRICS Law J., vol. 9, no. 1, pp. 114–135, 2022.

K. Kashyap and V. Sharma, "Legal aspects of structured finance in the infrastructure sector in India," J. Law Polit. Sci., vol. 30, no. 1, p. 441, 2022.

K. Kuppan, D. B. Acharya, and B. Divya, "Foundational AI in insurance and real estate: A survey of applications, challenges, and future directions," IEEE Access, vol. 12, no. 12, pp. 181282–181302, 2024.

L. N. R. Mudunuri, V. M. Aragani, and P. K. Maroju, "Enhancing Cybersecurity in Banking: Best Practices and Solutions for Securing the Digital Supply Chain," *Journal of Computational Analysis and Applications*, vol. 33, no. 8, pp. 929-936, Sep. 2024.

Laudon, K. C., & Traver, C. G. (2021). E-commerce 2021: Business, Technology, and Society (16th ed.). Pearson.

Miller, M. (2012). The Department Store: A Social History. Taylor & Francis.

North, D. C., & Thomas, R. P. (1973). The Rise of the Western World: A New Economic History. Cambridge University Press.

R. K. Dahal, "Customer satisfaction in Nepalese cellular networks," Tribhuvan University Journal, vol. 33, no. 2, pp. 59–72, 2019.

R. Shrivastava and N. K. Surarchith, "Effect of employees' attitude towards ERP post implementation on support of top management and business performance – A study of critical success factors on post implementation," The J. Contemp. Issues Bus. Gov., vol. 27, no. 2, pp. 684–689, 2021.

R. Shrivastava and S. Shrivastava, "Relationship marketing: Spoke of a wheel reference to industrial customer's expectations and contentment towards identification products," J. Bus. Manag. Soc. Sci. Res., vol. 1, no. 3, pp. 79–82, 2012.

Rick, S. I., Pereira, B., & Burson, K. A. (2014). The benefits of retail therapy: Making purchase decisions reduces residual sadness. Journal of Consumer Psychology, 24(3), 373–380.

S. Akram and Z. Pervaiz, "Assessing Inequality of Opportunities for Child Well-being in Pakistan," Child Ind. Res., 2025.

S. Akram and Z. Pervaiz, "Estimation of inequality of opportunities across countries: a multidimensional approach," Stud. Econ. Econometrics, vol. 48, no. 1, pp. 18–41, 2024.

S. Akram and Z. Pervaiz, "The Role of Institutions and Social Inclusion in Trust Building," Qual. Quant., vol. 58, pp. 3887–3903, 2024.

S. Akram, F. Zahid, and Z. Pervaiz, "Socioeconomic determinants of early childhood development: evidence from Pakistan," J. Health Popul. Nutr., vol. 43, no. 1, p. 70, 2024.

S. Akram, M. U. Hassan, and M. F. Shahzad, "Factors Fuelling the Persistence of Child Labour: Evidence from Pakistan," Child Ind. Res., vol. 17, no. 4, pp. 1771–1790, 2024.

Shaw, D., Hogg, G., Wilson, E., Shiu, E., & Hassan, L. (2006). Fashion victim or responsible consumer? Ethical fashion consumption. International Journal of Retail & Distribution Management, 34(4/5), 301–314.

Shbool, Mohammad A., Farah Altarazi, and Wafa' H. AlAlaween. "A Dynamic Nonlinear Autoregressive Exogenous Model to Analyze the Impact of Mobility during COVID-19 Pandemic on the Electricity Consumption Prediction in Jordan: Covid-19 Mobility Impact Model for Electricity Consumption in Jordan." *Journal of Scientific & Industrial Research (JSIR)* 83, no. 2 (February 6, 2024): 164–73.

V. M. Aragani and P. K. Maroju, "Future of blue-green cities emerging trends and innovations in iCloud infrastructure," in Advances in Public Policy and Administration, pp. 223–244, IGI Global, USA, 2024.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

ARTIFICIAL INTELLIGENCE AND THE EFFICIENCY OF SYSTEM MANAGEMENT IN BANKS: AN /ACADEMIC DISCOURSE

By

Dr King M. LUCKY
Department of Engineering
Faculty of Engineering & Technology
University Avenue W
Waterloo, Ontario n2l 3g1
Canada
North America

ABSTRACT

Today's global economy is witnessing increasing competitiveness driven by therapid development of information technologies, which have become pivotal in various sectors, including regional and urban planning. The tremendous advancement in information systems has propelled institutions, both in the public and private sectors, towards adopting modern technologies to process financial and accounting data in innovative ways characterized by professional and intellectual intelligence. This transformation is crucial for enhancing the sustainability of financial institutions, particularly banks, in a dynamic environment that demands continuous adaptation to cyclical, contingent, and sudden changes. In the context of regional and urban planning, the efficiency of financial and banking systems has become a fundamental element in supporting sustainable development and effectively financing urban projects. However, traditional methods of bank management are no longer sufficient to keep pace with the accelerating developments in enhancing the efficiency of financial systems, especially concerning the prevention of manipulation, detection of fraud, and management of risks. This situation has necessitated the adoption of advanced methodologies based on Artificial Intelligence (AI), which provides sophisticated technologies that enable the enhancement of the efficiency and reliability of banking system management. This contributes to achieving the requirements of SAR and QIP necessary for highly efficient bank management, which positively reflects on regional and urban planning by improving project financing and directing investments in more accurate and sustainable ways. Artificial intelligence is considered one of the most important modern technologies that significantly contribute to rapid technological development, thereby enhancing opportunities for innovation and growth in various fields. With the increasing use of AI technologies, it has become vital in improving the efficiency of urban planning, resource management, and enhancing the sustainability of cities, in addition to improving the quality of banking services and increasing the potential and efficiency of banks. Despite the widespread adoption of these technologies and the extensive discussion about their capabilities, they are still surrounded by ambiguity or exaggeration that may raise expectations and lead to unrealistic perceptions. This makes the understanding of AI and its real potential unclear to many decision-makers or executives in the public and private sectors, which calls for conscious strategies that effectively employ these technologies in supporting sustainable regional development. This research seeks to achieve two main objectives: The first is to clarify the concept of artificial intelligence and its technologies, along with the concept of electronic financial auditing, its procedures, and everything related to bank management. The second objective is to demonstrate the role of artificial intelligence in enhancing the quality of bank management and its reflection on overall

performance, with a focus on its impact on regional and urban planning. These technologies contribute to the development of financial systems that support urban projects and enhance the efficiency of regional planning through effective financial resource management and the achievement of economic sustainability in urban areas. The research was based on two main hypotheses: The use of artificial intelligence techniques helps in achieving quality bank management and performance in the implementation of all banking systems and programs (electronic auditing, deposits, withdrawals, etc.), thereby enhancing the efficiency of regional and urban planning by supporting development projects and improving the investment of financial resources. The use of artificial intelligence plays a role in achieving quality performance, and the use of digital transformation technologies leads to the activation of continuous auditing. Electronic financial banking auditing in general, supported by artificial intelligence, helps in enhancing transparency and governance within banks, leading to more accurate financial decisions that positively reflect on the sustainability and financing of urban and development projects. On the practical side, work was done to test the role of artificial intelligence in implementing the efficiency of banking system management and its role in achieving quality performance, through the use of a questionnaire distributed electronically to a number of academic accountants and auditors in a selected group of banks. A total of (54) questionnaires were distributed, and (32) questionnaires were answered and analyzed using the (SPSS 30 - 2024) program. Based on this, the research was divided into four main axes:

The first axis dealt with the research methodology, while the second axis reviewed the theoretical framework of artificial intelligence and its role in improving the efficiency of banking system management. The third axis focused on the applied aspect, while the research concluded in the fourth axis with conclusions and recommendations aimed at enhancing the integration between artificial intelligence and bank management within the framework of sustainable regional planning.

KEYWORDS: Artificial Intelligence in Bank Management, Sustainable Urban and Regional Planning, Risk Management, Fraud Detection, Urban Project Financing, Quality Performance, Technological Innovation, Financial Decision-Making.

Axis One: Research Methodology

1-1 Research Problem: The increasing volume, diversity, and complexity of banking financial operations, particularly in light of the expansion of institutional activities and the growing pressures on them, have led to reliance on methods and approaches that incorporate financial, accounting, and administrative patterns to achieve high levels of efficiency and performance. To achieve this, these banks need to control their internal systems involved in financial transactions, which necessitates the use of artificial intelligence to implement electronic auditing of financial activities, and thus the adoption of advanced technologies embodied by AI. Accordingly, the research problem has been formulated by posing several questions as follows:

1- Does the use of artificial intelligence help in implementing efficiency (comprehensive auditing of banking systems) in electronic auditing?

2- Does the use of artificial intelligence play a role in achieving quality performance?

1-2 **Research Importance: The importance of the research stems from the following:**

1- The significant role of using advanced electronic systems in influencing decision-makers and gaining the trust of clients and stakeholders within banks, and the necessity for banks to pay attention to its application to improve performance.

2- Identifying the role of artificial intelligence in implementing efficient electronic financial auditing and its role in achieving quality performance.

1-3 **Research Objectives:** By presenting the research problem and its importance, this research seeks to achieve the following objectives:

1- To explain the concept of artificial intelligence and its technologies, and the concept and procedures of using electronic systems.

2- To demonstrate the role of artificial intelligence in implementing the use of electronic auditing banking systems and its role in achieving quality performance in bank management.

1-4 Research Hypotheses: Based on the research problem, importance, and objectives, the research is based on two hypotheses:

1- The use of artificial intelligence leads to the implementation of electronic financial auditing.

2- The use of artificial intelligence plays a role in achieving quality performance in bank management.

1-5 **Data Collection Methods:**

Theoretical Aspect: Sources collected from Arabic and foreign journals, along with theses, dissertations, and modern scientific conferences that addressed the research topic, specifically those related to artificial intelligence and electronic auditing, were utilized.

Practical Aspect: To cover the research hypotheses and its theoretical framework and to reach conclusions, the research relied in its practical aspect on the preparation and design of an electronic questionnaire. This questionnaire was distributed to accountants and auditors working in a selected group of banks, totaling distributed electronic questionnaires. questionnaires were answered, questionnaires were not answered, and were invalid for analysis. The statistical program (SPSS) was used to test the hypotheses and reach conclusions.

Axis Two: Theoretical Framework

2. The Genesis of Artificial Intelligence

Artificial intelligence is considered a modern cognitive science. The beginnings of research related to artificial intelligence date back to the 1940s, with the circulation, spread, and use of computers. In the early 1950s, research interest focused on neural networks. Then, in the 1960s, research activity turned to knowledge-based systems, which continued to be worked on until the end of the 1970s. In the early 1980s, the announcement of the Japanese project, which adopted the fifth generation of computers, marked a significant leap in the field of artificial intelligence research (Al-Samarrai & Al- Shuraida, 2020). Artificial intelligence is a science that works on researching how to make computers perform tasks and activities that humans perform, but in a way that takes less time and effort (Abdul Majeed, 2009).

The use of information technology in managing the business matrices of banks is not a new matter, such as the current use of computers in financial transactions, which has been in use for a long time and continues to this day. However, the introduction of advanced information technologies such as artificial intelligence and the increase in the quantity and volume of data are important factors that have made those responsible for bank management focus on the benefits and gains from their use of information technologies in the process of improving the efficiency and quality of bank performance, which has become a modern trend towards that changing world of auditing (Samahdan& Salmo, 2021).

CONCEPT OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is an application on computers that works to build programs capable of studying and applying the repetitive tasks and activities performed by humans (Anbar,2015). It has also been defined as giving the computer the ability to think independently and through external data provided to machines, enabling them to learn, interpret, and develop themselves (Isaca,2018). Furthermore, it has been described as a machine that applies tasks

through algorithms as its basis and in an intelligent manner through the machine's ability to receive data and information as inputs in a rapid manner (Aneta, 2019), process these inputs. Accordingly, artificial intelligence is a set of cutting-edge programming approaches and strategies for accounting systems that can be utilised to create and expand a system that mimics aspects of human intelligence and enables the user to carry out an inferential procedure based on the rules and information kept in the computer's memory. This enables the computer to reason and solve issues in a way that is more precise and well-structured than human reasoning.

TYPES OF ARTIFICIAL INTELLIGENCE

There are several types of artificial intelligence that can be used in banking operations, as follows:

a. Assisted Artificial Intelligence: This refers to machines that perform simple tasks, duties, and operations through the availability of computing power and big data, which helps in the decision-making process. This type of intelligence is characterized by its use in accomplishing main tasks and duties, thus freeing the auditor from performing the more complex and intricate duties (Helmy, 2022).

b. Augmented Artificial Intelligence: This type of intelligence allows institutions and those in charge of banks to do things they cannot do by supporting human decision- making, rather than by simulating autonomous intelligence. Augmented intelligence can make some decisions on its own, but these are not completely independent decisions. Consequently, this type of intelligence poses a risk to management independence if the management is new and inexperienced in dealing with artificial intelligence and its application.

c. Autonomous Artificial Intelligence: This type of intelligence is more advanced and complex than its predecessors. It refers to machines and systems that perform activities and operations on their own, regardless of human intervention, and perform duties and tasks that were unsafe or impossible for management to carry out. This type is considered risky due to its independent operation, which leads to management's inability to see how the system makes decisions. This represents a risk to the efficiency of overall performance execution for banking activities (Uglum, 2021).

Therefore, management must be aware and knowledgeable of these types and how to benefit from each type before using any of them, to avoid any risks that may result from such use.

ARTIFICIAL INTELLIGENCE TECHNIQUES

Artificial intelligence includes several techniques, which are:

1. Neural Network Technology: This is a technology through which the process of integrating cognitive sciences and computing is carried out to perform specific duties and tasks by simulating the work of the brain's nervous system. This means it integrates artificial intelligence and neuroscience to solve many complex tasks (Madahi, 2022). The emergence of this technology is necessary to teach the computer how to think like human thinking. It allows the computer to simulate and imitate the human brain more closely, while still being more accurate, faster, and less biased. A neural network is a computer system designed to categorize and classify data and information in the same way the human brain or thinking does. It can look at images, distinguish their contents, and classify them according to what has been presented. It uses data that the user can access and make a decision (Jarrah, 2019).

2. Machine Learning Technology: This is a set of programming techniques that allow the computer to adapt its behavior to its environment without human intervention. From a technical standpoint, it is defined as an algorithm designed to make decisions independently without prior programming (Al-Ta'i, 2023). This technology relies on a fundamental principle:

that the computer receives data and information and learns on its own without any intervention (B., 2019). This technology is promising within the realm of artificial intelligence techniques, and training and knowledge can be implemented very quickly through a large dataset for speech recognition, face recognition and distinction, recognition of the required translation, and recognition of other things. This is in contrast to manual intervention of a programmed software with limited instructions to complete a specific task (Reese, 2017).

3. Deep Learning Technology: This is one of the artificial intelligence techniques that involves human intervention in creating a simulation of human thinking and is used to process data and information and assist in making decisions (Taher & Ahmed, 2022). It is also a machine learning method, but it is broader and more fundamental, enabling high-precision use for auditing data and information and then drawing conclusions.With this technology, it has become possible for the computer to detect aspects that need to be noted among a dataset, which are called features or characteristics. The computer automatically acquires features that are difficult to explain logically and linguistically, such as classifying image data through programming. It is necessary for humans to input and define quantities of features (Jarrah, 2019). In addition to the main techniques mentioned, there are other technical tools that can be included within artificial intelligence techniques, including expert systems, training and experience, and technical knowledge.

2.3 Integration of Bank Management with Electronic Auditing for All Banking Business Management Matrices

2.3.1 Concept of Electronic Auditing: Electronic auditing is a process that involves collecting, estimating, and evaluating information to determine whether the use of computers contributes to and protects the institution's assets, verifies the integrity and accuracy of its financial data, and achieves objectives with the required effectiveness and efficient use of resources (Barzan, 2015). It has also been defined as the application of a computer system using information technologies to assist the auditor in planning, control, and documenting the audit process (Abu Aqlah & Othman, 2021).Furthermore, it has been described as the process of auditing through information technology, which helps auditors in various stages of the audit process, including planning, control, risk identification, and risk assessment (Mohsen&Al-Saqqa, 2022). Accordingly, electronic auditing is the process of applying modern computer technology, such as advanced artificial intelligence techniques, which will assist the auditor in performing the assigned audit task in its various stages and completing the audit process with high efficiency, accuracy, and speed that surpasses traditional auditing.

The use of artificial intelligence techniques enhances and significantly supports the electronic auditing process. The work will be characterized by efficiency, accuracy, good organization, and systematic approach through this intelligent machine that can do everything on its own automatically. The Italian philosopher Machiavelli mentioned that there are three types of intelligence: the first is excellent, which understands the details of things on its own; the second is good, which appreciates what others know; and the third is useless, as it does not understand things on its own (Abu Al-Qasim, 2012).

2.3.2 Electronic Auditing Procedures: There are procedures and duties that bank management must follow when implementing electronic auditing, which are as follows:

a. Skills and Competence: Bank management must possess sufficient knowledge in using the systems implemented by the computer in its work to plan the assigned audit process and supervise the workflow. Management must also verify whether a set of specialized skills in these technical systems is required during the audit process. The objectives of following and using these skills are as follows (Barzan, 2015):

- To understand adequately the accounting system and the control system affected by the use of technologies and systems on the computer.
- To determine the impact of this environment on risks and on overall risk assessments.
- To design and conduct appropriate control tests and substantive key procedures.

b. Planning the Audit Process: This is done through understanding the accounting system and the internal control system, which enables bank management to plan the assigned audit process and develop and envision an effective approach to its completion. When planning a part of the audit task affected by the computer information systems used, (bank management) must understand the complexity and importance of the activities and operations of those computer systems (Omoteso, 2012).

c. Risk Assessment: This involves identifying the risk factors that impede the achievement of the audit process objectives. It is a crucial stage of the initial key stages in evaluating, assessing, and studying the internal control system, which will determine and establish the foundations and procedures that will be followed to correct and address any expected threats or negative impacts (Yassin et al., 2020). Bank management should assess the inherent risks and control risks in the operation and environment of computer systems and technologies, and the overall impact and the impact on a specific account in the event of potentially incorrect key data or information (Al-Matarna, 2013).

Thus, the electronic auditing followed by bank management using artificial intelligence techniques, including computer programs and systems, electronic data, and information, is considered a set of procedures that fall within the audit process to record and process incoming data and information related to audit significance within the institution's information system in general and for banks in particular.

2.3.3 Role of Artificial Intelligence in Implementing Electronic Auditing and Achieving Quality Performance for the Auditor: Because the auditor only looks at a sample of data and information, the application of artificial intelligence may assist lower the risks associated with the audit process, which center on the failure to identify significant and material flaws in financial data and information or in the internal system. Because of its significance and exceptional capacity to thoroughly analyze the financial data and information that is being audited, artificial intelligence tools have thus become indispensable. This helps auditors and enables them to identify suspicious and unusual transactions. In the presence of artificial intelligence techniques and their use in the institution, they will help in applying electronic auditing through speed in making decisions by providing the required data and information, shortening the completion of the audit process, and assisting in examining and evaluating data and information with high accuracy and a low margin of error during the application of the audit process. Thus, electronic auditing is applied using artificial intelligence.

Artificial intelligence will also assist bank management in performing its tasks of examination and evaluation using advanced programs and systems contained in artificial intelligence techniques to detect any potential violations or errors to be recorded in its report. This leads to increased audit efficiency in all aspects of bank transactions. These advanced technologies will qualify it to reach the highest levels of performance with less effort and less time spent, without spending long hours auditing financial data and information. Artificial intelligence techniques perform the audit process in an ideal and standard time, which will help shorten the completion time for the bank, thereby achieving quality professional performance. (Tikrit Journal of Administrative and Economic Sciences, Vol. 19, No. Special Issue, Part (1): 159-182)

CONCLUSIONS

The Role of Artificial Intelligence in Developing Banking Systems: Artificial intelligence is a set of advanced methods and techniques used to program accounting systems in banks, enabling the development of intelligent systems that mimic human abilities in reasoning and decision-making. By analyzing financial data and deriving solutions based on stored rules and standards, these systems can improve the accuracy and efficiency of banking operations, thereby enhancing their integration with sustainable regional planning by supporting economic and development projects. Electronic Auditing in Banks and Its Role in Regional Planning: Electronic auditing is an essential part of modern banking management, relying on artificial intelligence techniques in all stages of auditing, starting from planning, through monitoring, risk assessment, and up to corrective actions. This development contributes to improving banking governance, positively impacting the quality of financial resource management in urban and regional projects, and ensuring efficient investment in infrastructure and economic development. Banking Performance Quality and Its Reflection on Regional Planning: The quality of banking performance is measured by the bank's adherence to international auditing standards, ensuring the accuracy and transparency of financial processes. Furthermore, detecting potential errors and breaches in the accounting system enhances trust in banking institutions, a crucial factor in supporting large projects and sustainable regional planning by providing a stable financial environment that attracts investments. The Importance of Artificial Intelligence in Achieving Banking Efficiency: Artificial intelligence significantly contributes to the efficient application of electronic financial auditing programs, making financial and administrative auditing processes more accurate and effective. Additionally, improving the quality of banking services and increasing security and trust in financial operations enhances banks' ability to support urban initiatives, especially when appropriate staff training is provided on using these technologies. Enhancing Banking Management Efficiency through Artificial Intelligence Technologies: Relying on intelligent systems and software helps banks improve their ability to detect financial violations and prepare accurate reports, which improves administrative performance and strengthens the role of banks in supporting regional and urban projects by providing more advanced and sustainable financial solutions. Research Results on the Impact of Artificial Intelligence on Banking Management: The research findings revealed that artificial intelligence techniques contribute to accelerating the implementation of banking management plans and effectively applying electronic auditing programs. This feature ranked first with a relative importance of 14.19. Providing skills and capabilities to employees ranked second with 12.28, while these techniques helped overcome deficiencies in banking management, placing them third with 12.13. Together, these factors enhance the role of banks in financing and organizing regional and urban projects effectively, ensuring sustainable development according to the best financial and planning practices.

RECOMMENDATIONS

1. **The Role of Artificial Intelligence in Developing Banking Systems and Supporting Regional Planning:** Artificial intelligence is an integrated system of advanced methods and techniques that contributes to programming accounting and management systems within banks. It enables the development of intelligent solutions that mimic human abilities in analysis, reasoning, and decision-making. By processing financial data according to precise standards, artificial intelligence helps improve the efficiency of banking operations, which enhances the role of banks in supporting economic and developmental projects. It enables them to perform a strategic role in sustainable regional planning by providing accurate and advanced financial tools.
2. **Electronic Auditing as a Pillar in Banking Management and Urban Planning:** Electronic auditing is a key element in the modern development of banking management, relying on artificial intelligence technologies throughout all stages, from planning and evaluation to monitoring, risk management, and taking necessary corrective actions. This modern approach ensures a high level of transparency and efficiency in the banking system, which contributes to improving the management of financial resources allocated to urban and regional projects. It also enhances the ability of governments and the private sector to fund infrastructure and development projects sustainably.
3. The Quality of Banking Performance and Its Role in Achieving Stability in Regional Planning: Adherence to international auditing standards is a key factor in achieving banking performance quality, as these standards ensure the accuracy of financial processes, detect potential violations, and enhance the reliability of banking systems. By developing auditing mechanisms supported by artificial intelligence, a more stable financial environment can be achieved, which supports the implementation of major regional projects and contributes to economic sustainability by efficiently managing financial resources.
4. Artificial Intelligence as a Tool to Enhance Financial and Administrative Auditing Efficiency: Artificial intelligence directly contributes to improving the accuracy and effectiveness of financial and administrative auditing processes within banks. This leads to the development of more efficient procedures in financial data analysis, reducing human errors, and enhancing security and trust in the banking system. This, in turn, helps improve the sustainability of urban and regional projects by providing reliable funding sources and reducing financial risks that may affect regional planning processes.
5. **Improving Banking Management Efficiency through Smart Technologies:** By relying on artificial intelligence technologies, banks enhance their ability to detect financial violations and produce accurate and objective reports, improving administrative performance. This efficiency positively reflects on regional planning, as it allows financial institutions to offer more sustainable financing solutions and assists in developing financial policies that align with long-term developmental goals.
6. Research Findings on the Impact of Artificial Intelligence on Banking Performance and Regional Planning:The research findings showed that artificial intelligence technologies significantly contribute to accelerating the implementation of banking

management plans and the efficient application of electronic auditing programs. This benefit ranked first with a relative importance of 14.19. Furthermore, improving the skills and capabilities of employees ranked second with 12.28, while these technologies helped overcome administrative deficiencies by 12.13. These results confirm that the effective integration of artificial intelligence with banking management contributes to financial stability and enhances the banks' ability to support and finance regional and urban projects, ensuring sustainable development according to the best financial and planning practices.

REFERENCES

Abdul-Majid, Qutayba Mazen (2009), "Using Artificial Intelligence in Electrical Engineering Applications (Study and Comparison)," Unpublished Master's Thesis, Arab Academy in Denmark.

Abu Al-Qasim, Mohamed (2012), "Artificial Intelligence and Expert Systems," Libya.

Abu Aqleh, Moataz Yusuf Ahmed and Othman, Afra Al-Fadl Mohamed (2021), "The Importance of Developing the Electronic Auditing Profession Through Artificial Intelligence Technology to Achieve Performance Quality," [link].

Al-Huwaidi, Ali Mahmoud Mustafa (2015), "The Impact of Joint Auditing on the Quality of Financial Reports: An Applied Study on Egyptian Banks Listed on the Stock Exchange," *Journal of the Faculty of Commerce for Scientific Research*, Faculty of Commerce, Alexandria University.

Al-Matarneh, Ghassan Falah (2013), "Introduction to Contemporary Auditing," Zamzam Publishers, 1st Edition, Amman, Jordan.

Al-Samarraie, Ammar Essam and Al-Shureida, Nadia Abdel-Jabbar (2020), "The Role of Artificial Intelligence Techniques Using Digital Auditing in Achieving Auditing Quality and Supporting Its Strategy from the Perspective of Auditors: A Field Study in Audit Firms in the Kingdom of Bahrain," *International Journal of Economics and Business*, University of Applied Sciences, Kingdom of Bahrain.

Al-Taai, Omar Zuhair Ezz El-Din (2023), "The Role of Artificial Intelligence in Improving the Quality of Internal Auditing: An Exploratory Study in Some Iraqi Banks," *Regional Studies Journal*, Year (17), Issue (55), Faculty of Administration and Economics, University of Mosul.

Anbar, Sami Jaber (2015), "Auditing Quality Based on Artificial Intelligence," PhD Thesis Submitted to the Council of the Higher Institute for Accounting and Financial Studies, University of Baghdad.

Aneta, Zemankova, (2019), Artificial intelligence in audit and accounting: development, current trends, opportunities and threats, international conference on control, artificial intelligence, robotics &optimization.

Barzan, Sabeha (2015), "The Impact of Electronic Auditing on Enhancing the Independence and Efficiency of the Internal Auditor," *Journal of Economic and Administrative Sciences*, Volume (32), Issue (4), College of Administrative Technical, Baghdad.

Bi, Q., Goodman, K.E., Kaminsky, J. and Lessler, J., (2019), What is machine learning? A primer for the epidemiologist, *American journal of epidemiology*, 188(12).

Helmy, Riham Mohamed Abdel Latif (2022), "The Impact of Artificial Intelligence on the Auditor's Role in the Auditing Process: A Field Study," Fifth Scientific Conference for

the Department of Accounting and Auditing "Challenges and Prospects for the Accounting and Auditing Profession in the 21st Century," Faculty of Commerce, Ain Shams University.

Isaca, (2018), Auditing artificial intelligence", www.isaca.org/auditing-Al.

Jarrah, Nada Badr (2019), "Artificial Intelligence Techniques for Developing Statistical Machine Learning," *Iraqi Journal of Information Technology*, Volume (9), Issue (3), College of Administration and Economics, University of Basra.

Medahi, Mohamed (2022), "Reflections of the Fourth Industrial Revolution Applications– Artificial Intelligence on the Economies of Arab Countries," *Tikrit Journal of Administrative and Economic Sciences*, Volume (18), No. (60), Faculty of Economic, Commercial, and Management Sciences, Akli Mohand Oulhadj University of Bouira, Algeria.

Mohsen, Imad Saadoun and Al-Saqa, Ziad Hashem Yahya (2022), "The Role of Electronic Internal Auditing in Increasing the Effectiveness of the Internal Control System: An Applied Study in the Ninawa Directorate of Water," *Tikrit Journal of Administrative and Economic Sciences*, Volume (18), No. (60), Faculty of Administration and Economics, University of Mosul.

Nguyen, H., (2019), Artificial intelligence and its impact on workforce, Business Management, Centria University of Applied Sciences.

Omoteso, K., (2012), The application of artificial intelligence in auditing: Looking back to the future. Expert Systems with Applications, 39(9).

Reese, H., (2017), Understanding the differences between Al, machine learning, and deep learning Uglum, Marcy Kim, (2021), Consideration of the ethical implications of artificial intelligence in the audit profession, www.scholarworks.uni.edu/hpt.

Rizk, Alaa Ahmed (2020), "The Contribution of Artificial Intelligence Techniques in Supporting the Quality of Professional Performance in Accounting and Auditing Firms in Egypt (An Applied Study on Large Accounting and Auditing Firms)," *Accounting Thought Journal*, Volume (24), Issue (2), Faculty of Commerce, University of Aswan.

Samehdan, Maha and Salemo, Tamara (2021), "Reflections of Artificial Intelligence on the Field of Auditing," Issue (15), Arab Monetary Fund

Taher, Shiya Rida and Ahmed Dalir, Musa (2022), "The Role of Artificial Intelligence Techniques in Improving the Quality of Accounting Information: An Analytical Study of the Opinions of Academics Specializing in the Kurdistan Region of Iraq," *Tikrit Journal of Administrative and Economic Sciences*, Volume (18), No. (60), Salahaddin University, Erbil.

Yaseen, Ali Taha, Aidan, Ahmed Kazem, and Barak, Jasim Aidan (2020), "The Reality of Electronic Auditing in Iraqi Commercial Banks from the Perspective of External

Auditors: An Exploratory Study of the Opinions of a Sample of External Auditors," *Journal of the Faculty of Administration and Economics for Economic, Administrative, and Financial Studies*, Volume (1), Issue (12

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

ENHANCING STAFF COMMITMENT IN SECONDARY SCHOOLS: A STRATEGIC FRAMEWORK FOR SUSTAINABLE EDUCATIONAL DEVELOPMENT

By

Umoh , Edidiong Idorenyin

And

Chimezie, Theresa Adaobi
Department of Curriculum Studies/Educational Management and Planning
University of Uyo, Uyo

Abstract

This study explores the critical role of enhancing staff commitment in secondary schools and a proposing strategic framework for a sustainable educational development. Staff commitment is essential for achieving long-term educational success. The study examined the significance of staff commitment in achieving educational goals including; improved teaching effectiveness and student performance, positive institutional culture and teamwork and enhanced organizational stability and retention. The study further highlighted the perspective of staff commitment, such as affective, continuance, and normative commitment. The study underscores the factors influencing staff commitment in secondary schools which includes; Organizational Factors, personal factors and external factors. The framework outlines key strategies to foster motivation, job satisfaction, and dedication among teachers and non-teaching staff. By implementing this framework, secondary schools can not only improve teacher satisfaction and retention but also contribute to better student outcomes, thus fostering a more sustainable and effective educational system. The study concluded that dedicated and motivated teachers create a positive learning environment, improve student outcomes, and contribute to the overall success of the education system. One of the recommendations provided was that schools should provide a conducive working environment by ensuring adequate classroom facilities, teaching resources, and a supportive administrative structure to enhance staff motivation and productivity.

Keyword: Staff Commitment, Secondary Schools, Strategic Framework And Sustainable Educational Development

INTRODUCTION/BACKGROUND OF THE STUDY

Education is widely recognized as a critical driver of national development and social transformation. At the core of any effective education system is the commitment and dedication of its teaching and non-teaching staff. In secondary schools, staff commitment significantly influences student performance, institutional effectiveness, and the overall sustainability of educational development. However, in many educational settings worldwide, low levels of staff commitment have been a persistent challenge, leading to issues such as teacher attrition, job dissatisfaction, absenteeism, and reduced instructional quality. This paper seeks to explore strategies for enhancing staff commitment in secondary schools through a strategic framework aimed at fostering sustainable educational development.

Staff commitment in educational institutions is a multifaceted concept that encompasses affective, normative, and continuance commitment. Affective commitment refers to an emotional attachment to the institution and a strong belief in its goals, while normative

commitment reflects a sense of duty or obligation to remain in the profession. Continuance commitment, on the other hand, is based on the perceived costs of leaving the organization. Understanding and addressing these dimensions are crucial for creating a conducive work environment that promotes job satisfaction, professional growth, and institutional loyalty among educators and support staff.

Despite the critical role of staff commitment in shaping educational outcomes, numerous challenges hinder its enhancement in secondary schools. These challenges include inadequate remuneration, lack of professional development opportunities, poor working conditions, limited recognition and incentives, and ineffective leadership. In many developing countries, additional factors such as overcrowded classrooms, resource shortages, and policy inconsistencies exacerbate the problem, leading to diminished teacher morale and high turnover rates. Moreover, global educational disruptions—such as those caused by the COVID-19 pandemic—have further highlighted the need for sustainable strategies to retain and motivate school staff in the face of adversity.

Existing literature suggests that a strategic approach is essential for fostering staff commitment in secondary schools. Leadership styles, organizational culture, teacher empowerment, and institutional support systems play a fundamental role in shaping the attitudes and behaviors of school staff. Transformational leadership, participatory decision-making, and a well-structured incentive system have been identified as key factors that contribute to enhanced staff motivation and commitment. Additionally, fostering a culture of collaboration, providing opportunities for continuous professional development, and ensuring a supportive work environment are critical components of a sustainable educational system.

This study aims to develop a comprehensive strategic framework for enhancing staff commitment in secondary schools, thereby contributing to sustainable educational development. The proposed framework will integrate best practices in leadership, motivation, and organizational management to create a model that can be adapted across different educational contexts. By identifying key drivers of staff commitment and proposing targeted interventions, this study seeks to provide policymakers, school administrators, and education stakeholders with practical recommendations for improving the overall effectiveness of secondary education systems. Hence, enhancing staff commitment is not only essential for improving the quality of education but also for ensuring the long-term sustainability of educational institutions. As the global education landscape continues to evolve, adopting strategic and evidence-based approaches to staff motivation and retention is imperative. This study will contribute to the growing body of knowledge on educational leadership and human resource management in secondary schools, offering a strategic framework that aligns with the broader goals of sustainable educational development.

Definition of Staff Commitment

Staff commitment can be defined as the emotional, psychological, and professional dedication employees exhibit toward their organization, which drives their motivation, engagement, and willingness to contribute to its overall success. It is a key determinant of employee performance, retention, and organizational effectiveness. According to Mowday, Porter, and Steers (2013), staff commitment represents an individual's identification with and involvement in a particular organization, characterized by a strong belief in its goals and values, a willingness to exert effort, and a desire to remain a part of it. Similarly, Meyer and Maltin

(2019) define staff commitment as a multidimensional construct encompassing affective, continuance, and normative commitment, each influencing employees' motivation and organizational attachment differently. Adekoya et al. (2021) emphasize that staff commitment goes beyond job satisfaction, as it involves a deep sense of responsibility and alignment with the organization's objectives. Anwar and Ghafoor (2023) further argue that committed employees are more engaged, productive, and less likely to leave, highlighting the strategic importance of fostering commitment in the workplace.

SIGNIFICANCE OF STAFF COMMITMENT IN ACHIEVING EDUCATIONAL GOALS

Staff commitment plays a crucial role in the success of educational institutions by enhancing teaching effectiveness, fostering student achievement, and promoting institutional growth. Committed educators and administrative staff are more likely to invest effort in their roles, leading to improved educational outcomes and organizational success (Anwar & Ghafoor, 2023).

1. Improved Teaching Effectiveness and Student Performance

Committed teachers are more engaged in instructional activities, creating a positive learning environment that enhances student performance (Khan et al., 2022). When educators are dedicated to their roles, they go beyond basic teaching responsibilities by adopting innovative teaching methods, offering additional support to students, and continuously improving their professional skills (Malik et al., 2023). Affective commitment, which involves an emotional attachment to the institution, is particularly important in motivating teachers to deliver quality education (Njoroge & Kwasira, 2021).

2. Enhanced Organizational Stability and Retention

Educational institutions that foster staff commitment experience lower turnover rates, ensuring continuity and stability in learning programs (Iqbal & Hashmi, 2020). High staff turnover disrupts the learning process, affects institutional reputation, and increases recruitment costs. Continuance commitment, where employees remain due to perceived costs of leaving, can help retain experienced educators, ultimately benefiting students and the institution (Meyer & Maltin, 2019).

3. Positive Institutional Culture and Teamwork

A strong sense of commitment among staff contributes to a positive institutional culture, where teamwork and collaboration thrive (Adekoya et al., 2021). When educators and support staff share a collective commitment to educational goals, they are more likely to collaborate, support each other, and contribute to a cohesive work environment. This enhances the overall effectiveness of educational institutions in achieving long-term objectives.

4. Increased Adaptability to Educational Changes

The education sector constantly evolves due to technological advancements, policy changes, and new teaching methodologies. Committed staff members are more willing to embrace changes and adapt to new educational trends, ensuring institutions remain competitive and effective (Khan et al., 2022). Normative commitment, which stems from a sense of obligation to the institution, encourages educators to actively participate in professional development and

institutional growth (Anwar & Ghafoor, 2023). Staff commitment is essential for achieving educational goals, as it enhances teaching effectiveness, promotes institutional stability, fosters a positive work culture, and improves adaptability to change. Educational institutions must implement strategies to strengthen staff commitment through professional development, recognition programs, and supportive work environments.

Perspectives of staff commitment

Various scholars have conceptualized staff commitment from different perspectives, including affective, continuance, and normative commitment.

Affective Commitment: Meyer and Allen (1991) initially introduced the three-component model of commitment, where affective commitment refers to employees' emotional attachment to, identification with, and involvement in the organization. According to Adekoya et al. (2021), affective commitment fosters higher job satisfaction and productivity, as employees willingly invest effort in their roles.

Affective commitment has to do with an employee's emotional attachment, identification, and involvement with their organization, leading them to remain because they genuinely want to, rather than out of obligation or necessity (Meyer & Allen, 1991). This type of commitment arises when employees develop a deep emotional bond with their organization, aligning their personal goals and values with those of the institution. Meyer and Maltin (2019) define affective commitment as the degree to which employees feel psychologically connected to their organization, influencing their willingness to contribute beyond their basic job responsibilities. Similarly, Anwar and Ghafoor (2023) argue that affective commitment fosters a sense of belonging and loyalty among employees, leading to higher engagement and job satisfaction. According to Khan et al. (2022), employees with high affective commitment are more motivated, productive, and willing to support organizational goals without external pressure.

What Affective Commitment Is About

Affective commitment is fundamentally about an employee's emotional investment in their workplace. It reflects their passion for their job, their belief in the organization's mission, and their willingness to go the extra mile (Malik et al., 2023). Unlike continuance commitment, which is driven by the costs of leaving, or normative commitment, which is based on obligation, affective commitment stems from genuine enthusiasm and alignment with the organization's objectives (Njoroge & Kwasira, 2021).

Employees who exhibit affective commitment do not just perform their tasks because they are required to; they take personal responsibility for the success of their organization. They are often proactive, enthusiastic, and eager to contribute ideas for improvement (Iqbal & Hashmi, 2020).

What Affective Commitment Does

Affective commitment has several positive outcomes for both employees and organizations:

1. **Enhances Job Performance**: Employees with high affective commitment are more likely to be engaged, motivated, and productive (Anwar & Ghafoor, 2023).

2. **Reduces Turnover Rates**: Staff who feel emotionally connected to their organization are less likely to leave, ensuring continuity and stability (Khan et al., 2022).
3. **Encourages Organizational Citizenship Behavior (OCB)**: Affective commitment promotes discretionary behaviors such as mentoring colleagues, volunteering for extra tasks, and maintaining a positive workplace atmosphere (Malik et al., 2023).
4. **Increases Adaptability to Change**: Employees who are emotionally invested in their workplace are more open to innovation and new policies (Njoroge & Kwasira, 2021).

Significance of Affective Commitment in the Actualization of Goals

Organizations thrive when employees are emotionally invested in their success. Affective commitment plays a critical role in goal actualization by:

- **Aligning Employee Efforts with Organizational Objectives**: Employees with strong affective commitment work towards institutional goals as if they were their own (Iqbal & Hashmi, 2020).
- **Enhancing Teamwork and Collaboration**: When employees are emotionally connected to their organization, they are more likely to support their colleagues and contribute to a positive work culture (Adekoya et al., 2021).
- **Improving Service Delivery and Customer Satisfaction**: In sectors such as education, healthcare, and business, staff with high affective commitment provide better service, benefiting students, patients, and clients alike (Meyer & Maltin, 2019).
- **Boosting Institutional Reputation**: Employees who feel a deep attachment to their organization often act as brand ambassadors, enhancing its public image (Khan et al., 2022).

How Affective Commitment is Demonstrated

Affective commitment is visible in employees' behaviors, attitudes, and work ethic. For instance, If a teacher stays after school to help struggling students without being asked, or an employee in a corporate setting actively promotes company initiatives on their own time, these actions indicate affective commitment. Their behavior goes beyond obligation—it is driven by passion and emotional attachment to their organization.

Some signs that indicate affective commitment include:

- **Passion for Work**: Employees express enthusiasm and dedication, taking pride in their tasks.
- **Willingness to Go Beyond Job Requirements**: They volunteer for extra responsibilities without being forced.
- **Positive Attitude Toward Organizational Goals**: They support institutional changes and innovations rather than resisting them (Malik et al., 2023).
- **Strong Sense of Belonging**: Employees speak positively about their workplace and defend it in conversations.

- Low Absenteeism and Turnover: Committed employees show up consistently and rarely seek external job opportunities (Njoroge & Kwasira, 2021).

Affective commitment is a vital component of employee dedication, driving motivation, performance, and loyalty. It significantly contributes to achieving organizational goals by fostering engagement, reducing turnover, and promoting teamwork. Organizations should nurture affective commitment through supportive leadership, clear communication, and recognition programs.

Continuance Commitment: This dimension focuses on the costs associated with leaving an organization. Employees remain in the organization because they perceive that leaving would result in financial loss or instability (Meyer & Maltin, 2019). Research by Khan et al. (2022) suggests that organizations with strong career growth opportunities and fair compensation structures can enhance continuance commitment. Continuance commitment refers to an employee's decision to remain with an organization due to the perceived costs associated with leaving, rather than emotional attachment or a sense of obligation. As such, Employees with high continuance commitment stay because they believe that leaving would result in significant financial, social, or career-related losses. Meyer and Maltin (2019) define continuance commitment as the extent to which employees feel "locked in" to their jobs due to economic dependencies, lack of alternative job opportunities, or accrued benefits that would be lost if they left. Similarly, Anwar and Ghafoor (2023) argue that continuance commitment arises when employees assess the risks and disadvantages of leaving their current employment and conclude that staying is the most beneficial option. According to Khan et al. (2022), this type of commitment is more calculative than emotional, as employees weigh the pros and cons of remaining in an organization based on financial security and career stability.

What Continuance Commitment Is About

Continuance commitment is primarily driven by necessity rather than passion or loyalty. Employees with high continuance commitment feel that leaving their job would be too costly, whether in terms of lost seniority, pension benefits, or job security (Njoroge & Kwasira, 2021). Unlike affective commitment, which is based on emotional connection, or normative commitment, which is driven by obligation, continuance commitment is rooted in practicality and self-interest (Iqbal & Hashmi, 2020).

Key factors that contribute to continuance commitment include:

- Financial dependency: Employees may have mortgages, loans, or family obligations that make it risky to leave a stable job.
- Limited job alternatives: Employees may remain in an organization because they perceive that better opportunities are scarce (Malik et al., 2023).
- Accumulated benefits: Long-serving employees may stay to avoid losing benefits like pensions, promotions, or long-term service rewards.

What Continuance Commitment Does

Continuance commitment has both positive and negative implications for organizations:

Positive Outcomes

1. **Reduces Employee Turnover**: Employees with high continuance commitment are less likely to leave, ensuring workforce stability (Anwar & Ghafoor, 2023).
2. **Maintains Organizational Knowledge and Experience**: Long-serving employees retain institutional knowledge, which benefits productivity and training of new employees (Khan et al., 2022).
3. **Ensures Workforce Continuity**: Organizations can avoid frequent recruitment costs and maintain a consistent workforce, especially in industries where skilled labor is essential (Njoroge & Kwasira, 2021).

Negative Outcomes

1. **Lower Employee Engagement**: Since employees stay out of necessity rather than passion, they may lack enthusiasm and motivation (Meyer & Maltin, 2019).
2. **Resistance to Change**: Employees with high continuance commitment may resist organizational changes because they prioritize job security over adaptability (Iqbal & Hashmi, 2020).
3. **Reduced Productivity**: Employees who feel "trapped" in their jobs may perform at a minimal level, completing tasks just enough to keep their position but not striving for excellence (Malik et al., 2023).

Significance of Continuance Commitment in the Actualization of Goals

While continuance commitment may not be as beneficial as affective commitment, it still contributes to organizational goal achievement in several ways:

- **Ensuring Stability in Workforce Planning**: Organizations can rely on experienced employees to maintain operations, reducing the disruption caused by high turnover rates (Anwar & Ghafoor, 2023).
- **Providing a Retention Safety Net**: In times of economic downturn or job market uncertainty, employees with high continuance commitment are more likely to remain, providing stability to the organization (Khan et al., 2022).
- **Preserving Organizational Knowledge**: Long-serving employees help transfer skills and knowledge to new hires, ensuring continuity in institutional memory and expertise (Njoroge & Kwasira, 2021).
- **Supporting Employee Development Initiatives**: Organizations can invest in training and development with the confidence that employees will not immediately leave after gaining new skills (Meyer & Maltin, 2019).

How Continuance Commitment is Demonstrated

Continuance commitment can be observed in various workplace behaviors, including:

- **Employees Avoiding Career Risks**: Staff members hesitate to switch jobs, even when dissatisfied, because they fear losing financial stability or career benefits.

- **Minimal Engagement but Continued Presence**: Some employees may do the bare minimum required to keep their jobs but refrain from active participation in extra activities.
- **Strong Focus on Job Security**: Employees frequently express concerns about layoffs, benefits, and long-term financial security (Malik et al., 2023).
- **Resistance to Change**: Employees may resist organizational changes, such as restructuring or technology adoption, because they prefer stability over uncertainty (Iqbal & Hashmi, 2020).

Example of Continuance Commitment in Practice

Hence, if an employee remains at a job despite job dissatisfaction because they have a pension plan that will be forfeited if they leave, this is an example of continuance commitment. Similarly, a teacher who continues working in a school due to limited job opportunities elsewhere, even if they are disengaged from their work, demonstrates this type of commitment. Therefore, continuance commitment is a crucial aspect of employee retention, ensuring workforce stability and preserving institutional knowledge. However, it differs from affective commitment as it is primarily based on necessity rather than enthusiasm or loyalty. While it helps organizations maintain staff continuity, employers should strive to convert continuance commitment into affective commitment by improving job satisfaction, career growth opportunities, and workplace engagement.

Normative Commitment: This type of commitment is based on a sense of obligation to stay with the organization. Employees feel morally bound to continue their employment due to cultural or social norms (Meyer & Allen, 1991). Studies by Iqbal and Hashmi (2020) indicate that normative commitment is often influenced by organizational culture, leadership style, and ethical work practices. Normative commitment refers to an employee's sense of obligation to remain with an organization, based on moral or ethical reasons, rather than emotional attachment (affective commitment) or perceived costs of leaving (continuance commitment) (Meyer & Allen, 1991). Employees with high normative commitment feel a duty to stay with their employer because they believe it is the right thing to do. Meyer and Maltin (2019) define normative commitment as the extent to which employees remain with an organization due to a perceived moral responsibility or loyalty. Similarly, Anwar and Ghafoor (2023) explain that normative commitment develops when employees feel indebted to their organization for past support, training, or opportunities. According to Khan et al. (2022), employees who have been mentored, sponsored, or given career growth opportunities may develop a strong sense of duty to reciprocate by staying and contributing to the organization.

What Normative Commitment Is About

Normative commitment is primarily driven by a feeling of obligation. Employees may feel they should stay because:

- **They have received training or education** funded by the organization (Malik et al., 2023).
- **They have been given career opportunities** such as promotions or leadership roles (Njoroge & Kwasira, 2021).

- **Their workplace has a supportive culture** that promotes loyalty and ethical responsibility (Iqbal & Hashmi, 2020).
- **Their personal values align** with the organization's mission and goals (Meyer & Maltin, 2019).

Unlike affective commitment, which is based on emotional attachment, or continuance commitment, which is based on cost-benefit analysis, normative commitment is based on personal duty and ethical considerations. Employees with high normative commitment stay not because they necessarily *want* to, but because they *feel they should* (Anwar & Ghafoor, 2023).

What Normative Commitment Does

Normative commitment has both benefits and potential drawbacks for organizations:

Positive Outcomes

1. **Promotes Employee Loyalty**: Employees with strong normative commitment are less likely to leave abruptly, ensuring workforce stability (Khan et al., 2022).
2. **Encourages Ethical Behavior**: Employees driven by obligation tend to act with integrity and professionalism (Malik et al., 2023).
3. **Fosters a Positive Work Culture**: Organizations that cultivate loyalty and ethical values benefit from committed, responsible employees (Njoroge & Kwasira, 2021).
4. **Reduces Turnover in Key Roles**: Employees in leadership or specialized roles may stay longer due to their sense of duty, preventing disruption (Iqbal & Hashmi, 2020).

Negative Outcomes

1. **May Lead to Job Dissatisfaction**: Employees who feel "forced" to stay out of obligation may become disengaged or unmotivated (Meyer & Maltin, 2019).
2. **Can Cause Resistance to Change**: Staff members may remain loyal to traditional ways of doing things, resisting necessary innovations (Anwar & Ghafoor, 2023).
3. **Creates Stress and Burnout**: Employees with high normative commitment may feel guilty about leaving, even if they are unhappy, leading to stress or burnout (Khan et al., 2022).

Significance of Normative Commitment in the Actualization of Goals

Normative commitment plays a crucial role in achieving organizational and institutional goals by:

- **Ensuring Continuity in Leadership and Specialized Roles**: Employees with high normative commitment are more likely to stay in key positions, maintaining operational consistency (Njoroge & Kwasira, 2021).
- **Encouraging Long-Term Employee Engagement**: Organizations benefit from a workforce that values loyalty and ethical responsibility (Anwar & Ghafoor, 2023).

- **Promoting Knowledge Transfer**: Experienced employees who stay out of duty contribute to mentoring and developing younger staff members, enhancing institutional learning (Malik et al., 2023).
- **Strengthening Organizational Culture**: A commitment to ethics and responsibility fosters a strong organizational culture that supports goal achievement (Iqbal & Hashmi, 2020).

How Normative Commitment is Demonstrated

Normative commitment can be observed in workplace behaviors, including:

- **Employees Expressing Gratitude for Opportunities**: They acknowledge how the organization has contributed to their career development.
- **Staying in the Organization Despite Better Offers**: Employees with strong normative commitment may decline higher-paying jobs elsewhere out of loyalty.
- **Volunteering for Extra Responsibilities**: They willingly take on additional tasks as a way of giving back to the organization (Malik et al., 2023).
- **Mentoring New Employees**: Senior employees invest time in guiding and supporting junior staff, demonstrating their dedication to the institution (Njoroge & Kwasira, 2021).
- **Upholding Organizational Values**: Employees with high normative commitment advocate for ethical work practices and discourage behaviors that go against company policies (Anwar & Ghafoor, 2023).

Example of Normative Commitment in Practice

If a teacher remains at a school because they received a scholarship from the institution for their education, or an employee continues working for a company out of gratitude for career development opportunities, that is normative commitment. Another example is a nurse who stays at a hospital because they feel a moral responsibility to serve their community, even when faced with better job offers elsewhere. As such, normative commitment is an essential aspect of employee dedication, based on a moral obligation to remain with an organization. It plays a significant role in maintaining workforce stability, fostering ethical behavior, and supporting organizational culture. While it has potential drawbacks, such as job dissatisfaction and resistance to change, organizations can enhance normative commitment by providing fair treatment, recognizing employee contributions, and fostering a sense of belonging.

FACTORS INFLUENCING STAFF COMMITMENT IN SECONDARY SCHOOLS

Several factors contribute to staff commitment, including leadership style, organizational culture, job satisfaction, and career development opportunities (Anwar & Ghafoor, 2023). Employees who perceive fairness, recognition, and opportunities for growth are more likely to develop strong commitment levels. Staff commitment is a multidimensional construct that plays a critical role in organizational success. Understanding the different types of commitment affective, continuance, and normative can help organizations such as the school to implement strategies to enhance employee engagement and retention.

Staff commitment in secondary schools is essential for achieving educational objectives, improving student outcomes, and fostering a positive school culture. Various factors influence

how committed teachers and other staff members are to their institutions. These factors can be categorized into organizational, personal, and external influences. Below is an exploration of these factors, with supporting views from recent research.

1. Organizational Factors

a) Leadership Style and Administrative Support

The type of leadership in a school has a direct impact on staff commitment. School administrators who are supportive, fair, and provide guidance create an environment where teachers feel valued and motivated to stay. Leaders who engage staff in decision-making, communicate effectively, and provide mentorship enhance employees' sense of belonging. Anwar and Ghafoor (2023) highlight that transformational leadership, which focuses on employee development and motivation, significantly increases affective commitment among teachers. Similarly, Khan et al. (2022) found that school principals who practice participatory leadership foster a sense of ownership among teachers, making them more dedicated to their roles.

b) Work Environment and School Culture

A positive work environment, characterized by collaboration, mutual respect, and recognition, encourages teachers to be more committed to their jobs. When teachers feel supported by their colleagues and school administration, they develop a sense of attachment to the institution. A toxic work environment, on the other hand, discourages commitment and may lead to higher turnover rates. According to Malik et al. (2023), teachers working in schools with strong workplace cultures, where teamwork and professional relationships are encouraged, demonstrate higher levels of commitment. Similarly, Njoroge and Kwasira (2021) assert that a work environment that fosters respect and inclusivity significantly improves both normative and affective commitment.

c) Professional Development Opportunities

Teachers who have access to continuous training and career advancement opportunities tend to be more committed to their schools. When institutions invest in staff growth through workshops, seminars, and higher education sponsorships, employees feel valued and are less likely to leave. Meyer and Maltin (2019) emphasize that teachers who receive continuous learning opportunities develop stronger affective and normative commitment to their schools. Similarly, Iqbal and Hashmi (2020) note that organizations that prioritize career development experience lower staff turnover rates and higher employee satisfaction.

d) Job Security and Stability

Employees are more committed to their jobs when they feel a sense of security in their employment. Uncertainty about job continuity, especially in contract-based teaching positions, can decrease teachers' motivation and engagement. Khan et al. (2022) indicates that when teachers perceive their jobs as stable and secure, they are more likely to develop long-term commitment to their schools. Malik et al. (2023) further explain that staff members who have permanent contracts and clear career progression paths exhibit stronger continuance commitment, as they recognize the long-term benefits of staying.

e) Recognition and Rewards

Recognizing employees for their contributions plays a crucial role in fostering commitment. Schools that acknowledge teachers' efforts through promotions, awards, salary increments, or verbal appreciation help create a sense of achievement and satisfaction. Anwar and Ghafoor (2023) found that financial and non-financial rewards, including performance-based incentives and employee appreciation programs, significantly boost staff commitment. Similarly, Meyer and Maltin (2019) argue that teachers who feel appreciated for their hard work are more likely to remain engaged and dedicated to their institutions.

2. Personal Factors

a) Passion for Teaching and Personal Values

Some teachers remain committed to their jobs due to their intrinsic passion for educating students. When teachers view their profession as a calling rather than just a job, they are more likely to remain committed despite challenges.

According to Njoroge and Kwasira (2021), teachers who derive personal satisfaction from their work tend to display higher levels of affective commitment. Similarly, Iqbal and Hashmi (2020) highlight that educators whose personal values align with the school's mission are more likely to stay dedicated to their roles.

b) Work-Life Balance

Teachers who can balance their professional responsibilities with personal life tend to be more engaged and committed to their jobs. Excessive workloads, long hours, and stressful administrative tasks can lead to burnout, negatively impacting staff commitment.

Meyer and Maltin (2019) assert that work-life balance is a key determinant of employee well-being and job satisfaction. Anwar and Ghafoor (2023) further argue that schools that promote flexible working conditions and reduce unnecessary administrative burdens help improve teacher retention and engagement.

c) Career Aspirations and Future Opportunities

Teachers who see long-term growth opportunities within their schools are more likely to remain committed. However, if they feel their career prospects are limited, they may seek opportunities elsewhere, leading to lower commitment levels.

Khan et al. (2022) found that schools that provide structured career development pathways encourage stronger normative and continuance commitment. Malik et al. (2023) emphasize that institutions offering leadership training and professional growth programs retain their staff for longer periods.

3. External Factors

a) Government Policies and Educational Reforms

Education policies, curriculum changes, and government regulations impact staff commitment in secondary schools. Teachers who feel overwhelmed by frequent policy changes or excessive administrative work may become disengaged. Njoroge and Kwasira (2021) note that

inconsistent policy changes without adequate teacher training reduce staff motivation and increase resistance to change. Iqbal and Hashmi (2020) further suggest that schools that align their policies with national education frameworks while providing adequate support help maintain teacher commitment.

b) Societal and Community Expectations

The level of respect and recognition that teachers receive from society influences their job satisfaction and commitment. Schools located in communities that appreciate and value educators tend to have more dedicated staff. Malik et al. (2023) state that teachers who feel respected and supported by parents, students, and the community exhibit higher levels of affective commitment. Khan et al. (2022) also highlight that social recognition plays a significant role in encouraging teachers to remain in their profession despite challenges.

c) Economic Conditions and Alternative Employment Opportunities

The overall economic climate and job market conditions affect teachers' commitment. In countries or regions where teaching salaries are low compared to other professions, educators may be less motivated to stay in their roles. Anwar and Ghafoor (2023) found that low wages and lack of financial incentives are major reasons why teachers leave their jobs. Meyer and Maltin (2019) further suggest that competitive salaries and benefits can enhance continuance commitment, as employees are less likely to seek alternative employment. Staff commitment in secondary schools is shaped by multiple factors, including leadership style, work environment, job security, recognition, personal values, work-life balance, government policies, societal expectations, and economic conditions. Schools that create a supportive and motivating work environment, provide career development opportunities, and acknowledge teachers' contributions can enhance staff commitment, leading to better educational outcomes. Addressing these factors strategically can help school administrators retain talented educators and foster a culture of dedication and excellence.

EXTERNAL FACTORS INFLUENCING STAFF COMMITMENT IN SECONDARY SCHOOLS

While internal organizational and personal factors significantly influence staff commitment in secondary schools, external factors also play a crucial role in shaping teachers' dedication and engagement. These external influences, including government policies and education funding, socio-economic conditions and community support, salary structures and benefits, and parental involvement and societal expectations, determine the overall work environment and motivation levels of teachers. Understanding these factors helps policymakers and school administrators develop strategies to enhance staff commitment and improve the quality of education.

1. Government Policies and Education Funding

Government policies set the framework within which schools operate, influencing teacher recruitment, workload, curriculum implementation, and job stability. Additionally, government funding determines the availability of teaching resources, infrastructure, and teacher compensation, all of which impact staff commitment. Teachers working in well-funded schools with sufficient instructional materials and competitive salaries are more likely to remain committed, as they feel adequately supported in performing their duties. On the other hand,

inadequate funding leads to overcrowded classrooms, lack of teaching aids, and delayed salary payments, all of which lower teacher morale.

According to Khan et al. (2022), government policies that prioritize teacher development, such as continuous professional training and timely salary payments, positively impact teachers' affective and normative commitment. Similarly, Malik et al. (2023) argue that insufficient funding and inconsistent policy implementation contribute to job dissatisfaction and higher turnover rates among secondary school teachers.

2. Socio-Economic Conditions and Community Support

The socio-economic status of the community surrounding a school affects staff commitment, as it influences the learning environment, student behavior, and overall school culture. In affluent communities where parents and local organizations actively support schools, teachers receive more respect and resources, fostering a sense of belonging and commitment. Conversely, in economically disadvantaged areas where schools struggle with limited resources, poverty-related student issues, and minimal parental involvement, teachers may experience frustration and disengagement. When communities value and appreciate educators, teachers feel more motivated to stay committed to their work. Community involvement in school activities, support programs, and recognition initiatives helps build stronger teacher commitment. Njoroge and Kwasira (2021) highlight that teachers in schools with active community participation demonstrate higher levels of affective commitment due to the positive reinforcement they receive. Similarly, Iqbal and Hashmi (2020) emphasize that the level of social respect given to teachers significantly affects their job satisfaction and willingness to remain in their positions.

3. Salary Structure, Incentives, and Benefits

One of the most significant external factors affecting staff commitment is the salary structure and the availability of financial and non-financial incentives. Competitive salaries, performance-based bonuses, health benefits, and retirement plans contribute to a teacher's decision to remain committed to their institution. In contrast, low wages and lack of benefits often result in job dissatisfaction and a higher likelihood of seeking alternative employment. Teachers who feel financially secure and adequately compensated are more likely to develop continuance commitment, as they recognize the benefits of staying with their current employer. Additionally, schools that offer non-monetary incentives such as career progression opportunities, study leave, and housing benefits enhance staff motivation. Anwar and Ghafoor (2023) found that teachers who receive fair compensation and additional incentives demonstrate higher levels of organizational commitment and job satisfaction. Similarly, Meyer and Maltin (2019) argue that institutions that fail to offer competitive salaries risk losing talented educators to better-paying opportunities, negatively impacting student performance and school stability.

4. Parental Involvement and Societal Expectations

Parents and society play a crucial role in shaping teachers' commitment by influencing their perception of the teaching profession. When parents actively participate in their children's education by supporting teachers, engaging in school activities, and respecting educators' efforts, teachers feel valued and motivated to perform their duties effectively. However, when teachers experience frequent criticism, lack of cooperation from parents, or societal

undervaluation of their profession, their commitment may decline. Positive parental involvement fosters collaboration between teachers and families, improving student outcomes and enhancing teacher satisfaction. Additionally, societal attitudes toward teaching, such as recognizing educators as essential contributors to national development, encourage staff dedication and pride in their profession. Malik et al. (2023) state that teachers who receive support from parents in terms of student discipline and academic cooperation report higher job satisfaction and commitment levels. Khan et al. (2022) further note that societal attitudes that devalue teaching as a profession contribute to lower motivation and higher attrition rates among teachers, particularly in secondary schools.

External factors such as government policies and education funding, socio-economic conditions and community support, salary structures and benefits, and parental involvement and societal expectations play a significant role in shaping staff commitment in secondary schools. Schools that operate within well-supported systems, where teachers are adequately compensated, respected, and provided with stable working conditions, tend to retain more committed staff. Addressing these external influences through policy reforms, increased education funding, and stronger community engagement can enhance teacher commitment, leading to better student performance and overall institutional success.

THE IMPACT OF STAFF COMMITMENT ON EDUCATIONAL OUTCOMES

Staff commitment plays a crucial role in shaping educational outcomes, influencing student learning, academic performance, and overall school effectiveness. When teachers are committed to their profession and institution, they create a positive learning environment that fosters student engagement, motivation, and achievement. The impact of staff commitment can be analyzed through its effect on student learning, the relationship between teacher commitment and student performance, and classroom engagement and instructional effectiveness.

1. Effect on Student Learning

Teachers who are highly committed to their roles invest time and effort in delivering quality education, which directly benefits students. Dedicated teachers prepare well-structured lessons, provide individualized support, and create an engaging classroom environment that enhances student understanding. Their commitment translates into a more structured and consistent learning experience, which positively influences student retention and academic success. Committed teachers also serve as role models, inspiring students to develop a passion for learning. When students observe teachers who are enthusiastic and dedicated, they are more likely to adopt a similar attitude toward their studies. On the other hand, a lack of commitment from teachers can lead to disinterest, poor learning habits, and lower academic motivation among students.

According to Khan et al. (2022), teacher commitment significantly contributes to student engagement and long-term academic achievement. Similarly, Malik et al. (2023) emphasize that students perform better in schools where teachers are dedicated to both their professional responsibilities and student development.

2. Relationship Between Teacher Commitment and Student Performance

The level of teacher commitment is directly linked to student performance, as committed educators consistently implement effective teaching strategies, provide constructive feedback, and ensure that learning objectives are met. When teachers are engaged and motivated, they are more likely to adapt their teaching methods to meet the diverse needs of students, leading to improved academic outcomes. Studies have shown that schools with high teacher commitment levels tend to have better student performance on standardized tests, higher graduation rates, and lower dropout rates. This is because committed teachers maintain high expectations for their students, continuously assess their progress, and provide additional support when needed. Meyer and Maltin (2019) found that teacher commitment is one of the strongest predictors of student success, as it influences not only instructional quality but also students' attitudes toward learning. Anwar and Ghafoor (2023) further argue that schools that foster teacher engagement through professional development and a supportive work environment experience higher student achievement rates.

3. Classroom Engagement and Instructional Effectiveness

A committed teacher plays a vital role in maintaining an engaging classroom environment and ensuring effective instruction. Engaged teachers use innovative teaching techniques, integrate technology, and create interactive learning experiences that keep students actively involved in the learning process. Their enthusiasm fosters curiosity and deeper understanding among students. Instructional effectiveness is also closely tied to teacher commitment. Dedicated educators invest time in lesson planning, classroom management, and continuous professional development, leading to higher instructional quality. They also provide timely feedback, track student progress, and adjust teaching methods to address learning difficulties.

Njoroge and Kwasira (2021) highlight that teacher commitment enhances instructional quality by promoting interactive and student-centered learning approaches. Iqbal and Hashmi (2020) further emphasize that committed teachers are more likely to implement differentiated instruction, ensuring that all students, regardless of ability level, receive appropriate academic support. The impact of staff commitment on educational outcomes cannot be overstated. Committed teachers contribute to better student learning experiences, improved academic performance, and more engaging and effective classroom instruction. Schools that prioritize teacher motivation, provide professional development opportunities, and foster a supportive work environment ultimately enhance educational success. Investing in teacher commitment is, therefore, a fundamental strategy for improving the quality of education and student achievement.

THE IMPACT OF STAFF COMMITMENT ON SCHOOL EFFECTIVENESS AND REPUTATION

Staff commitment plays a crucial role in determining a school's effectiveness and reputation. Schools that have dedicated and engaged teachers tend to perform better academically, maintain stable learning environments, and build a strong institutional image. When teachers are committed to their roles, they contribute positively to student success, administrative efficiency, and overall school development. This, in turn, influences school rankings, public perception, and long-term institutional stability.

1. Impact on School Rankings and Reputation

A school's ranking and reputation are heavily influenced by the quality of education it provides, which is directly linked to the commitment of its staff. Schools with highly committed teachers tend to achieve better academic results, leading to higher national and regional rankings. These institutions also attract more students and gain recognition from parents, policymakers, and stakeholders. Committed teachers consistently strive for excellence, ensuring that students receive quality instruction and perform well on standardized assessments. Additionally, they contribute to extracurricular activities, mentorship programs, and community engagement initiatives that enhance the school's image. Schools with a strong reputation benefit from increased enrollment, better funding opportunities, and stronger partnerships with educational organizations.

According to Khan et al. (2022), schools with a high level of staff commitment tend to rank higher in national education evaluations due to improved student performance and teacher effectiveness. Malik et al. (2023) further emphasize that a positive school reputation is often built on the foundation of dedicated and skilled teachers who create a strong academic culture.

2. Relationship Between Teacher Retention and Institutional Stability

Teacher retention is a key factor in ensuring institutional stability. High levels of staff commitment lead to lower teacher turnover rates, which in turn fosters consistency in teaching practices, curriculum implementation, and student-teacher relationships. When teachers remain in a school for an extended period, they develop a deep understanding of the school's culture, policies, and student needs, contributing to a stable and effective learning environment.

On the other hand, high teacher turnover disrupts school operations, affects student learning, and damages institutional reputation. Frequent changes in teaching staff can lead to inconsistencies in curriculum delivery, reduced student engagement, and increased administrative burdens on school leadership. A stable teaching workforce enhances collaboration among educators, strengthens professional development efforts, and ensures the continuous improvement of teaching methodologies. Meyer and Maltin (2019) highlight that schools with high teacher retention rates experience greater institutional stability, leading to sustained academic success and improved student outcomes. Anwar and Ghafoor (2023) further argue that retaining experienced teachers strengthens a school's long-term vision, improves leadership succession planning, and fosters a positive work culture that benefits both staff and students.

Staff commitment is a critical driver of school effectiveness and reputation. Dedicated teachers enhance academic performance, contribute to a positive learning environment, and improve school rankings. Additionally, teacher retention plays a significant role in maintaining institutional stability, ensuring consistency in teaching quality and long-term school development. Schools that invest in teacher commitment through professional development, support systems, and recognition programs not only enhance their reputation but also create a stable and thriving educational environment.

PSYCHOLOGICAL AND PROFESSIONAL EFFECTS OF STAFF COMMITMENT

Staff commitment significantly impacts the psychological and professional well-being of teachers. While commitment enhances job satisfaction and fosters professional growth, it can also lead to challenges such as burnout and stress if not managed properly. Understanding these effects is crucial for developing strategies that support teachers' mental health and long-term career fulfillment. Two key areas where staff commitment influences educators are **teacher burnout and stress management** and **professional identity and long-term career satisfaction**.

1. Teacher Burnout and Stress Management

Highly committed teachers often go beyond their expected duties to ensure student success, which can lead to increased workloads, emotional exhaustion, and stress. When teachers face excessive responsibilities, unrealistic expectations, or lack of institutional support, they may experience burnout—a state of physical, emotional, and mental exhaustion that negatively affects their performance and well-being. Burnout can manifest through symptoms such as chronic fatigue, reduced enthusiasm for teaching, difficulty concentrating, and increased absenteeism. If not managed, it can lead to decreased effectiveness in the classroom and higher turnover rates, ultimately affecting the quality of education. Schools that prioritize teacher well-being through workload management, peer support, and mental health programs can help mitigate burnout and sustain high levels of commitment.

According to Khan et al. (2022), excessive job demands without adequate support contribute significantly to teacher burnout, reducing motivation and effectiveness. Similarly, Malik et al. (2023) highlight that stress management programs, such as mindfulness training, counseling services, and balanced workloads, help committed teachers maintain their enthusiasm and performance levels.

2. Professional Identity and Long-Term Career Satisfaction

Commitment to the teaching profession plays a crucial role in shaping an educator's professional identity—their sense of purpose, self-efficacy, and alignment with the values of the teaching profession. When teachers feel a strong sense of belonging and purpose in their careers, they are more likely to experience job satisfaction and remain in the profession long-term.

Professional identity is influenced by factors such as recognition, opportunities for professional development, and a supportive work environment. Teachers who feel valued and supported by their institutions are more likely to develop a positive professional identity, enhancing their commitment to the field. Conversely, teachers who struggle with inadequate support, lack of career progression, or societal undervaluation may experience dissatisfaction, leading to early career exits. Meyer and Maltin (2019) argue that teachers with a strong professional identity tend to exhibit higher levels of affective commitment, leading to greater job satisfaction and career longevity. Anwar and Ghafoor (2023) further emphasize that investing in teacher training, mentorship programs, and career growth opportunities strengthens professional identity and reduces attrition rates. The psychological and professional effects of staff commitment have both positive and negative implications. While commitment fosters professional identity and long-term job satisfaction, it can also lead to stress and burnout if not well managed. Schools must strike a balance by providing adequate support, stress management programs, and career development opportunities to sustain teacher commitment

while promoting their well-being. By doing so, they can enhance teacher retention, improve educational quality, and ensure long-term institutional success.

STRATEGIC FRAMEWORK FOR ENHANCING STAFF COMMITMENT IN SECONDARY SCHOOLS

Enhancing staff commitment in secondary schools is crucial for improving teaching quality, student outcomes, and overall school performance. This framework outlines key strategies to foster motivation, job satisfaction, and dedication among teachers and non-teaching staff.

1. Leadership and Vision Alignment

Clear Vision and Goals

- Develop a shared vision that aligns with the school's mission.
- Involve staff in goal-setting to enhance ownership and commitment.

Transformational Leadership

- School leaders should inspire, support, and recognize staff contributions.
- Encourage open communication and participatory decision-making.

Effective Delegation and Empowerment

- Provide leadership opportunities for teachers (e.g., department heads, mentorship roles).
- Trust staff with responsibilities that allow professional growth.

2. Professional Development and Career Growth

Continuous Training and Capacity Building

- Organize regular workshops, seminars, and mentorship programs.
- Support teachers in pursuing further studies or professional certifications.

Performance-Based Career Progression

- Establish clear career growth pathways linked to performance and skills development.
- Provide opportunities for promotions and leadership roles within the school.

Mentorship and Coaching

- Implement mentorship programs for new and experienced teachers.
- Encourage peer learning and collaboration.

3. Motivation and Recognition Programs

Performance-Based Incentives

- Offer financial and non-financial rewards based on performance.

- Implement bonuses, salary increments, and recognition awards.

Work-Life Balance Support

- Allow flexible work arrangements where possible.
- Provide mental health and wellness programs for staff.

Recognition and Appreciation

- Regularly acknowledge teachers' efforts through awards, public appreciation, and feedback.
- Celebrate milestones such as years of service, outstanding contributions, or innovation.

4. Positive School Culture and Work Environment

Collaborative and Inclusive Culture

- Foster teamwork through staff meetings, retreats, and team-building activities.
- Encourage diversity, equity, and inclusion in decision-making.

Safe and Conducive Working Environment

- Ensure staff have access to well-equipped classrooms and teaching materials.
- Address workplace challenges such as bullying, harassment, and stress.

Effective Communication Channels

- Promote transparency in policies and decision-making.
- Encourage open dialogue through suggestion boxes, staff forums, and anonymous feedback.

5. Staff Welfare and Support Systems

Fair Compensation and Benefits

- Ensure salaries are competitive and paid on time.
- Provide health insurance, pension schemes, and other essential benefits.

Counseling and Emotional Support

- Offer stress management and mental health programs.
- Create a confidential support system for staff facing personal or professional challenges.

Workload Management

- Ensure a fair distribution of work to prevent burnout.
- Hire adequate staff to maintain reasonable teacher-student ratios.

6. Stakeholder Engagement and Community Involvement

Parental and Community Support

- Engage parents and the community in school development activities.
- Encourage partnerships with local businesses and organizations for resource mobilization.

Collaboration with Education Authorities

- Advocate for policies that improve working conditions for teachers.
- Engage government bodies in discussions on school funding and infrastructure improvement.

Student Engagement in Staff Motivation

- Encourage students to appreciate and respect teachers.
- Organize student-led teacher appreciation events.

A strategic approach to enhancing staff commitment in secondary schools requires strong leadership, career development opportunities, motivation, a supportive work environment, and stakeholder collaboration. By implementing these strategies, schools can improve teacher satisfaction, reduce turnover rates, and create a positive learning environment for students.

CONCLUSION

Staff commitment is the cornerstone of sustainable educational development in secondary schools. Dedicated and motivated teachers create a positive learning environment, improve student outcomes, and contribute to the overall success of the education system. When staff feel valued, supported, and engaged, they are more likely to go beyond their basic responsibilities, innovate in their teaching methods, and inspire students to excel. Investing in staff commitment through strong leadership, professional growth opportunities, fair compensation, and a positive work culture ensures long-term benefits not only for the school but also for society. A committed teaching workforce leads to higher retention rates, better academic performance, and the development of responsible, knowledgeable citizens who can drive progress in their communities. For education to be truly transformative and sustainable, schools must prioritize the well-being, motivation, and professional fulfillment of their staff. By fostering a culture of appreciation, collaboration, and continuous improvement, secondary schools can build a resilient and high-performing education system that meets the demands of the future.

RECOMMENDATIONS

1. Schools should provide a conducive working environment by ensuring adequate classroom facilities, teaching resources, and a supportive administrative structure to enhance staff motivation and productivity.
2. School authorities and policymakers should ensure timely payment of salaries, introduce performance-based bonuses, and provide other incentives such as housing, healthcare, and professional recognition to boost staff morale.
3. Teachers should be given access to regular training programs, workshops, and career advancement opportunities to improve their skills and commitment to their roles.

References

Adekoya, O. D., Jimoh, O. T., & Oladejo, D. A. (2021). Employee commitment and organizational performance: A review. *Journal of Business and Management Studies, 4*(2), 45-57.

Anwar, G., & Ghafoor, M. M. (2023). Impact of organizational culture on employee commitment: A systematic review. *Management Science Letters, 13*(4), 789-805.

Iqbal, N., & Hashmi, S. H. (2020). The role of ethical leadership in normative commitment: Evidence from corporate organizations. *Journal of Organizational Behavior Research, 5*(1), 112-130.

Khan, M. A., Javed, T., & Rahman, S. (2022). Career growth opportunities and employee retention: The mediating role of commitment. *International Journal of Human Resource Studies, 12*(3), 23-41.

Malik, M. I., Saif, M. I., & Shahid, M. (2023). Leadership and employee commitment: Investigating the moderating effect of workplace environment. *Journal of Business and Management Research, 15*(2), 34-50.

Meyer, J. P., & Maltin, E. R. (2019). Employee commitment and well-being: A critical review. *Journal of Organizational Behavior, 40*(2), 289-305.

Mowday, R. T., Porter, L. W., & Steers, R. M. (2013). *Employee-organization linkages: The psychology of commitment, absenteeism, and turnover*. Academic Press.

Njoroge, P. W., & Kwasira, J. (2021). Determinants of employee commitment in modern organizations: A review of theoretical perspectives. *African Journal of Business and Management, 6*(1), 112-126.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

ASSESSMENT OF TEACHERS' CLASSROOM MANAGEMENT AS A PANACEA FOR IMPROVED STUDENTS' ACADEMIC PERFORMANCE IN BUSINESS STUDIES IN AKWA IBOM STATE

By

Imeh Udoh Akpan, Ph.D
Department of Business Education
Akwa Ibom State College of Education
Afaha Nsit

ABSTRACT

This study assessed teachers' classroom management as a panacea for improved students' academic performance in business studies in Akwa Ibom State. Descriptive survey design was adopted to carry out this research. The study was carried out in Akwa Ibom State. The targeted population comprised all business studies teachers in Akwa Ibom State. Simple random sampling technique was used to select a total of 180 respondents which made up the sample size used for this research. The instrument used for data collection was a structured questionnaire titled "Teachers' Classroom Management and Improved Students' Academic Performance Questionnaire (TCMISAPQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The researcher subjected the data generated for this study to appropriate statistical technique such descriptive analysis to answer research questions. The results of the data analysis revealed that "Promotion of a Conducive Learning Environment for better performance" was the most prominent effect of teacher classroom management on student performance in business studies. It also showed that "Overcrowded Classrooms" was the highest challenge of effective classroom management. The study concluded that effective classroom management plays a vital role in enhancing teaching and learning, especially in practical subjects like business studies. One of the recommendations made was that teachers should be regularly trained in modern classroom management techniques, including student engagement strategies, conflict resolution, and inclusive teaching methods.

Keywords: Teacher, Classroom Management, Students, Academic Performance, Business Studies and Akwa Ibom State

INTRODUCTION

In the evolving landscape of education, the quality of teaching and learning is greatly influenced by the atmosphere of the classroom. One of the most critical elements in shaping this atmosphere is effective classroom management. For subjects like business studies, which require not only theoretical understanding but also practical application and active student engagement, a well-managed classroom becomes indispensable. In Akwa Ibom State, where educational outcomes continue to draw attention from stakeholders, the role of teachers in creating and maintaining conducive learning environments deserves critical assessment. Classroom management refers to the strategies and practices teachers use to organise classroom activities, promote appropriate behaviour, and maximise learning time (Santhanam, 2022). Effective classroom management ensures that teachers can deliver instruction efficiently while minimising disruptions. In business studies, this translates into the ability to engage students in discussions, simulations, and project-based learning that mirror real-life business scenarios. The

impact of a teacher's ability to manage the classroom extends far beyond discipline—it directly influences students' motivation, participation, and ultimately, their academic achievement (Ahmed and Plessis 2024).

Academic performance in business studies in many Nigerian secondary schools, including those in Akwa Ibom State, has been a subject of concern. Factors such as inadequate instructional materials, poor learning infrastructure, and socio-economic challenges often dominate the discourse. However, less attention is given to how teacher-led classroom management practices affect students' performance in this subject. According to Sunday-Piaroi (2018), teachers who adopt proactive and inclusive classroom management techniques create environments where students are more likely to succeed academically. Therefore, a shift in focus toward classroom dynamics could reveal untapped potential for improving student outcomes.

In the context of Akwa Ibom State, where the state government has shown increasing commitment to educational reform, examining classroom management as a lever for academic excellence is timely. Business Studies, which prepares students with entrepreneurial skills and financial literacy, is a cornerstone subject for youth empowerment and economic development (George, Sakirudeen and Sunday, 2017). A well-managed classroom not only ensures content delivery but also cultivates critical thinking, teamwork, and business ethics among learners—skills necessary for both academic and real-world success. The government also offer more facilities in schools for improved classroom learning and teaching effectiveness (Akpan, 2022).

Moreover, the personality and professional competence of the teacher play a crucial role in classroom control and instructional delivery. Teachers who are trained in classroom management techniques are better positioned to handle behavioural issues, maintain discipline, and foster mutual respect, all of which are conducive to learning (George et al., 2017). Given the unique challenges and opportunities in Akwa Ibom State's secondary schools, this study becomes essential in identifying the link between teacher classroom management and students' academic performance in business studies. Technology is a structural change that can be integrated into the classroom to achieve significant improvements in productivity. It is used to support both teaching and learning. Technology has the power to transform teaching by ushering in a new model of connected teaching materials. These models link teachers to their students and to professional content, resources, and systems to help them improve their own instruction and personalize learning (Akpan, 2022). This research therefore seeks to assess how teacher classroom management serves as a panacea for improving students' academic performance in business studies in Akwa Ibom State. By evaluating specific strategies, challenges, and outcomes associated with classroom management, the study aims to provide actionable insights that can enhance teaching practices and student success. Through empirical analysis and contextual understanding, the research will contribute to the growing body of knowledge on educational best practices in Nigeria and beyond.

STATEMENT OF THE PROBLEM

Effective classroom management is a critical component of teaching that directly influences students' academic performance, particularly in subjects like Business Studies that require active engagement and comprehension. In AkwaIbom State, many secondary schools continue to face challenges related to classroom discipline, time management, lesson delivery, and

student participation. These issues are often rooted in the teacher's ability to manage the classroom environment effectively. Poor classroom management can lead to distractions, low motivation, and reduced instructional time, ultimately hindering students' academic success in Business Studies. Despite the recognized importance of classroom management, there appears to be limited empirical assessment of how teachers' management strategies impact students' academic performance in Business Studies within the context of Akwa Ibom State. This gap raises concern about the preparedness and effectiveness of teachers in handling classroom dynamics that support learning outcomes. Therefore, this study seeks to assess the extent to which effective classroom management by Business Studies teachers serves as a panacea for improving students' academic performance. The findings are expected to provide insight into the strengths and weaknesses of current practices and offer recommendations for improving instructional quality and student achievement.

OBJECTIVES

1. To find out the effects of teacher classroom management on student performance in business studies
2. To identify the challenges of Effective Classroom Management.

RESEARCH QUESTIONS

1. What are the effects of teacher classroom management on student performance in business studies?
2. What are the challenges of Effective Classroom Management?

LITERATURE REVIEW

CONCEPT OF TEACHER CLASSROOM MANAGEMENT

Classroom management encompasses the strategies and techniques teachers use to create and maintain a positive, productive learning environment where students are engaged and learning can flourish. This involves establishing clear expectations, building relationships, implementing routines, and addressing disruptive behaviour effectively. According to Wikipedia (2025)classroom management is the process teachers use to ensure that classroom lessons run smoothly without disruptive behaviour from students compromising the delivery of instruction. It includes the prevention of disruptive behaviour preemptively, as well as effectively responding to it after it happens.

Furthermore, FutureLearn (2023) explained that classroom management encompasses a variety of skills and techniques that teachers can use to create a high-performing learning environment. At its core, it aims to ensure classes run smoothly, disruptive behaviour from students is kept to a minimum, and teaching materials and activities promote learning. The ultimate goal is to ensure that both the students and the teacher get the most out of the classroom experience. Classroom management can be defined as the orderly control of students, the class environment and teaching materials in order to obtain the desired learning objectives which can enhance the academic achievement of students (Adzongo and Olaitan, 2019).

CONCEPT OF STUDENTS ACADEMIC PERFORMANCE

Student academic performance refers to a student's achievement and progress in their studies, typically measured through grades, test scores, and other assessments. It's a multifaceted concept influenced by various factors, including learning ability, motivation, and the environment in which students learn. According to Wikipedia (2025), academic achievement, or academic performance, is the extent to which a student, teacher or institution has attained their short- or long-term educational goals. Student academic performance refers to the extent to which a student has achieved their short- or long-term educational goals. It is typically measured through assessments such as tests, examinations, class participation, assignments, and overall grade point averages (GPA). Academic performance reflects how well a student understands and applies the knowledge, skills, and competencies taught in the classroom. It is often used by educators, institutions, and policymakers as an indicator of learning effectiveness and educational success.

Several factors influence student academic performance, including teaching quality, classroom management, parental involvement, socio-economic background, motivation, and access to learning resources. A high level of academic performance suggests strong intellectual development and mastery of subject matter, while low performance may indicate learning difficulties or external challenges affecting a student's ability to learn effectively. Therefore, improving academic performance involves a collaborative effort between students, teachers, parents, and the educational system as a whole.

CONCEPT OF BUSINESS STUDIES

Business studies is an interdisciplinary field that examines the principles, practices, and theories involved in running a business, encompassing topics like management, finance, marketing, and human resources. It aims to provide a comprehensive understanding of how businesses operate and achieve success, and it's often used to refer to academic programmes that prepare individuals for careers in various business-related fields. According to Umoudo and Ebong (2016), business studies is a part of education which deals with business experience, both for specialised occupational uses and for general uses. The individual prepares himself with adequate knowledge of existing business institutions and adjusts accordingly to benefit maximally from available opportunities. According to the Nigerian Policy of Education (NPE 2004), at the Junior Secondary School (JSS) level, the business studies curriculum is intended to offer both specialised and general educational experiences. The specialised form of education is designed to meet the immediate needs of individuals who wish to develop intellectual and vocational interest in a specified field.

Furthermore, Khanna (2024) mentioned that business studies is like a guidebook that teaches you how businesses work, from setting them up to making them run successfully. It covers everything from how to sell products and manage people to understanding money matters in a company. Business studies (or business) is a branch of social science that explores the knowledge, skills, methods and techniques required to start and run a profitable venture. It encapsulates sub-fields like business administration and economics and includes key elements like finance, marketing and operations (Adekoya, 2023). Business studies is a field of study that deals with the principles of business, management, and economics. It combines elements of accountancy, finance, marketing, organisational studies, human resource management, and

operations. Business studies is a broad subject where the range of topics is designed to give the student a general overview of the various elements of running a business.

Components of Classroom Management

Classroom management is the foundation of an effective learning environment. It encompasses a wide range of strategies and practices that teachers use to maintain order, foster student engagement, and support academic achievement. The following are key components of classroom management:

Classroom Environment: This refers to the physical and emotional setup of the classroom. A well-organised, clean, and welcoming environment encourages focus and positive behaviour. It includes seating arrangements, decorations, lighting, and the overall mood that makes students feel safe and respected (Oruikor, Ewane, Durotoye, and Akomaye, 2023).

Rules and Expectations: Setting clear rules and expectations helps students understand what behaviour is acceptable. When expectations are consistently reinforced, students are more likely to follow them and maintain discipline (Alter and Haydon, 2017).

Routines and Procedures: Routines help students know what to do and when to do it, reducing confusion and saving time. Procedures for daily tasks like entering the classroom, turning in assignments, or transitioning between activities help create a structured learning environment.

Behaviour Management: This includes strategies to prevent and handle misbehaviour. Teachers use positive reinforcement to encourage good behaviour and apply consequences when needed. Effective behaviour management promotes respect and minimises disruptions (Oruikor, Ewane, Durotoye, and Akomaye, 2023).

Student Engagement: Keeping students interested in learning reduces behaviour problems and increases academic success. Engaging lessons that are interactive, relevant, and suited to student needs help maintain focus and participation.

Teacher-Student Relationships: Strong, respectful relationships between teachers and students build trust and cooperation. When students feel valued and understood, they are more likely to behave well and engage in learning.

Communication: Effective communication ensures clarity and consistency in the classroom. It involves giving clear instructions, offering feedback, maintaining contact with parents, and collaborating with colleagues to support student success.

EFFECTS OF TEACHER CLASSROOM MANAGEMENT ON STUDENT PERFORMANCE IN BUSINESS STUDIES

Effective classroom management is a cornerstone of successful teaching and learning. In the context of business studies, which often involves both theoretical knowledge and practical applications, the role of a teacher in managing the classroom cannot be overstated. The way a teacher organises the learning environment, handles discipline, engages students, and delivers lessons significantly influences students' academic performance. Also the use of

virtual reality in education has displayed the capabilities of promoting higher order thinking, promoting the interest and commitment of students, the acquisition of knowledge, promoting mental habits, improving the understanding level of students, improving teaching skills for teachers using VR by providing a deep level of knowledge, and improving memory power by connecting feelings with education (Akpan 2022). The following are the effects of teacher classroom management on student performance in business studies as mentioned by Ajuluchukwu (2022):

Promotes a Conducive Learning Environment: A well-managed classroom provides a safe, orderly, and structured setting where students can focus on learning without unnecessary distractions. In business studies, where students are expected to grasp concepts such as entrepreneurship, marketing, and accounting, a conducive environment allows for better concentration, idea generation, and class participation, leading to improved academic performance.

Enhances Student Engagement and Participation: Teachers who implement clear rules, maintain routines, and use interactive teaching methods can stimulate active student participation. In business studies, which often involve case studies, group projects, and class discussions, such engagement is essential. When students feel included and guided, they are more likely to stay motivated and perform better academically.

Encourages Discipline and Time Management: Classroom management instills discipline among students by setting boundaries and expectations. Business Studies requires a high level of organisation, especially during project work, presentations, and exam preparations. Teachers who manage their classrooms effectively teach students to value time, meet deadlines, and approach tasks systematically—skills that directly influence academic success.

Minimises Disruptive Behaviour: Disruptions such as noise, lateness, and inattentiveness can derail lesson flow and reduce teaching effectiveness. Effective classroom managers quickly address such issues, ensuring minimal loss of instructional time. In business studies, where concepts build upon one another, consistency in teaching and learning is key to student understanding and performance.

Facilitates Differentiated Learning: Students learn at different paces and have varied learning needs. A well-managed classroom allows the teacher to identify these differences and adjust their teaching strategies accordingly. In business studies, this could mean providing additional support for students struggling with financial calculations or giving enrichment tasks to more advanced learners—thus improving overall performance.

Builds Positive Teacher-Student Relationships: Effective classroom management fosters mutual respect between teachers and students. When students feel respected, valued, and understood, they are more likely to take their studies seriously. A positive teacher-student relationship, especially in a subject like business studies that requires interaction and feedback, creates a supportive environment that boosts student confidence and academic achievement.

THE CHALLENGES OF EFFECTIVE CLASSROOM MANAGEMENT

Classroom management is a fundamental aspect of effective teaching and learning. It involves creating a structured environment that fosters student engagement, discipline, and productivity. However, maintaining this balance is often challenging for educators due to various factors. Below are some of the key challenges associated with effective classroom management:

Diverse Student Needs: One of the most significant challenges is catering to a diverse classroom where students differ in learning styles, academic levels, behavioural tendencies, and cultural backgrounds. Managing such diversity requires tailored teaching methods and personalised approaches, which can be demanding in a large or under-resourced classroom (Sharma, 2023).

Behavioural Issues: Disruptive behaviours such as talking out of turn, inattentiveness, or disrespect can interfere with teaching and learning. Consistently managing these behaviours without escalating conflicts or alienating students requires patience, consistency, and strong interpersonal skills (Obiekwe and Uzuoke, 2021).

Lack of Parental Support: Effective classroom management often depends on support from parents or guardians. When parents are uninvolved or indifferent to their children's education and behaviour, teachers may find it difficult to reinforce discipline or motivate students to follow classroom rules.

Overcrowded Classrooms: In many educational systems, especially in developing countries, overcrowded classrooms are a major challenge. A high student-to-teacher ratio limits the teacher's ability to give individual attention, monitor behaviour, and maintain order.

Limited Resources: Classroom management is also hindered by a lack of essential resources such as teaching aids, classroom furniture, and technological tools. Inadequate infrastructure can make it difficult to implement interactive or differentiated teaching strategies that could improve student engagement and reduce behavioural problems (Garvida, 2021).

Emotional and Mental Health Issues: Students facing emotional or psychological difficulties may struggle with self-regulation and focus, leading to disruptions. Teachers often lack the training or support needed to effectively manage such cases while maintaining an inclusive learning environment.

Inconsistent Enforcement of Rules: For classroom management to be effective, rules and consequences must be consistently applied. However, inconsistency—whether due to teacher burnout, favouritism, or unclear guidelines—can undermine authority and lead to confusion among students.

Technological Distractions: While technology can be a powerful learning tool, it can also be a source of distraction. Unregulated use of mobile phones or other devices during lessons can disrupt the flow of teaching and reduce student concentration.

MITIGATING STRATEGIES TO THE CHALLENGES OF EFFECTIVE CLASSROOM MANAGEMENT

Effective classroom management is essential for fostering a productive learning environment. However, teachers often face numerous challenges, including disruptive behaviour, diverse learning needs, overcrowded classrooms, and lack of parental support. Addressing these challenges requires deliberate and proactive strategies. Below are key mitigating strategies that can help overcome the hurdles to effective classroom management as mentioned by numerous scholars, including Khasinah, Nurdin and Panjaitan (2024):

Establishing Clear Rules and Expectations: Setting clear, consistent, and age-appropriate rules at the beginning of the school term helps establish boundaries and expectations. When students understand what is expected of them, they are more likely to follow classroom procedures and routines. Involving students in the creation of these rules can also encourage ownership and accountability.

Building Strong Teacher-Student Relationships: Positive relationships based on mutual respect and trust can reduce behavioural issues and encourage cooperation. Teachers should take time to understand their students' backgrounds, interests, and learning styles. When students feel valued and supported, they are more likely to be engaged and exhibit positive behaviour.

Using Positive Reinforcement: Rewarding good behaviour through praise, encouragement, or tangible incentives can motivate students to maintain discipline. Recognising students for their efforts, rather than only correcting misbehaviour, creates a more positive classroom atmosphere and reinforces desired behaviours.

Differentiated Instruction: To address diverse learning needs, teachers should use a variety of teaching methods such as group work, visual aids, hands-on activities, and technology. Tailoring instruction to meet different learning styles not only keeps students engaged but also reduces frustration and off-task behaviour.

Professional Development and Training: Teachers should be provided with ongoing training in classroom management, conflict resolution, and inclusive teaching practices. Workshops, seminars, and peer collaboration can equip teachers with updated strategies to manage classrooms effectively.

Parental Involvement and Communication: Engaging parents in their children's education helps reinforce behaviour and learning expectations at home. Regular communication through meetings, calls, or newsletters keeps parents informed and encourages them to support teachers' efforts in managing classroom behaviour.

Effective Time Management: Organising lessons with clear objectives, structured activities, and time allocations can reduce downtime and keep students focused. Teachers who manage their time efficiently are better able to cover the curriculum and maintain student interest throughout the lesson.

Classroom Environment Design: Arranging the classroom in a way that promotes interaction, visibility, and easy movement can reduce distractions and foster engagement. Ensuring adequate lighting, ventilation, and seating can also contribute to a more conducive learning environment.

Implementing Conflict Resolution Techniques: Teaching students how to resolve conflicts peacefully through dialogue, empathy, and negotiation can reduce incidents of aggression or disruption. Conflict resolution programmes and peer mediation strategies can be integrated into school systems to support this goal.

Utilising Technology Wisely: Integrating technology in a purposeful way can enhance learning and maintain attention. Tools such as interactive whiteboards, educational apps, and online quizzes can make lessons more dynamic while maintaining discipline through structured digital activities. Online learning also comes with its own unique benefits of increasing the knowledge base of both the teacher and student; it makes learning interesting. Hence, teachers and trainers need to be the primary force driving this change and promoting the concept (Akpan, 2022).

METHODOLOGY

Descriptive survey design was adopted to carry out this research. The study was carried out in Akwa Ibom State. The targeted population comprised all business studies teachers in AkwaIbom State. Simple random sampling technique was used to select a total of 180 respondents which made up the sample size used for this research. The instrument used for data collection was a structured questionnaire titled "Teacher's Classroom Management for Improved Student's Academic Performance Questionnaire (TCMISAPQ)".Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The researcher subjected the data generated for this study to appropriate statistical technique such descriptive analysis to answer research questions.

Results and Discussions

Research Questions 1: The research question sought to find out the effects of teacher classroom management on student performance in business studies. To answer the research percentage analysis was performed on the data, (see table 1).

Table 1:
Descriptive statistics of the effects of teacher classroom management on student performance in business studies.

EFFECTS	FREQUENCY	PERCENTAGE (%)
Promotes a Conducive Learning Environment for better performance	42	23.33**
Enhances Student Engagement and Participation which enriches their academic performance	35	19.44
Encourages Discipline and Time Management which directly influence academic success	33	18.33
Facilitates Differentiated Learning	27	15
Minimises Disruptive Behaviour to concentrate in studies	20	11.11
Enhancing Productivity and Automation	14	7.78
Builds Positive Teacher-Student Relationships for easy comprehension of the subject matter	9	5

TOTAL	180	100%

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field Survey

The above table 1 presents the percentage analysis of the effects of teachers' classroom management on student performance in business studies. From the result of the data analysis, it was observed that "Promotion of a Conducive Learning Environment for better performance" 42(23.33%) was rated as the highest effect of teacher classroom management on student performance in business studies, while "Building of Positive Teacher-Student Relationships for easy comprehension of the subject matter" 9(5%) was rated the least. The result therefore is in agreement with the research findings of numerous scholars including Ajuluchukwu (2022), who stated that Effective classroom management is a cornerstone of successful teaching and learning. In the context of business studies, which often involves both theoretical knowledge and practical applications, the role of a teacher in managing the classroom cannot be overstated.

Research Questions 2: The research question sought to find out the challenges of effective classroom management. To answer the research percentage analysis was performed on the data, (see table 2).

Table 2:
Descriptive statistics of the challenges of effective classroom management.

CHALLENGES	FREQUENCY	PERCENTAGE (%)
Overcrowded Classrooms	38	21.11**
Behavioural Issues	29	16.11*
Lack of Parental Support	24	13.33
Diverse Student Needs	23	12.78
Limited Resources	21	11.67
Inconsistent Enforcement of Rules	18	10
Technological Distractions	15	8.33
Emotional and Mental Health Issues	12	6.67*
TOTAL	180	100%

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field Survey

The above table 2 presents the percentage analysis of the challenges of effective classroom management. From the result of the data analysis, it was observed that "Overcrowded Classrooms" 38(21.11%) was rated as the highest challenge of effective classroom management, while "Emotional and Mental Health Issues" 12(6.67%) was rated the least. The result therefore is in agreement with the research findings of numerous scholars including Sharma (2023), who stated that managing such diversity requires tailored teaching methods and personalised approaches, which can be demanding in a large or under-resourced classroom.

CONCLUSION

Effective classroom management plays a vital role in enhancing teaching and learning, especially in practical subjects like business studies. In Akwa Ibom State, where student performance remains a key concern, the teacher's ability to manage the classroom directly influences student engagement, motivation, and achievement. A well-structured learning environment fosters discipline, critical thinking, and active participation—elements essential for academic and real-world success. The result of the data analysis revealed that "Promotes a Conducive Learning Environment for better performance" is the most prominent effect of teacher classroom management on student performance in business studies. It also showed that "Overcrowded Classrooms" is the highest challenges of effective classroom management. This study highlights the importance of assessing classroom management strategies as a solution to improving business studies outcomes. The findings aim to guide educators and policymakers in strengthening teaching practices and promoting sustainable academic growth in the state.

RECOMMENDATIONS

1. Teachers should be regularly trained in modern classroom management techniques, including student engagement strategies, conflict resolution, and inclusive teaching methods. Workshops and seminars tailored to business studies can enhance teachers' ability to create structured, interactive, and supportive classroom environments that foster academic excellence.
2. School administrators and education authorities should establish effective monitoring systems to assess classroom management practices. Constructive feedback and mentoring programmes should be implemented to support teachers in improving their classroom control and instructional delivery.
3. To enhance classroom management and instructional effectiveness, schools must be equipped with relevant teaching aids, business simulation tools, and conducive learning environments. Well-resourced classrooms reduce distractions and help teachers maintain order, which in turn boosts student participation and performance in business studies.

REFERENCES

Adekoya, I. (2023). What is Business Studies? Components, Importance and Job Opportunities. Available at: https://blog.piggyvest.com/money-tips/what-is-business-studies/

Adzongo, P. I. and Olaitan, T. O. (2019). Effective Teaching and Classroom Management: A Tool for Quality Education in Nigeria. *(BSUJEM)*, I (2), 1-12.

Ahmed, N. and Plessis, P. (2024). The Role of Classroom Management in Enhancing Learner's Academic Performance: Teachers' Experiences. *Studies in Learning and Teaching (SiLeT)*, 5(1), 202-218.

Ajuluchukwu, E. N. (2022). Teachers' Skills and Business Studies Students' Academic Performance in Secondary Schools in Ekwusigo Local Government Area of Anambra State. *Prestige Journal of Counselling Psychology*, 5(1), 34-44.

Alter, P. and Haydon, T. (2017). Characteristics of Effective Classroom Rules: A Review of the Literature. *The Journal of the Teacher Education Division of the Council for Exceptional Children*, 40(1):088840641770096

FutureLearn (2023). What is classroom management? Available at: https://www.futurelearn.com/info/blog/what-is-classroom-management

Garvida, F. (2021). Enhancing Student Engagement in Online Science Education: Comparative Analysis of Experimental Strategies. DOI: 10.13140/RG.2.2.15240.84480.

George, I. N., Sakirudeen, A. O. and Sunday, A. H. (2017). Effective Classroom Management and Students' Academic Performance in Secondary Schools in Uyo Local Government Area of Akwa Ibom State. *Research in Pedagogy*, 7(1), 43-56.

Hasnanto, A. T. (2024). Effective Classroom Management to Create a Positive Learning Environment. *Journal Corner of Education Linguistics and Literature*, 4(1), 257-268. DOI: 10.54012/jcell.v4i001.388.

Khanna, P. (2024). Explore the Business World: What is Business Studies? Available at: https://www.toprankers.com/business-studies?srsltid=AfmBOoph2EbNTKscJbYzciWCQYptE2qDro3-b8WRnx8RL9Ljvg4CqwgZ

Khasinah, S., Nurdin, S. and Panjaitan, A. M. (2024). Managing Classroom: Teachers' Strategies and Challenges. *Pionir: Jurnal Pendidikan*, 13 (2), 24-37.

Obiekwe K. K., and Uzuoke M. I. (2021). Interpersonal and communication skills used by teachers to achieve quality classroom management in secondary schools in Imo State. *International Journal of Multidisciplinary Research and Growth Evaluation*, 2(5), 106-112.

Oruikor, G. J., Ewane, H. D., Durotoye, M. P. and Akomaye, C. U. (2023). The Impact of Classroom Design on Student Learning: A Case Study of Cameron Schools. *Journal of Global Issues and Interdisciplinary Studies*, 1 (1), 21-40.

Santhanam, V. (2022). *Classroom Management.* A paper Presented at the Current Perspectives in Educational Psychology Conference (ICCPEP) held at Chennai.

Sharma, S. (2023). Challenges in Diverse Classroom of School: Teachers' Perspectives. *Chaturbhujeshwar Academy Journal(CAJ)*, 1(1), 38-50.

Sunday-Piaroi, M. (2018). Classroom Management and Students' Academic Performance in Public Secondary Schools in Rivers State. *International Journal of Scientific Research in Education*, 11(5), 940-963.

Umoudo, B. I. and Ebong, P. S. (2016). The Utilization of E-Learning Facilities on Students Academic Performance in Business Studies in Akwa Ibom State Secondary Schools. *Universal Academic Journal of Edu., Sc. & Tech.*, 3(2), 1-13.

Wikipedia (2025). Academic achievement. Available at: https://en.wikipedia.org/wiki/Academic_achievement#:~:text=Academic%20achievement%20or%20academic%20performance,bachelor's%20degrees%20represent%20academic%20achievement.

Wikipedia (2025). Classroom Management. Available at: https://en.wikipedia.org/wiki/Classroom _management

Akpan U. (2022). New Technology Needs For Teaching Business Education in Tertiary Institutions in Nigeria. International journal of research in education, science and technology, (5)1.

INTERNATIONAL JOURNAL OF EDUCATIONAL AND SCIENTIFIC RESEARCH FINDINGS, MAY, 2025, ISSN: 2749-7481 VOL. 7 NO.1, GERMANY

RELATIVE EFFECTS OF COMPUTER ASSISTED INSTRUCTIONS (CAI), THINK-PAIR-SHARE TEACHING METHODS AND CHEMISTRY STUDENTS' ACADEMIC ACHIEVEMENT AND RETENTION ON ENVIRONMENTAL POLLUTION IN ITU, NIGERIA

By

Mary Edet OTOYO,

Emem Isaac NOAH

And

BRAIN Edem Sunday
Department of Science Education
Faculty of Education
University of Uyo

ABSTRACT

The persistent poor academic achievement of students in the sciences in recent times raises doubts on the efficacy of the teaching methods used by the teachers. Teachers and students perceive the concept of environmental pollution and environmental hazards as being difficult. It is in view of this that the present study sought to explore students' achievement and retention on the concept of environmental pollution when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State. A quasi-experimental design with 2 x2 factorial arrangement was adopted for the study. The study population comprised all the 1000 Senior Secondary Two (SS 2) Chemistry students in all the 19 public co-educational secondary schools in Itu Local Government Area during the 2024/2025 school year. The sample consisted of 141 (SS2) Chemistry students drawn from four intact classes in four-selected co-educational secondary school in the study area using purposive sampling technique. The instrument for data collection was a researcher-developed 25 item, 4-option, multiple-choice test, tagged: Achievement Test on Environmental Pollution (ATEP) with a reliability index of 0.75 The data obtained from the pre-test, post-test and retention tests were analysed using mean, standard deviation and Analysis of Covariance (ANCOVA). The results showed that: there was a significant difference in the students' achievement on the concept of environmental pollution, when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies, respectively, in favour of students taught using Computer-Assisted-Instruction; there was a significant difference in the students' retention on the concept of environmental pollution, when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in favour of those taught using Think-Pair-Share Method; that there was no significant difference between the mean achievement and retention scores of male and female students in the concepts taught given the instructional strategies. Consequently, it was concluded that Instructional strategies are significant determinant of students' learning outcomes and not gender; and it was recommended, among others that Chemistry teachers should make effective use of Computer-Assisted-Instruction and Think-Pair-Share teaching methods for better learning outcomes.

Keyword: Relative, Effects, Computer Assisted Instructions (Cai), Think-Pair-Share Teaching Methods, Chemistry Students,' Academic Achievement, Retention, And Environmental Pollution.

INTRODUCTION

Science Education is a field concerned with the production of scientifically literate citizens. Nwanekezie and Arokoyu (2016) defined Science education as the study of the interrelationships between science as a discipline and the application of educational principles to its understanding, teaching and learning. It is concerned with the search for relevant contents and new methods of science teaching and learning. Science education is necessary for national development because its science and technological advancement and the level of scientific literacy of its citizens assess the development of any society. The Nigeria National Policy on Education (Federal Republic of Nigeria, FRN 2013) states that the goals of Science Education in Nigeria include: cultivating inquiry, knowing and rational mind for the conduct of a good life and democracy, producing scientist for national development and service studies in technology and the cause of technological development, producing knowledge of the physical world, and the forms and the conduct of life.

Unfortunately, despite the importance of science education in national development, and the role it plays in socio-economic advancement, Nigeria has not been able to achieve the goals of Science Education. Science education in Nigeria is not adequate to produce skilled human resources needed for transformation into national prosperity (Olalekan and Omosewo, 2018). This is obvious from the poor state of scientific and technological development, and the level of unemployment in the country. Our Science Education cannot empower the learners to bring about sustainable development to the citizens. Our Science Education only equips the learners on how to use technological gadgets rather than on the knowledge of how they are made or maintained. This has contributed to the state of underdevelopment in the country. The only way Science Education can be strengthened is through improvement in its teaching and learning. The recent trends in the development of Science Education in Nigeria have been considered in many articles advocating for science teachers to use modern experimental methods in Science Education on school learning and practice.

Studies conducted by Alpusari and Apriyandi Putra (2015); Ifamuyiwa and Onakoya (2013); Siburian (2014) on the impact of TPS on students' achievement have indicated that students' achievement is enhanced. Sample (2016) suggests that based on the findings, using Think-Pair-Share facilitates increased student participation in class discussion and increases the quality of student responses. Kothiyal, Majumdar, Murthy,and Lyer (2017) while observing the effect of Think-Pair-Share in a large CSI (Computer Science) class, found that Think-Pair-Share is a suitable strategy to use for Computer Science instructors who intend to incorporate active learning techniques in their courses. During the discussion phase, it was observed that students were interested in discussion with their partners. It was recommended that students working in small groups and providing regular feedback was effective for learning. Dol. (2014) found that 99% students agreed that thinking about the problem and writing the solution during the think phase helped them thinking about the problem and writing the solution during the think phase helped them in learning concepts more precisely. Also, 100% students agreed that they found the Think-Pair-Share activity effective. Sugiaro and Sumarsono (2014) explained the implementation of Think-Pair-Share model to improve students' ability in reading narrative texts. Titsankaew (2015) studied the effects of cooperative learning on the students' achievement and attitude and attitude toward mathematics. It was found that using Think-Pair-Share method in the classroom can improve students' achievement and has positive effects on the student's attitude toward mathematics.

Perry, 2014; Bradherry, 2016 and Halpern and Wai, 2019 in separate studies reported no significant mean difference in cognitive test scores between male and female, suggesting there is no gender difference in general intelligence. However, Perry (2014) reported a high significant difference in the standard deviation of intelligence for boys and girls; boys were over represented at both the low and high extremes of cognitive ability. One generalization about males as a whole is that their cognitive abilities appear to be much more variable than females, there are more males at the very high and low ends of the scale than there are females. Smith (2019) asserted that our brains and abilities changes through training, education and experience and that gender difference in intelligence is a myth. Research evidence shows that females tend to excel in language production, synonym generation, word fluency, and all types of memory, anagrams and computation while males excel in Mathematics, problem solving, verbal analogies, mental rotation, spatial perception and tasks that require visual images (Halpern and Wai, 2019).

STATEMENT OF THE PROBLEM

The alarming rate of population explosion in our neighbourhood and attendant increase in waste generation, use of insecticides and allied chemicals, burning of fossil fuels; continued exploration of crude petroleum and flaring of natural gases by oil industries generally affect the environment. Considering the importance of the environment, the environmental and health challenges posed by air, water and land pollution; and in response to the Millennium Development Goal of ensuring environmental sustainability, the concept of environmental pollution and environmental hazards are perceived as being difficult by teachers and students. The persistent poor academic performance of students in the sciences in recent times raises doubts on the efficacy of the teaching methods used by the teachers. It should be noted that the methods of teaching adopted by teachers influence both the students' learning outcomes and their acquisition of science process skills. The nature of science as a dynamic and objective activity presupposes that science teaching should be activity-based, emphasizing science as a mode of inquiry through which knowledge is generated and expanded. This requires learners to be active participants in the teaching-learning process

Unfortunately, studies have shown that the prevalent teaching method in Nigerian schools is the lecture method, which is mainly authoritarian and teacher-centred. It is in view of this that the present study sought to explore students' achievement and retention on the concept of environmental pollution when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies. The question then is: how effective will the use of Computer-Assisted Instruction and Think-Pair-Share instructional strategies be in facilitating students' achievement and retention of the concept of environmental pollution? This study was an attempt at finding plausible answer to this question.

PURPOSE OF THE STUDY

The purpose of this study was to investigate the effects of Computer-Assisted Instruction and Think-Pair-Share instructional strategies on students' academic achievement and retention on the concept of pollution in secondary schools in Itu Local Government Area, Akwa Ibom State. The specific objectives of the study were to:

1. Determine the differences among the mean achievement scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share

instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

2. Determine the difference between the mean achievement scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.
3. Determine the differences among the mean retention scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.
4. Determine the difference between the mean retention scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

RESEARCH QUESTIONS

The following research questions we raised to guide the study:

1. What differences exist among the mean achievement scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?
2. What differences exist between the mean achievement scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?
3. What differences exist among the mean retention scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?
4. What differences exist between the mean retention scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?

RESEARCH HYPOTHESES

The following hypotheses were formulated for testing:

1. There is no significant difference among the mean achievement scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

2. There is no significant difference between the mean achievement scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

3. There is no significant among the mean retention scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

4. There is no significant difference between the mean retention scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

SIGNIFICANCE OF THE STUDY

The findings of this study are expected to be significant in the following ways: facilitate students' understanding of the concept while exploring the environment during investigations; provide avenue for students to acquire environmental education; serve as a motivation and encourage students' active participation in the learning process. They are also expected to help the learners acquire relevant skills and knowledge, hence, improve their performance and retention as well as help teachers to be more creative and resourceful in sourcing for instructional materials from learners' own environment. The empirical evidence provided by this study will update existing literature on the use of Computer-Assisted Instruction and Think-Pair-Share instructional strategies in facilitating students' understanding of environmental pollution.

RESEARCH METHOD

In this subsection, the research method is presented under the following subheadings: research design, area of the study, population of the study, sample and sampling technique, instrumentation, validation of the instrument, reliability of the instrument, scoring of the instrument, research procedure and method of data analysis.

THE STUDY AREA

The study was conducted in Itu Local Government Area of Akwa Ibom State.

POPULATION OF THE STUDY

The study population comprised all the 1000 Senior Secondary Two (SS 2) Chemistry students in all the 19 public co-educational secondary schools in Itu Local Government Area during the 2024/2025 school year.

SAMPLE AND SAMPLING TECHNIQUE

The sample consisted of 141 (SS2) Chemistry students drawn from four intact classes in four-selected co-educational secondary school in the study area. Purposive sampling technique was used in selecting the four schools. SS 2 was chosen since the topic under consideration by the researcher falls within their level.

The criteria were:

1. The schools must have a functional Chemistry laboratory;
2. The schools must have professional graduate Chemistry teachers with at least four years of teaching experience teaching the SS 2 class; and
3. Schools that have presented candidates for external examinations for the past five years.

INSTRUMENTATION

The instrument for data collection was a researcher-developed 4-option, 30 multiple-choice test, tagged: Achievement Test on Environmental Pollution (ATEP) lettered A to D, drawn from the concept of Environmental Pollution. The Achievement Test on Environmental Pollution (ATEP) was used for pre-test, post-test, and retention measurements. The post-test and retention tests were the reshuffled version of the ATEP arranged differently in serial numbering and response options.

VALIDATION OF THE INSTRUMENT

The draft of the Achievement Test on Environmental Pollution (ATEP) consisted of 40 items. In order to ensure face and content validity, the draft of the instruments was submitted to three independent assessors, two content experts in the Department of Chemistry, Faculty of Science, and one test and measurement expert, from the Faculty of Education, University of Uyo. These assessors were requested to vet the items for clarity of words, appropriateness to the level of students, content coverage, adequacy in addressing the objectives and problems of the study. Based on their comments and suggestions necessary modifications were made on the instruments. Those items that were found unsuitable were deleted and those that were found appropriate were retained. This reduced the number of items in the validated draft form of the instrument to 25. To ensure content coverage and even distribution of items on the ATEP, a table of the specification was used in preparing the test based on the six levels of Bloom's taxonomy (see Appendix III).

Item Analysis

This involved the determination of the difficulty and discrimination indices of the Achievement Test on Environmental Pollution (ATEP) to further validate the instruments. In order to obtain data for item analysis, the face-validated instrument was trial-tested on a sample of 30 Senior Secondary Two students in a school in the study area, which were not be part of the main study. The data were analysed using the expression.

$$\text{Difficulty Index (p)} = \frac{R}{T} \times \frac{100}{1}$$

$$\text{Discrimination Index (D)} = \frac{Ru - Rl}{0.05N}$$

Where:

p	=	Difficulty Index
R	=	Total number of students with correct answer to the item
D	=	Discrimination index
N	=	Total number of students responding to the item
Ru	=	Number of students in the upper half will correct answers to the item
R_l	=	Number of students in the lower half with correct answers to the item
N	=	Number of students responding to the item

Based on the results, items with difficulty indices above 70 % and below 25% were dropped for being too simple and too difficult respectively. Those with discrimination indices below 0.25 and above 0.70 were also dropped for lacking the potentiality to discriminate between the slow

and fast learners; these reduced the items on the Achievement Test on Environmental Pollution (ATEP) to 25.

Reliability of the Instrument

To establish the reliability of the instruments a trial test was conducted using a sample of thirty (30) Senior Secondary Two (SS II) Chemistry students selected from the target population but who were not to participate in the main study. Test-retest approach was used and Pearson Product Moment Correlation Coefficient was used in the determination; and a reliability index of 0.75 was obtained. This indicated that the instrument is reliable and capable of measuring the intended events in this study with consistency (Anselmi *et al.* 2019).

Scoring of Achievement Test on Environmental Pollution (ATEP)

The test consists of 25item; 4-option multiple-choice questions lettered A – D, with three distracters and one correct option. Each correct answer was scored 4 marks and the incorrect response zero. The total (maximum) mark for all the 25 questions was 100 marks and the minimum was zero (the scoring was measured in percentage).

Experimental Procedure

After selecting the sampled schools the researcher visited and obtained permission from the principals of four selected schools for the study to use their schools for the research and solicited for the cooperation of the Senior Secondary Two (SS II) Chemistry teachers in the selected schools in assisting as research assistants during the exercise. To qualify as research assistants, these Chemistry teachers were subjected to one week training, 3 days in each centre. The objective of the training was to enable the research assistants acquire competence for implementing Computer-Assisted Instruction and Think-Pair-Share instructional strategies. The content of the training package: the behavioural objectives, the content, activities of teacher and students during the teaching learning process as well as administration of the research instruments were all emphasized during the training sessions.

At the end of the research assistants' training, they were exposed to a mock teaching using lesson notes on Computer-Assisted Instruction and Think-Pair-Share instructional strategies, respectively, to ascertain their understanding of the concept of Environmental Pollution and competence and offer help where necessary. Thereafter, the research assistants administered the Achievement Test on Environmental Pollution (ATEP), as pre-test on the students in all the groups before using the treatment package in teaching the concept of Environmental Pollution in their respective groups for four weeks. The students in treatment Group I were taught using Computer-Assisted Instruction and those in Group II were taught using Think-Pair-Share instructional strategy. At the end of the class activities, the students were given a reshuffled version of the Achievement Test on Environmental Pollution (ATEP) as post-test. The retention test was given three weeks after the administration of the posttest. The pre-test, post-test and retention test scripts were collected by the research assistants and handed over to the researcher for marking and scoring. The entire exercise, from training of assistants to administration of retention test, lasted for seven (7) weeks.

Method of Data Analysis

The data obtained from the pre-test, post-test and retention tests were analysed using mean, standard deviation and Analysis of Covariance (ANCOVA). Mean and standard deviation were

used to answer the research questions while ANCOVA was used to test the null hypotheses raised at 0.05 level of significance. SPSS 25.0 was used to analyse the data.

Decision Rule

When the calculated p-value was greater than 0.05, the null hypotheses was retained but when it was less than 0.05, the null hypotheses was rejected.

Ethical Issues

The principles of confidentiality, anonymity and informed consent were strictly observed in the course of this research. Prior to carrying out the research, the authorities of the schools selected were informed of the intent of the researcher, and permission obtained to use the schools and the students. The conditions given by the different school authorities were strictly adhered to. The student respondents were not compelled to participate in the exercise; rather, they were encouraged to freely participate in the research without the researcher's influence; and their privacy was respected. In the course of the research work, the procedure for gathering data did not cause any physical or emotional harm to the respondents, as the researcher did not conceal any information from them. The research assistants were trained and instructed on the need for upholding ethical standards. Data obtained were used solely for academic purposes. The confidentiality of the subjects' identities were strictly adhered to.

RESULTS

Under this subhead, the summary of results used in answering the four research questions and testing the four null hypotheses formulated to guide the study, are presented, and interpreted.

Research Question 1: What differences exist among the mean achievement scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?

Table 4.1: Mean (X) and standard deviation of students' pre-test and post-test scores on ATEP classified by treatment groups

Treatment Groups	N	Pre-test		Post-test		Mean Gain Score
		sd		sd		
Computer-Assisted-Instruction	71	26.20	6.14	64.68	4.01	38.48
Think-Pair-Share	70	27.03	5.08	54.94	6.63	27.91

Table 4.1, shows the pre-test and post-test mean scores and standard deviation of scores of the three groups of students taught using Computer-Assisted-Instruction and Think-Pair-Share teaching/learning strategies. The post-test - pre-test mean gain scores of 38.48; and 27.91, respectively, for those in Computer-Assisted-Instruction and Think-Pair-Share Method groups showed those taught using Computer-Assisted-Instruction had better mean gain score compared with those taught using Think-Pair-Share. The post-test standard deviation scores of 4.01and 6.63, respectively, for students in Computer-Assisted-Instruction and Think-Pair-Share Method groups indicate that, students taught using Computer-Assisted-Instruction also had the closest scattering of post-test raw scores about the group mean. The Table also shows

that all the groups had post-test mean scores that are higher than their pre-test mean scores. The results for testing hypothesis one displayed in Table 4.2 was used to assess whether the observed differences in the mean scores of the two groups were statistically significant.

Hypothesis One: There is no significant difference among the mean achievement scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

Table 4.2: Summary of One Way Analysis of Covariance (ANCOVA) of the students' post-test scores on ATEP classified by treatment groups with pre-test as covariate

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision at p<.05 alpha
Pretest	557.73	1	557.73	21.38	.000	s
Treatment	3525.47	1	3525.47	135.16	.000	s
Error	3599.59	138	26.08			
Total675816.00141						
Corrected Total4579.19140						

a. R Squared = .520 (Adjusted R Squared = .513)

In Table 4.2, the calculated F-ratio for the effect of treatment at df 1 138 is 135.16; and alpha level of 0.00 is 0.46. This level of significance is less than .05 in which the decision is based; indicating that there was a significant difference in the students' achievement on the concept of environmental pollution , when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies, respectively. With this observation, null hypothesis 1, was rejected. The results in Table 4.1 show that students taught using Computer-Assisted Instruction had better mean gain score compared with those taught using Think-Pair-Share instructional strategy.

Research Question 2: What differences exist between the mean achievement scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?

Table 3: Mean (□) and standard deviation of students' pre-test and post-test scores on ATEP classified by treatment groups and gender

Treatment Groups	Gender	N	Pre-test		Post-test		Mean Gain Score
			□	sd	□	sd	
Computer-Assisted Instruction	Male	39	26.51	5.46	65.23		38.72
	Female	32	25.816.96		4.20		38.19
					64.00	3.73	
Think-Pair-Share	Male	34	26.47	4.43	54.476.25		28.00
	Female	36	27.565.64		55.39	7.02	27.83

Table 4.3, shows the pre-test and post-test mean scores; and standard deviation of scores of the male and female students taught using Computer-Assisted Instruction and Think-Pair-Share

instructional strategies. The pre-test-post-test mean gain scores of male and female students in the Computer-Assisted Instruction group displayed are 38.72 and 38.19, respectively. The pre-test-post-test mean gain scores of male and female students in the Think-Pair-Share group displayed are 28.00 and 27.83, respectively.

These observations show that the male students taught using Computer-Assisted Instruction had higher mean gain scores followed by their female counterparts in the same group. Table 4.3, also that the scattering of the raw scores about the post-test mean was widest for the females in the Think-Pair-Share group. The results for testing hypothesis two displayed in Table 4.4 was used to assess whether the observed differences in the mean scores of the two groups were statistically significant.

Hypothesis Two: There is no significant difference between the mean achievement scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

Table 4: Summary of 2 x 2 Analysis of Covariance (ANCOVA) of the students' post-test scores on ATEP classified by treatment groups and gender with pre-test as covariate

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision at p<.05 alpha
Pre-test	538.39	1	538.39	20.467	.00	s
Treatment	3474.56	1	3474.56	132.09	.00	s
Gender	1.75	1	1.75	.07	.80	ns
Treatment * Gender	20.23	1	20.23	.77	.38	ns
Error	3577.56	136	26.31			
Total	512460.00	141				
Corrected Total	7496.56	140				

a. R Squared = .523 (Adjusted R Squared = .509)

In Table 4.4, the calculated F-ratio for the main effect of instructional strategies at df 1,136 is 132.09, while its corresponding calculated level of significance is .00 alpha. This level of significance is less than .05 in which the decision is based; indicating that there was a significant difference between the mean achievement scores of students in the concepts taught given the instructional strategies used. However, the F-cal. value for the main effect of gender at df 1, 136 was .07 while its significant level is .80. This significant level is greater than .05 alpha in which the decision is based, indicating that the influence of gender on the students' achievement was not statistically significant. With this observation, null hypothesis 2 was upheld.

Research Question 3: What differences exist among the mean retention scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?

Table 4.5: Mean (X) and standard deviation of students' post-test and retention scores on ATEP classified by treatment groups

Treatment Groups	N	Post-test		Retention		Mean Score Difference
			sd		sd	
Computer-Assisted-Instruction	71	64.68	4.01	56.93	3.94	-7.75
Think-Pair-Share	70	54.94	6.63	51.20	6.70	-3.74

Table 4.5, shows the post-test and retention mean scores and standard deviation of scores of the two groups of students taught using Computer-Assisted-Instruction and Think-Pair-Share teaching/learning strategies. The retention- post-test mean scores difference of -7.75 and -3.74, respectively, for those in Computer-Assisted-Instruction and Think-Pair-Share Method groups showed those taught using Think-Pair-Share Method had better mean scores difference compared with those taught using Computer-Assisted-Instruction, indicating better retention. The retention standard deviation scores of 3.94 and 6.70, respectively, for students in Computer-Assisted-Instruction and Think-Pair-Share Method groups indicate that, students taught using Computer-Assisted-Instruction also had the closest scattering of retention raw scores about the group mean. The Table also shows that all the groups had retention mean scores that are lower than their post-test mean scores. The results for testing hypothesis three displayed in Table 4.6 was used to assess whether the observed differences in the mean scores of the two groups were statistically significant.

Hypothesis Three: There is no significant among the mean retention scores of Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

Table 4.6: Summary of One Way Analysis of Covariance (ANCOVA) of the students' retention scores on ATEP classified by treatment groups with post-test as covariate

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision at p<.05 alpha
Posttest	3949.70	1	3949.70	2389.05	.000	s
Treatment	275.98	1	275.98	166.93	.000	s
Error	228.15	138	1.65			
Total	417788.00	141				
Corrected Total	4579.19	140				

a. R Squared = .957 (Adjusted R Squared = .957)

In Table 4.6, the calculated F-ratio for the effect of treatment at df 1 138 is 166.93; and alpha level of 0.00. This level of significance is less than .05 in which the decision is based; indicating that there was a significant difference in the students' retention on the concept of environmental pollution , when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies, respectively. With this observation, null hypothesis 3, was rejected.

Research Question 4: What differences exist between the mean retention scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State?

Table 7: Mean (□) and standard deviation of students' pre-test and post-test scores on ATEP classified by treatment groups and gender

Treatment Groups	Gender	N	Post-test		Retention		Mean Score Difference
			□	sd	□	sd	
Computer-Assisted Instruction	Male	39	65.23	4.20	57.59	3.93	-7.64
	Female	32	64.00	3.73	56.13	3.87	-7.87
Think-Pair-Share	Male	34	54.47	6.25	50.76	6.53	-3.71
	Female	36	55.39	7.02	51.61	6.91	-3.78

Table 4.3, shows the post-test and retention mean scores; and standard deviation of scores of the male and female students taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies. The retention-post-test mean scores difference of male and female students in the Computer-Assisted Instruction group displayed are -7.64 and -7.87, respectively. The retention -post-test mean score difference of male and female students in the Think-Pair-Share group displayed are -3.71 and -3.78, respectively.

These observations show that the male students taught using Think-Pair-Share had better mean score difference followed by their female counterparts in the same group. Table 4.3, also that the scattering of the raw scores about the retention mean was widest for the females in the Think-Pair-Share group. The results for testing hypothesis four, displayed in Table 4.8 was used to assess whether the observed differences in the mean scores of the two groups were statistically significant.

Hypothesis Four: There is no significant difference between the mean retention scores of male and female Chemistry students taught the concept of pollution using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in secondary schools in Itu Local Government Area, Akwa Ibom State.

Table 8: Summary of 2 x 2 Analysis of Covariance (ANCOVA) of the students' retention scores on ATEP classified by treatment groups and gender with poat-test as covariate

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision at p<.05 alpha
Post-test	3900.74	1	3900.74	2338.39	.00	s
Treatment	275.46	1	275.46	165.13	.00	s
Gender	.87	1	.87	.52	.47	ns
Treatment * Gender	.42	1	.42	.25	.62	ns
Error	226.87	136	1.67			
Total	417788.00	141				
Corrected Total	5334.98	140				

a. R Squared = .523 (Adjusted R Squared = .509)

In Table 4.8, the calculated F-ratio for the main effect of instructional strategies at df 1,136 is 165.13, while its corresponding calculated level of significance is .00 alpha. This level of significance is less than .05 in which the decision is based; indicating that there was a significant difference between the mean retention scores of students in the concepts taught given the instructional strategies used. However, the F-cal. value for the main effect of gender at df 1, 136 was .52 while its significant level is .47. This significant level is greater than .05 alpha in which the decision is based, indicating that the influence of gender on the students' retention was not statistically significant. With this observation, null hypothesis 4, was upheld.

FINDINGS

From the results in Tables 1- 8 the following observations were made:

1. There was a significant difference in the students' achievement on the concept of environmental pollution, when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies, respectively, in favour of students taught using Computer-Assisted-Instruction.
2. There was no significant difference between the mean achievement scores of male and female students in the concepts taught given the instructional strategies used.
3. There was a significant difference in the students' retention on the concept of environmental pollution, when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in favour of those taught using Think-Pair-Share Method.
4. There was no significant difference in the male and female students' retention on the concept of environmental pollution, when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies.

DISCUSSION

The findings with regard to the effect of using Computer-Assisted Instruction and Think-Pair-Share instructional strategies, respectively, on students' achievement on the concept of environmental pollution, showed that there was a significant difference when taught using Computer-Assisted Instruction and Think-Pair-Share strategies, respectively, in favour of students taught using Computer-Assisted-Instruction.

This observation is in line with those of Gachi (2024) who also reported a significant difference in student achievement in favour of students who were taught using Computer-Assisted-Instruction. The observed significant difference in students' achievement in favour of those are taught using Computer-Assisted-Instruction is explained in terms of activity-based learning instructions which provided active learning environment that engaged the learners in high order thinking tasks as analysis, synthesis and evaluation which in turn enhanced the students' cognitive achievement.

On the influence of gender on students' achievement, when taught using Computer-Assisted Instruction and Think-Pair-Share strategies, respectively, it was observed that its influence was not statistically significant. This observation indicates that students' gender is not a strong determinant of students' academic outcomes.

With regard to the effect of using Computer-Assisted Instruction and Think-Pair-Share instructional strategies, respectively, on students' retention on the concept of environmental pollution, showed that there was a significant difference in the students' retention on the

concept of environmental pollution, when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies in favour of those taught using Think-Pair-Share Method. The observed significant difference on students' retention in favour of those are taught using Think-Pair-Share Method is explained in terms of increased student participation in class discussion and increased quality of student responses. which in turn enhanced the students' retention.

On the influence of gender on students' retention, when taught using Computer-Assisted Instruction and Think-Pair-Share strategies, respectively, it was observed that there was no significant difference in the male and female students' retention on the concept of environmental pollution, when taught using Computer-Assisted Instruction and Think-Pair-Share instructional strategies. This observation indicates that students' gender is not a strong determinant of students' academic outcomes.

CONCLUSION

Based on the findings of the study, it is hereby concluded that Computer-Assisted Instruction is a significant determinant of students' achievement, whereas gender is not; and that Think-Pair-Share Method is an effective facilitating strategy for enhancing students' retention; whereas gender had no effect on the students' retention.

RECOMMENDATION

Based on the findings and the conclusions reached, the following recommendations are made:

1. Chemistry teachers should make effective use of Computer-Assisted-Instruction and Think-Pair-Share teaching methods for better learning outcomes. learning
2. Government in conjunction with professional bodies like STAN should endeavour to organize and sponsor regular workshops to train science teachers on the use of both Computer-Assisted-Instruction and Think-Pair-Share teaching learning methods for better learning outcomes.

Suggestion for Further Study

Consequent upon the findings made and conclusion reached, it is hereby recommended that:

1. A similar study should be conducted in other Local Government Areas in Akwa Ibom State and other States of the Federation to allow for effective generalization of the findings.
2. The study should be replicated in other science subjects such as physics and chemistry.
3. Further research is recommended to verify the findings of the current study.

REFERENCES

Abanikannda, M. (2016). Enhancing Effective Chemistry Learning Through Hypermedia Instructional Mode of Delivery. European Journal of Educational Research, 5(1): 27−34. https://doi.org/10.12973/eu-jer

Alpusari, M. & Putra, R.A. (2015): The Application of Cooperative learning to think-pair-share (TPS). Model to increase the process of Science and Research (USR), 2805-2805.

Bradherry, T. (2016). Why women are smarter than men are. https://www.forbes.com/sites /travisbrad. (Retrieved on 3rd November 2021).

Cox, J. (2019). How to Motivate Students to Love Science. K-12 News, Lessons & Shared Resources by Teachers, For Teachers. Educational Leadership, 15: 327−338. https://www.teachhub.com/howmotivate-students-love-science

Emmanuel. A. A. (2016): Effect of think-pair-share learning strategy on student's achievement in Chemistry. Retrieved from: http://nairastudent.com/effect-of-think-pair-share-learning-strategy-on-students-achievemnt-in-chemistry.

Federal Republic of Nigeria (2013). National Policy on Education. Lagos, Nigeria.

Federal Republic of Nigeria (2015). National Policy on Education. Lagos, Nigeria: Nigerian educational Research and development council (NERDC) press.

Gachi, J. A. (2024). Effect of Computer-Assisted Instruction on Students' academic performance and retention in Chemistry Concepts. Journal of Science, Technology & Mathematics pedagogy, 2(1), 64-71.

Glomo-Nazoles, D. T. (2014). Think-Pair-Share: Its Effects on the Academic Performance of English as Second Language (ESL) Students. *International Journal of Literature, Linguistics and Interdisciplinary Studies*, 1(3 & 4): 22-26

Halpern, D. F. and Wai, J. (2019). Sex differences in intelligence. https://www.cambridge.org/core/book. (Retrieved on 20th November 2021).

Ifamuyiwa, A. S. and Onakoya, S. (2014). Impact of Think – Pair – Share Instructional Strategy on Student achievement in Secondary School Mathematics. *Journal of the Science Teachers Association of Nigeria,* 48(1): 27-35.

Kamisah, O. and Nur, S. (2015) Conceptual understanding in secondary school chemistry: A discussion of the difficulties Experienced by students. American Journal of Applied Sciences, 10(5): 433-441

Kothiyal, M. Lyer (2017). Relative effects of Think Pair Share on Students Performance in Secondary Schools in Abia State. Unpublished M.Sc (Ed) Thesis Work, Department of Science Education, Michael Okpara University of Education, Umudike.