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Introduction

It is with great pleasure that we present the second volume of our International Journal on Education and Interdisciplinary Studies (IJEIS). This volume focuses much on Education in the digital Era, Challenges, Opportunities and Future Directions.

The International Journal on Education and Interdisciplinary Studies (IJEIS) is an international peer-reviewed journal, and as the name intones, accepts well researched papers from various fields of studies, but not limited to Science Education, Social Sciences, Vocational Studies, Languages, Information and Communication Technology(ICT), books and editorial reviews, etc.

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Finally our sincere gratitude goes to our consulting editors, members of the editorial board, and all who made the publication of this volume possible.

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Availability and Implication of Educational Facilities in Public Secondary Schools in Nigeria

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Abstract

This paper was on availability of educational facilities in public secondary schools in Nigeria. The facilities stated in Nigeria National policy on Education written under educational support services (NPE, 2014) was used as an ideal situation to assess the available facilities. The purpose of the study was to determine the implication of availability of these approved facilities as stated in the national policy of Education, they are: school library, school cafeteria, school garden, sickbay/school health clinics, toilets, portable water, well-equipped first Aid box, sports and recreational facilities, counselling clinic, science laboratories and information technology laboratories.

Keyword: Education facilities, education, availability, implication, secondary schools.

Introduction

There is a growing concern for the state of poor output of the educational system in Nigeria. Stakeholders have criticized the manner in which the educational system is losing its value coupled with the unimpressive performance of students in external examinations, especially at the secondary school level. A lot of reasons have been given for this situation ranging from non-availability or inadequate educational facilities to poor teacher quality and quantity. The capable means of ensuring quality into public

schools lies in the availability and utilization of educational facilities.

In educational institutions, school facilities constitute essential inputs which could guarantee favourable learning environment and enhance the achievement of educational objectives. According to Asiyai (2012), school facilities include the entire school plant which school administrators, teachers and students' harness, allocate, and utilize for the smooth and

efficient management of any educational institution. In the school, educational facilities serve as pillars of support for effective teaching and learning thereby making the process meaningful and purposeful. School facilities also include permanent and semi-permanent structures, such as machinery, laboratory equipment, the blackboard, teachers' tools and other equipment as well as consumables. Educational facilities also refer to non-human and non-financial resources which include all movable and immovable materials which are used for teaching, learning and other school activities.

The provision of school facilities brings about a conducive teaching and learning environment for teachers, students and other staff members to perform their duties effectively. A good school environment fosters desirable behaviour, creativity, harmonious relationship and problem-solving skills among students. In the same vain, the quality and standard of educational output depends on the extent to which school facilities are provided and managed. Akinsolu (2004) asserted that educational curriculum cannot be sound and well operated without adequate provision of school facilities which include classroom, laboratories, workshops, libraries, equipment, consumables, electricity, water, visual and audio- visual aids, tables, desks, chairs, playground, storage space and toilets. All these are essential in all school levels including secondary schools.

Secondary school education is the education, children received after primary education before the tertiary stage. For this reason, huge investment is required in terms of funding so as to equip the sector with the adequate facilities to attain its set down goals. Its broad goal is the preparation of Individual children for useful-

living within the society and for higher education (National policy on Education, 2014:14).

If secondary schools have improper physical facilities like unattractive school building, non-teaching learning aids, cracked classroom walls and floors, lack of toilets, lack of library, lack of potable water, lack of playground, lack of power supply, lack of first aid box, lack of educational technology, over- crowded classroom etc. this will provide a negative effect in overall environment of the school, it will also reflect in student's achievement. That is why adequate facilities are very much desirable in secondary schools in other to enthrone a high academic performance and job efficiency.

This paper focused on implication of availability of educational facilities of public secondary schools in Nigeria, is highly desirable, this will be addressed under the following headings: concept of educational facilities, component of educational facilities, factors to be considered in the provision of educational facilities, benefits of educational facilities, implication of the availability of educational facilities in public secondary schools in Nigeria.

Concept of Educational Facilities

Educational Facilities was coined from two words education and facility, education according to Wikipedia is the process of facilitating learning or the acquisition of knowledge, skills, values, morals belief and habits. This can be formal or informal, the formal Education is further divided into stages such as pre- school, primary, secondary and tertiary. This formal education takes place in a place called institution. While facility is a place or piece of equipment provided for a particular purpose (oxford dictionary). Literally Educational facilities means places or equipment

used for teaching and learning,

Educational facilities according to Adigeb, Anake and Undie (2017) are those materials that enhance teaching/learning processes, in their further statement they said that these facilities include buildings as well as items such as machines, laboratory equipment, chalkboard and learner’s tools. According to Murat and Opsunju (2021) educational facilities are materials in the school which are physical and spatial enablers of teaching and learning which will increase the production of results, when combined with other resources in adequate quality and quantities, constitute vital inputs for achieving desired educational goals. Adeyemi and Adu (2010) stated that “school facilities are the materials, resources that facilitate effective teaching and learning in the school.”

School facilities are important tools which enable teachers to impart knowledge to the learners. According to Ofoegbu (2021) educational facilities are facilities provided to students so that they can use every opportunity to develop full potentials, these may include building, fixtures and equipment necessary for the effective and efficient operation of the programme of public education. In her further statement educational facilities simply means all the physical properties of the school consisting of the grounds inside the school building and various facilities within the school ground and inside the school building, example include classroom, laboratories, rooms and space for fine arts, rest rooms, specialized laboratories, exteriors, landscaping and similar items which the state board of education may consider needful. The quality of school and its output is determined by the availability and utilization of requisite facilities in form of school plant and equipment for the production of high- quality school graduates. Despite the importance of school facilities like libraries, laboratories,

classroom furniture and tools for practical learning experiences, studies revealed that some secondary schools lacked requisite facilities. Ogbu (2015) explained that learning can be hampered if physical facilities are inadequate or are in a state of dis-repair.

This is because learners are not provided the opportunity of associating classroom teaching with the reality of practical experiences or further research. Inadequacy of facilities in schools also questions the quality of the schools’ graduates, thereby making it difficult for such graduates to proceed to and excel at the next level of academic pursuit and, therefore, reduce the chances of employment after graduation. These bring worries to researchers. Hence the need to explore the implication of availability of educational facilities in secondary schools in Nigeria.

Component of educational facilities

Three components of educational facilities according to Odey (2018) include physical facilities, instructional facilities and school physical environment.

Physical Facilities refers to the school plant, that is the school building, classroom, library, laboratories, toilet facilities, offices and other materials and infrastructures that would likely motivate students towards learning. They are germane to effective learning and academic performance of the students. In support of this Akomolafe and Adesua (2016) identified physical facilities as the main factor contributing to academic achievement in the school systems. They include the school buildings, classroom, libraries, laboratories and recreational equipment among others, whereby the quality, appropriateness and adequacy of these items contribute to performance in the school system.

Instructional facilities are the process of using or transforming the environment so that it can be placed in pre-existing cognitive structures, classroom, seminar rooms, instructional laboratories, on campus, clinics, cybraries and other spaces used principally for the purpose of delivering formal instruction to students (Ogbu, 2015). Effective use of instructional facilities can bring about, promotion of student’s memory development and recall, assisting student’s skill development activities, demonstrating specific skills and performing specific office functions. Eze and Omeje (2018) emphasized that resources of high quality attract the learner because they enhance the meaning of what is presented. This is conformity with Anunobi (2010) that observed that quantity and quality of the instructional materials determine the students’ academic performance.

The school physical environment includes the buildings, classrooms, furniture, equipment, instructional materials, laboratories, libraries, play grounds, and so on. Others are walls, machinery, decorative objects, play fields, skating rinks, swimming pools, audio-visual equipment. The physical outlook of the school environment is very important in contributing to healthy academic exercise. It forms the fulcrum on which other activities revolve. This is because it creates an atmosphere of the mind for study. A school located along air-traffic route, roadside (especially without a fence) in neighborhood of industrial activities, markets, and so on will constitute a nuisance and interference with the students’ learning process. It will generate noise enough to badly affect the study adventure. School Environment According to Mick (2011) means the extent to which school settings promote student safety and student health, which may include topics such as the physical plant, the academic environment, available physical and mental health supports

and services, and the fairness and adequacy of disciplinary procedures, as supported by relevant research and an assessment of validity. Eze and Omeje (2018) opined that students in poorly maintained school environment tend to become passive, and not attentive to instructions, resort to memorization and rote learning. Indicating that learning condition has implication on poor academic achievement of students. A conducive learning environment can help increase intellectual activities, encourage friendship, cooperation and support among the students, and at the same time, promote learning, student growth and development. A quality environment will be created if the infrastructure of the learning environment is planned and organised well, meets certain criteria and is in line with student needs and curriculum objectives (Odufowokan, 2011). These scholars further emphasized that learning environment is an important determinant of student learning. An environment that is conducive and suits the needs of the teachers and students, as well as complements the classroom activities can help improve the learning outcomes.

Factors to be considered in the provision of educational facilities

These factors according to (Penn, 2017) include the following: noise, air quality, lighting, temperature, space.

Noise levels greatly affect teacher and student performance. In fact, excessive noise causes dissatisfaction and stress in both teachers and students. Research has found that schools that have classrooms with less external noise are positively associated with greater student engagement and achievement compared to schools with classrooms that have noisier environments (Hussain, 2017). Thus, building schools that buffer external noise from classrooms using acoustic materials can improve

student outcomes.

Air quality plays a significant role in physical environment of the school. Poor ventilation is a major contributor to absenteeism for students with asthma. Research also indicates that many schools suffer from “sick building syndrome” which affects the absenteeism and performance of all students. Moreover, bacteria, viruses, and allergens that contribute to childhood disease are commonly found in schools with poor ventilation systems. Indoor pollutants are also emitted from office equipment, flooring materials, paints, adhesives, cleaning products, pesticides, and insects. All of these environmental hazards can negatively affect children, particularly in schools with poor ventilation systems. Thus, these factors are put into consideration to maintain conducive environment for learning.

Lighting is another factor that is to be considered in enthroning conducive learning environment. Before, the advent of cheap electricity, schools often relied on natural lighting. As electric power costs declined, the amount of artificial light used in schools increased. Research has shown that artificial lighting has negative impacts on those in schools while natural lighting has positive impacts. In fact, research has shown that not only does classroom lighting boost the morale of teachers and students, appropriate amounts of natural lighting also reduce off-task behavior and improves test scores. Penn (2017) found that students with the most exposure to natural daylight progressed 20% faster in in math and 26% faster in reading than students who were taught in environments with the least amount of natural light.

Proper control of temperature is another factor to be considered in the physical environment of the school. One consistent research finding

across individuals of all ages is that the temperature in which a person works affects engagement levels and overall productivity including student achievement. Anyone that has worked in a classroom or office that is too hot or too cold knows how difficult it can be when trying to work when the temperature is uncomfortable. According to Ogbu (2015) the ideal temperature range for effective learning in reading and mathematics is between 68° and 74°. To maintain such a temperature in every classroom within a school, teachers typically need to be able to control the temperature in their own classroom. At the very least, teachers should be able to control the temperature of small blocks of classrooms that receive the same amount of sunlight and have similar exposures to outside temperatures.

Classroom size and space: Considering, the class size and space, the overcrowded classrooms and schools have consistently been linked to increased levels of aggression in students. Overcrowded classrooms are also associated with decreased levels of student engagement and, therefore, decreased levels of learning. Alternatively, classrooms with ample space are more conducive for providing appropriate learning environments for students and associated with increased student engagement and learning. Classroom space is particularly relevant with the current emphasis on 21st century learning such as ensuring students can work in teams, problem solve, and communicate effectively. Classrooms with adequate space to reconfigure seating arrangements facilitate the use of different teaching methods that are aligned to 21st century skills. Creating private study areas as well as smaller learning centers reduces visual and auditory interruptions, and is positively related to student development and achievement.

Benefits of educational facilities

There are several benefits attributed to availability and utilization of educational facilities. Eze and Omeje (2018) observed that educational resources are of vital importance to the teaching of any subject in the school curriculum because it would make discovered facts glue firmly to the memory of the students. The benefits of educational facilities are numerous to mention, they are itemized as follows: Importance of educational facilities according to Ofoegbu (2021) is that it provides house for schools, it helps in realization of educational goals and objectives, it ensures security, educational facilities act as facility agent for all educational activities, it enhances effectiveness and efficiency of teaching and learning process. This is in conformity with Ogbu (2015) who affirmed that, facilities enable the learner to develop problem solving skills and scientific attitudes. In addition, he further stated that facilities provide students access to educational materials which equip them to learn at their own pace. The net effect is increase in overall academic performance of the entire students.

Implications of the availability of educational facilities in public schools.

These facilities are: Library, Cafeteria, Garden, Sickbay/Health Clinics, Toilets, portable water, first Aid box, Sports/Recreational facilities, Counselling Clinic, Laboratories: physics, Chemistry, Biology, Home Economics, computer (IT devices).

Adequate educational facilities are main pre-requisite for the proper development of secondary education (Prostutigogoi, 2020). The size of some educational facilities was found satisfactory to some extent, but some are inadequate. Availability and utilization of school plant and other teaching and learning materials

enhance the teachers’ effectiveness and boost the production of good quality secondary school graduates who are ready to move on to and excel at the tertiary level of education.

School library is referred to as the collection of print and non-print materials kept in a school for the use of both the pupils & teachers mainly for pupils. Eze and Omeje (2018) states that a well-stocked school library contributes to the total development of its users. This provides materials that support the curriculum, enlarge the horizon of the pupils and stimulate their critical imaginative facilities. Fakomogbon, (2012) observed that school library helps to support the school curriculum by providing up-date information to keep teachers and students abreast of new development. The national policy emphasized on provision of a separate building mapped out for the library which must be stocked with current material (both print and non -print). School library which stands as the nerve center of learning activities in post-primary school, is unavailable in some schools and the one that is available does not bequeath to be a library. This is in conformity with Eze and Omeje (2018) who reported in their study that regrettably that many schools have either no library or a dilapidated one. Only a few can be regarded as sound school libraries. The states of these libraries are unsatisfactory. Majority of the existing libraries have obsolete materials, inadequate space for the library users, no professional librarians, among others. Some of the school libraries do not meet up the standard required or mapped out for equitable school libraries in the following areas - most print resources are obsolete, some of library services are not obtainable, lack of professional librarians, inadequate funds for provision of library resources and services, lack of ICT facilities, Internet and reading carrels. The text books were mostly available but cannot be fully utilized by

the students due to lack of professional trained librarians who can catalogue and classify these print resources so to be easily retrieved by the students.

Laboratories is a room or building equipped for scientific experimentation, it can also be used for research teaching or other educational activities. Odey (2018) noted that some, secondary schools approved by the West African Examinations Council (WAEC) and the National Examinations Council (NECO) have no science laboratories. Odey posited that studying science without Practical is like attempting to drive a car without an engine or a faulty engine and concluded that the situation is capable of frustrating the students to the extent that they will be unable to find their feet at the university level which could impede further development of science in Nigeria. Chukwuneke (2010) observed that students in most secondary schools do not make use of Biology equipment for practical learning experiences and, therefore, could not distinguish between the beaker and conical flask, and so lack knowledge of how to maintain such equipment. Furthermore, Chukwuneke found that other science laboratories were inadequate and students lacked knowledge of science subjects in secondary schools. This is exactly the situation the writer observed with most public secondary schools in Nigeria. Here some school converted one of their classrooms to what look like a laboratory. However, using one room for all the sciences for the teaming population in public schools. The same is applicable for computer laboratories. Schools in this aspect lacks these facilities which poses a very big challenge towards advancing technology in teaching and learning.

Availability of toilet facilities
Toilet facilities among others are often considered a necessity that should be provided to

meet the physical and emotional needs of students and staff as well as to prevent incidence of infectious diseases in schools. Spaces for convenience consist of toilets, cafeteria, kitchen, dormitories, custodian sheds, stores and water facilities. It is quite unfortunate that these facilities were found lacking in some schools. This is a situation in some of the secondary school assessed in Nigeria, some that is available is presently in a deplorable state and lack water for its proper usage. Toilet facilities was stated clearly as one of the essential educational facilities in secondary schools as was found in National policy of Education (NPE 2014). In further clarity the policy also stated that the toilets must be provided separately for both sexes. Jaiyoba and Atanda (2011) discovered that toilet facility has a relationship with students' academic achievement in mathematics and has contributed significantly.

Availability of portable water
Water facilities are necessary requirements for institutions (Yakubu,2017). This is essential for drinking and also for keeping toilets and the environment clean, conforming with the common adage that says cleanliness is next to godliness. The implication of non-availability of portable water in schools is that students then resort to defecating outside the toilet facilities this is detriment to health, both to teachers and student, hence making the environment non conducive for learning.

Availability of Cafeteria
The cafeteria is a place set aside for food vendors to sell food to students. It was observed that food vendor sells their foods under the trees and school corridors. Yakubu (2017) asserts that this cafeteria has to be attractively built and spacious enough to occupy all students conveniently and make for free movement into and out of the place. It happened that some of the existing

public secondary schools in Nigeria lacks this facility hence food vendors were prone to be seen in front of the school, exposing student to danger as they intend to buy food from them, Students were seen working outside the school premising during school hours.

Availability of school garden and sports facilities. School farm is part of educational facilities meant practical agriculture as education. This was not available to most schools, because of lack of space. Most of these schools are located at the heart of commercial cities, which is notable for their high interest in commerce. The same thing was observed in the area of sports facilities like field, this was not available in most schools because of lack of space. Udokanma, Akpu and Onwuka (2016) during their study observed that secondary school students in Awka South local Government Area of Anambra state shows little or no interest in sport activities due to lack of facilities and inadequate provision of equipment and supplies. It was found that funding is the greatest problem confronting sports development in Nigeria, this situation can be ameliorated through allocation of more fund towards acquisition of sports facilities and shifting schools from commercial areas.

Conclusion
The quality and standard of educational output

depends on the extent to which school facilities are provided and managed. Educational facilities are essential factors determining the level of academic achievement in our schools and employability capacity of the citizenry, thus to ensure adequate availability of educational facilities in our schools, government should ensure good supply of educational facilities comprising physical, instructional and environmental facilities to schools as a vital tool for teaching and learning. Adequate provision and proper maintenance of school facilities will improve the teaching lessons in class and directly have a positive impact on the academic performance of the students (Nurai, Manana, Syrahia,& Mold,2016).

Recommendations
Host community, Charity Organizations and parents should assist the government by providing instructional materials to make the environment conducive for teaching and learning in the schools. Existing school libraries should be expanded through communal efforts and Corporate Social Responsibility (CSR). Teachers and principals of secondary schools should device additional means of acquiring these facilities, utilize them effectively and efficiently for the sole purpose of enhancing teaching and learning. This will make our schools to stand tall in terms of academic excellence and employability skills for greater contribution to national development through employment.

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Analysis of the Welfare Effects of Agricultural Trade Liberalization on Nigerian Farmers Using a Computable General Equilibrium (CGE) Model

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Abstract

Agricultural trade liberalization has been widely promoted as a policy instrument for enhancing efficiency, competitiveness, and economic growth in developing countries. This study analyzes the welfare effects of agricultural trade liberalization on Nigerian 700 farmers, processors and marketers, using a Computable General Equilibrium (CGE) model. The CGE framework captures the inter-linkages among production sectors, households, government, and external trade, thereby providing a comprehensive assessment of economy-wide impacts. The model is calibrated using a Social Accounting Matrix (SAM) constructed from recent Nigerian macroeconomic and sectoral data. Policy simulations are conducted to evaluate the effects of tariff reductions and removal of import restrictions on key agricultural commodities. Welfare changes are measured through variations in household income, real consumption, factor returns, and equivalent variation indices across different farmer groups, including smallholder and commercial farmers. Preliminary results suggest that trade liberalization generates mixed welfare outcomes. While reduced input costs and improved resource allocation enhance productivity and benefit commercially oriented farmers, increased import competition may adversely affect smallholder farmers producing import-competing crops. The study concludes that agricultural trade liberalization in Nigeria has the potential to improve aggregate welfare but may exacerbate inequality among farmers without targeted support measures. Policymakers should therefore adopt a balanced approach that combines gradual trade reforms with strategic interventions to protect vulnerable farming households and promote inclusive agricultural development.

Keywords: Welfare, Farmers, Trade, Liberalization, Computable General Equilibrium model

Introduction

Agriculture plays a critical role in the Nigerian economy providing employment for about 35–40% of the workforce, contributing significantly to gross domestic product (GDP),

and acting as the main source of livelihood for millions of rural households. Despite its substantial economic contributions, the sector suffers perennial challenges such as low productivity, weak value chains, infrastructure

deficits, market fragmentation, and limited access to finance and technology (World Bank, 2022). These constraints have shaped policy debates on strategies to enhance agricultural performance, rural incomes, and food security in Nigeria. Within this context, agricultural trade liberalization emerges as a key policy lever aimed at promoting efficiency, competitiveness, and integration into global markets.

Trade liberalization broadly refers to the removal or reduction of tariffs, import quotas, and other policy barriers that restrict the flow of agricultural goods across borders (Adegioriola, & Ben-Obi, 2024). In Nigeria, liberalization gained policy prominence during the Structural Adjustment Programme (SAP) era of the mid-1980s and continued through various trade reforms associated with membership in the World Trade Organization (WTO) and bilateral and regional agreements (Agada, Ibrahim, & Omonona. (2023). The intent of these reforms was to improve allocative efficiency, stimulate private sector participation, diversify exports, and accelerate economic growth. Yet, the implications of these reforms especially for welfare outcomes among farmers and rural households have been uneven and contested in the literature.

From a theoretical perspective, liberalization can yield both positive and negative outcomes. On the positive side, reducing trade barriers can expand market access for exportable agricultural products, enhance domestic competitiveness through international comparison, lower prices for agricultural inputs and consumer food products, and attract foreign investment. Conversely, liberalized trade exposes domestic farmers especially smallholders to increased competition from imports, including subsidized commodities from more developed economies, which can depress domestic output and farm-

gate prices (Laborde, Martin, & Vos, 2019). Because smallholder farmers often lack productive capacity and market linkages, they are especially vulnerable to adverse shocks that can erode welfare and aggravate rural poverty.

Empirical studies on agricultural trade liberalization in Nigeria have generated diverse findings. While some research suggests liberalization positively affects agricultural output, especially for certain crops, the distributional impact remains ambiguous. For example, Agada et al. (2023) found that trade openness over the period 1986–2020 positively influenced the long-run output of key staples such as cassava, rice, and wheat, indicating potential productivity gains associated with liberalization policies. However, these results are based on econometric methods rather than economy-wide modeling that capture sectoral interdependencies and welfare distribution.

To address this gap, a growing body of literature has applied Computable General Equilibrium (CGE) models to analyze the economy-wide and welfare effects of trade policy reforms in Nigeria. CGE models are grounded in microeconomic theory and provide a comprehensive framework that links production sectors, households, government, and international markets through a Social Accounting Matrix (SAM) (Bouët, Cosnard, & Laborde, 2018). This modeling approach can concurrently simulate how changes in trade policy (e.g., tariff reductions) affect output, factor returns, terms of trade, employment, household incomes, and welfare indicators such as real consumption and poverty. By capturing feedback effects across sectors and households, CGE models offer richer insights than partial equilibrium or single-market analyses (Chitiga-Mabugu, Henseler, Mabugu, & Maisonnave, 2020).

A notable example is the work of Okodua and Alege (2014), which employs a CGE model based on a 2006 SAM of Nigeria to estimate household welfare implications of trade liberalization through import tax shocks. Their findings suggest that while partial or full liberalization increases overall consumption and real income, it also induces unemployment in key sectors such as agriculture and industry, resulting in mixed welfare effects for Nigerian households. The study further cautions against blanket liberalization without targeted sectoral considerations, since some groups particularly rural agricultural households may be adversely affected (Nwafor, Adenikinju, & Ogujiuba, 2007). Other published versions of this work form literature, similarly emphasize that rural households could experience welfare losses due to shifts in consumption patterns toward imported goods, underscoring the vulnerability of domestic farmers to trade shocks.

Okodua and Alege (2025) applied a CGE simulation based on Nigeria’s Social Accounting Matrix and found that full or partial trade liberalization tends to increase consumption and real income overall but can also induce unemployment in key sectors including agriculture, which can offset some welfare gains. This underscores the notion that liberalization effects are heterogeneous across households and sectors. Other CGE research in the broader regional and global context highlights that welfare changes depend on the structure of the economy, trade policy design, and the responsiveness of production factors to price signals.

In Nigeria, trade liberalization gained momentum with the structural adjustment programs of the 1980s and continued through WTO commitments, regional trade agreements, and periodic tariff reforms (WTO, 2023).

Proponents argue that exposing domestic producers to international competition can boost output, increase exports, and improve living standards. Agada, Iorember, & Nwosu,. (2023) found that higher trade openness over the period 1986–2020 positively influenced output of major agricultural commodities like rice, wheat, cassava and others, indicating that liberalization policies can be healthy for agricultural performance when measured in output terms.

Historical CGE applications also include investigations of commodity-specific policies. For instance, Obi-Egbedi, Okoruwa & Yusuf, (2013) use a static CGE model to simulate rice trade policy scenarios including tariff increases and reductions and assess impacts on macroeconomic aggregates and household welfare. They found that liberalization yields small increases in agricultural output compared with protectionist policies, but welfare losses occur in both scenarios, with reduced tariffs associated with relatively lower negative effects on households. This highlights how trade policy effects can differ by commodity and household category, reinforcing the importance of disaggregated analyses.

Beyond static models, studies incorporating dynamic CGE frameworks provide further nuance. Nwafor, Adenikinju, and Ogujiuba (2007), (with dynamic simulations) find that trade liberalization tends to benefit capital-intensive sectors and urban households while reducing returns to land and labor key income sources for rural farmers. This dynamic modeling shows urban poverty may decline over time but rural poverty can increase without complementary policies to support agricultural productivity. Such findings align with broader CGE literature suggesting that without structural enhancements in agriculture (e.g., infrastructure, technology, extension services),

trade liberalization alone may not deliver pro-poor outcomes. Moreover, studies outside direct liberalization contexts strengthen the analytical case for CGE models. Research examining food price shocks using CGE simulations indicates that changes in global food prices can have complex effects on domestic output and poverty, with rural households bearing uneven burdens. Although not directly focused on trade policy, this work demonstrates how economy-wide shocks transmitted through trade channels influence agriculture and welfare outcomes.

Overall, current literature underscores that agricultural trade liberalization has heterogeneous effects on Nigerian farmers and households. While liberalization may generate efficiency gains and output improvements in some sectors, its impact on welfare and poverty particularly in rural communities dependent on agriculture is neither uniformly positive nor straightforward. CGE models, by integrating sectoral and household interactions, are uniquely positioned to provide rigorous analysis of these multifaceted effects. Given evolving global trade environments including the potential effects of agreements such as the African Continental Free Trade Area (AfCFTA) and Nigeria’s ongoing trade policy reforms updated CGE studies focusing on welfare distribution among agricultural households remain crucial. Such analyses can equip policymakers with evidence-based insights on how to balance trade openness with targeted support strategies that enhance farmer resilience, improve equity, and promote sustainable agricultural development. Adegoriola and Ben-Obi (2024) examined the impact of AfCFTA on poverty reduction in Nigeria and found that trade liberalization could lead to significant welfare gains for Nigerian farmers. The welfare effects of agricultural

liberalization on Nigerian farmers are a crucial area of study, as agriculture remains a vital sector in Nigeria’s economy, contributing approximately 30% to the country’s GDP (Simona, 2021).

Recent studies have employed CGE models to examine the impact of trade liberalization on agricultural productivity and welfare in Nigeria. For example, Inusa and Umaru (2021) used a CGE model to analyze the impact of trade openness on agricultural performance in Nigeria and found that trade openness had a positive impact on agricultural productivity.

Studies have shown that trade liberalization can have both positive and negative impacts on agricultural productivity and welfare. For instance, Okodua (2025) found that trade liberalization led to increased agricultural productivity and welfare gains for rural households.

Given this backdrop, there is a compelling need to systematically analyze the welfare effects of agricultural trade liberalization on Nigerian farmers using a formal, economy-wide modelling approach such as CGE modelling. A comprehensive analysis can provide policymakers with deeper insights into whether current trade policies are conducive to farmers’ welfare, and which segments of the farming population are likely to gain or lose. This is increasingly important at a time when Nigeria seeks to balance its trade obligations with domestic development objectives, food security concerns, and inclusive rural growth.

Problem Statement
Nigeria has progressively adopted trade liberalization policies through tariff reductions, removal of quantitative restrictions, and participation in multilateral and regional trade

agreements such as the World Trade Organization and the African Continental Free Trade Area (African Union. 2021).

While trade liberalization is theoretically expected to enhance efficiency, promote specialization based on comparative advantage, and improve overall welfare, its actual effects on agricultural households in developing countries remain ambiguous. On one hand, reduced trade barriers can provide farmers with access to larger export markets, improved inputs, and competitive prices. On the other hand, increased exposure to international competition particularly from subsidized agricultural imports may depress domestic prices, reduce farm incomes, and exacerbate rural poverty. These mixed outcomes raise concerns about whether agricultural trade liberalization truly improves the welfare of Nigerian farmers or disproportionately benefits other sectors of the economy.

Empirical studies in Nigeria have largely focused on the relationship between trade openness and aggregate agricultural output or economic growth, often employing partial equilibrium or econometric techniques. However, such approaches may fail to capture the full economy-wide effects of trade policy reforms, including inter-sectoral linkages, factor mobility, price transmission mechanisms, and household income distribution. Given that changes in trade policy affect not only production but also wages, consumption patterns, government revenue, and relative prices, a comprehensive analytical framework is required.

The Computable General Equilibrium (CGE) model provides a robust tool for evaluating the economy-wide welfare effects of policy reforms (Devarajan, & Robinson, 2021). By incorporating detailed sectoral interactions and household accounts within a Social Accounting Matrix

(SAM), a CGE model can simulate how trade liberalization scenarios impact farmer incomes, employment, consumption, and overall welfare. Despite its relevance, there is limited recent evidence that specifically analyzes the welfare implications of agricultural trade liberalization on Nigerian farmers using a CGE framework.

Therefore, there is a critical need to conduct an in-depth, economy-wide assessment of how agricultural trade liberalization affects the welfare of Nigerian farmers. Understanding these effects is essential for designing trade policies that promote inclusive growth, protect vulnerable farming households, and ensure sustainable agricultural development.

Justification of the Study

Agricultural trade liberalization remains one of the most debated policy issues in developing economies, particularly in countries like Nigeria where agriculture is a major source of employment and rural livelihood. As Nigeria deepens its integration into the global trading system through institutions such as the World Trade Organization and regional agreements like the African Continental Free Trade Area, understanding the welfare implications of trade reforms has become increasingly important.

This study is justified on policy relevance grounds. Trade reforms affect prices, incomes, employment, and government revenue. However, without clear empirical evidence on how these reforms affect farmers particularly smallholder farmer’s policy decisions may unintentionally worsen rural inequality and poverty. This research provides evidence-based insights to guide policymakers in designing complementary measures such as subsidies, safety nets, and productivity-enhancing programs.

Again, the study contributes to academic

literature by employing a Computable General Equilibrium (CGE) model, which captures economy-wide interactions often, ignored in partial equilibrium and econometric studies, and will also serve as a useful reference for researchers, development agencies, and policymakers.

Objectives of the Study

The Broad Objective of the study is to analyze the welfare effects of agricultural trade liberalization on Nigerian farmers using a Computable General Equilibrium (CGE) model.

Specific Objectives

- 1.To examine the structure and trends of agricultural trade liberalization policies in Nigeria.
- 2.To simulate the impact of agricultural trade liberalization on agricultural output, prices, and factor returns using a CGE model.
- 3.To evaluate the welfare effects of trade liberalization on Nigerian farmers in terms of income, consumption, and employment.
- 4.To assess the distributional effects of trade liberalization across different categories of farming households.
- 5.To provide policy recommendations aimed at enhancing the welfare gains from agricultural trade liberalization while minimizing adverse effects.

Research Questions

The study will seek to answer the following questions:

- 1. What is the current structure of agricultural trade protection and liberalization in Nigeria?
- 2. How does agricultural trade liberalization affect output, prices, and factor returns in the agricultural sector?
- 3. What are the welfare effects of agricultural trade liberalization on Nigerian farmers in terms of income, consumption, and

- employment?
- 4. How do the welfare effects vary across different categories of farmers (e.g., smallholder vs. large-scale farmers)?
- 5. What are the broader economy-wide implications of agricultural trade liberalization in Nigeria?

Research Hypotheses

The study will test the following hypotheses:

Null Hypotheses (H0)

- 1.H0₁ : Agricultural trade liberalization has no significant effect on the welfare of Nigerian farmers.
- 2 H00 :Agricultural trade liberalization has no significant effect on agricultural output and prices in Nigeria .
- 3 H00 :There is no significant difference in the welfare effects of agricultural trade liberalization between smallholder and large scale farmers .
- 4 H00 :Agricultural trade liberalization has no significant economy wide impact on factor returns and household income distribution .

Methodology

The study adopts a standard single country CGE model calibrated to a Nigerian Social Accounting Matrix \$AM)Seven hundred 700) respondents comprising of farmers ,processors and marketers from southeast Nigeria were selected .

Model Specification

Production in each sector is modeled using a nested production function :

- At the top level, output is produced using a Leontief function combining value-added and intermediate inputs.
- At the second level, value-added is generated using a Constant Elasticity of Substitution (CES) function between

primary factors (labor, capital, and land for agriculture).

The CES value-added function is specified as:
 $VA_s = A_s [\delta L_s^{-\rho} + (1-\delta) K_s^{-\rho}]^{-1/\rho}$
 $VA_s = A_s \left[\delta L_s^{-\rho} + (1-\delta) K_s^{-\rho} \right]^{-1/\rho}$
Where:
• VA_s = Value-added in sector s
• L_s = Labor input
• K_s = Capital input
• A_s = Efficiency parameter
• δ = Share parameter
• ρ = Substitution parameter

Trade Specification (Armington Assumption)
The model assumes imperfect substitutability between domestic and imported goods using the Armington (1969) specification.
Composite goods are defined as:
 $Q_c = [\alpha M_c^{-\rho} + (1-\alpha) D_c^{-\rho}]^{-1/\rho}$
Where:
• Q_c = Composite good
• M_c = Imports
• D_c = Domestic goods
• α = Share parameter
• ρ = Substitution parameter

Exports are modeled using a Constant Elasticity of Transformation (CET) function to allocate output between domestic sales and exports.

Data Analysis, Results and Discussion
1. What is the current structure of agricultural trade protection and liberalization in Nigeria–

Table 4.1 presents the structural composition of the economy based on the Social Accounting Matrix (SAM).

Sector	Share of GDP (%)
Agriculture	26.4
Manufacturing	18.2
Services	42.7
Oil & Gas	12.7
Total	100
The agricultural sector accounts for 26.4% of GDP, confirming its importance in employment and rural livelihoods.	

2. How does agricultural trade liberalization affect output, prices, and factor returns in the agricultural sector?

Table 4.2: Percentage Change in Output after Trade Liberalization			
Sector	Full Liberalization (%)	50% Tariff Reduction (%)	Regional Liberalization (%)
Agriculture	-3.8	-1.9	-1.2
Manufacturing	+2.6	+1.4	+1.8
Services	+1.9	+0.8	+1.1
Total GDP	+0.7	+0.4	+0.6

- Agricultural output declines under full liberalization due to increased competition from imports.
- Manufacturing and services expand due to reallocation of resources.
- Overall GDP increases slightly, suggesting efficiency gains at the macro level.

3. What are the welfare effects of agricultural trade liberalization on Nigerian farmers in terms of income, consumption, and employment?

Table 4.3: Percentage Change in Agricultural Prices		
Commodity Group	Full Liberalization (%)	50% Reduction (%)
Staple crops	-6.5	-3.2
Cash crops	-4.1	-2.0
Livestock	-3.3	-1.7
• Reduction in tariffs lowers domestic agricultural prices.		

- Consumers benefit from lower food prices.
 - Farmers face declining output prices, potentially reducing income.
4. How do the welfare effects vary across different categories of farmers (e.g., smallholder vs. large-scale farmers)?

Welfare is measured using Equivalent Variation (EV), expressed as percentage change in household income.

Table 4.4: Welfare Effects by Household Category			
Household Type	Full Liberalization (%)	50% Reduction (%)	Regional Scenario (%)
Smallholder Farmers	-6.8	-3.4	-2.1
Large-scale Farmers	-3.5	-1.7	-1.0
Urban Households	+2.4	+1.2	+1.6
National Average	+0.5	+0.3	+0.4

- Smallholder farmers experience the largest welfare losses.
- Large-scale farmers are less affected but still experience income decline.
- Urban households benefit from lower food prices.
- National welfare improves slightly, masking rural welfare losses.

5. What are the broader economy-wide implications of agricultural trade liberalization in Nigeria?

Table 4.5: Changes in Employment (%)		
Sector	Full Liberalization	50% Reduction
Agriculture	-4.7	-2.3
Manufacturing	+2.1	+1.0
Services	+1.5	+0.7

- Agricultural employment declines.
- Labor shifts toward manufacturing and services.
- Rural unemployment may increase in the short run.

Discussion of Findings
The results indicate that agricultural trade liberalization produces mixed outcomes: There are macro-level gains as GDP increases slightly due to efficiency gains. Consumer benefits due to lower food prices which improves urban welfare. Farmer losses as smallholder farmers experience significant welfare decline. There are factor redistribution as returns shift from land and rural labor toward capital.

The findings suggest that while trade liberalization improves overall efficiency, it adversely affects vulnerable farming households unless accompanied by supportive policies such as: agricultural subsidies, productivity-enhancing investments, rural credit programs, and social protection measures.

- Summary of Findings
- Agricultural output declines under full liberalization.
 - Domestic agricultural prices fall significantly.
 - Rural wages and land returns decrease.
 - Smallholder farmers experience the largest welfare losses.
 - National welfare improves marginally but is unevenly distributed.

Summary, Conclusion and Recommendations
Summary of the study
This study analyzed the welfare effects of agricultural trade liberalization on Nigerian farmers using a Computable General Equilibrium (CGE) model. The study was motivated by Nigeria’s increasing integration

into the global trading system through institutions such as the World Trade Organization and regional agreements like the African Continental Free Trade Area.

A Social Accounting Matrix (SAM)-based CGE model was developed to simulate three trade reform scenarios: full tariff elimination, partial tariff reduction (50%), and regional trade liberalization. The model assessed changes in sectoral output, prices, factor returns, employment, and household welfare, with special attention to farming households.

The results showed that:

- Agricultural output declined under full liberalization due to increased import competition.
- Domestic Agricultural prices fell significantly.
- Returns to land and rural labor decreased.
- Smallholder farmers experienced the largest welfare losses.
- Urban households benefitted from lower food prices.
- National welfare increased marginally but gains were unevenly distributed.

These findings confirm that trade liberalization produces efficiency gains at the macroeconomic level but generates distributional challenges that disproportionately affect rural farming households.

Conclusion

Based on the simulation results, the study concludes that agricultural trade liberalization in Nigeria has mixed welfare effects. While trade reforms improve aggregate efficiency and generate modest GDP growth, they adversely affect smallholder farmers due to falling output prices and declining returns to land and rural labor.

The welfare losses among farming households highlight structural weaknesses within Nigeria’s agricultural sector, including low productivity, limited access to credit, inadequate infrastructure, and poor market integration. In the absence of complementary domestic policies, exposure to international competition can worsen rural inequality and poverty.

Therefore, trade liberalization alone is insufficient to guarantee welfare improvements for Nigerian farmers. The overall welfare gains from liberalization tend to favor urban consumers and capital owners, while rural producers bear adjustment costs.

In summary, agricultural trade liberalization must be accompanied by targeted agricultural development policies to ensure inclusive growth and equitable welfare outcomes.

Policy Recommendations

Based on the findings, the following recommendations are proposed: Rather than full and immediate tariff elimination, Nigeria should adopt a gradual approach to agricultural trade liberalization. Sensitive agricultural products that directly affect rural livelihoods should receive transitional protection while productivity-enhancing reforms are implemented. Government Strengthening Agricultural Productivity through investment in rural infrastructure (roads, storage, and irrigation), agricultural extension services, and access to improved seeds and technology, and mechanization programs. Improving productivity will enable farmers to compete effectively in liberalized markets.

There should be targeted support for smallholder farmers, who are the most vulnerable to trade shocks through, provision of input subsidies, and

access to affordable credit, crop insurance schemes, and direct income support programs. Such interventions can cushion short-term welfare losses.

There should be Rural Diversification Programs to encouraging rural non-farm employment

opportunities to reduce dependence on agriculture and minimize welfare losses arising from trade reforms.

Any fiscal gains from trade liberalization should be reinvested in rural development programs to promote inclusive welfare improvements.

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Influence of Field Trip on Students’ Interest in Learning of Chemistry in Secondary Schools in Onitsha North LGA, Anambra State.

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Abstract
The study investigated the influence of field trip on students’ interest in learning of chemistry in secondary schools in Onitsha North Local Government Area of Anambra State. Four research questions guided the study. The population of the study comprised of 1,632 chemistry students in all the public secondary schools Onitsha Education Zone. Purposive sampling was used to sample 435 chemistry students for the study. The instrument for data collection was structured questionnaire developed by the researchers titled Influence of Field Trip on Students Interest in learning of Chemistry in Secondary schools in Onitsha North Local Government Area of Anambra (QIFTSILC). The instrument was validated by three experts and the reliability of the instrument was obtained using Cronbach alpha reliability which gave a reliability index of 0.79. Data collected were analyzed using mean and standard deviation to answer the research questions. Interpretation is based on real limit of numbers, where a mean of 3.50 - 4.50 implies Very Often (OV), 2.50 - 3.49 implies Often Used (OU), 1.50 - 2.49 implies Rarely Used (RU) and 0.9.50 -1.49 implies Not Used (NU). The findings of the study revealed the followings; Field trip influences chemistry students’ interest in Learning chemistry, there are various benefits associated with utilization of field trips on students’ interest among others which include developing social skills, exposing students to different situations. Chemistry teachers rarely utilize field trip to stimulate students’ interest in teaching and learning of chemistry. Time constraints, financial constraints, inadequate support from school management or authorities, poor students’ behavior and attitudes and inadequate support from some teacher are problems hindering the use of field trip to stimulate students’ interest in teaching and learning of chemistry. Based on the findings and conclusions, it was recommended among others that the Seminars and workshops should be organized by stakeholders in chemistry to train teachers on the use of field trip instructional strategy to help enhance students’ interest in chemistry.

Introduction

The purpose of learning is to develop knowledge and have a command on what student are studying at present so that they will be able to apply the knowledge in their future lives also, for this purpose, different sorts of activities like seminars, discussion, presentations, workshops, local conferences, lectures, and field trips are essential to be conducted especially the activity of field trip which are commonly conducted to the students by giving them opportunity for self-experience, observation, and self-lasting learning.

Science is the bedrock on which modern day technological breakthrough is hinged. Different authors according to their own understanding have defined science. Igwe (2018) defined science as a systematic study of the nature of the behaviour of the material and physical universe through observation, experimentation measurement, and recording. In addition, Esu (2017) defined science as a systematic, precise, objective way to study the natural world. Science in the secondary schools is taught through two main categories; as Basic Science at the basic secondary, and the separate science subjects as chemistry, physics and biology at the Senior Secondary. It is however worrisome to note that studies and findings had pointed out that there is low achievement in secondary school chemistry and other science subjects (Onwuakpa and Nweke, 2020).

Chemistry, as a science subject, is like a pivot in the Nigeria secondary schools curriculum since other subjects such as Physics, Biology, and Agriculture depend on it. The study of Chemistry involves pursuit of truth hence instills diligence, patience and objectivity among learners. Chemistry learning develops the scientific habits in students, which are transferable to other areas in life. Such habits

involve non-reliance on superstition, critical thinking, and respect for other people’s opinions. The above qualities when learnt help solve many problems of individual and social living (Das, 2018). Chemistry also prepares students for vocations, and careers at tertiary levels of learning, and in life generally. The teaching of chemistry should be done such that learners understand and like it. From the WAEC chief examiners report in 2010, it has been discovered that despite all the efforts of the state and federal government in providing materials, and equipment for teaching and learning, students still perform poorly in their internal and external examinations especially in chemistry. Reasons for these poor performance have been blamed on teachers’ incompetence in teaching, lack or poor training of teachers, inadequate facilities, broad chemistry content, students’ interest, students poor background to mention but a few.

A field trip is a chance to take children out of the classroom and to have new, exciting, and hands-on experiences. Taking kids on an adventure helps to build bonds among the students. It also helps in providing a change in routine for the students and keeps them engaged in learning. A field trip or excursion is a journey by a group of people to a place away from their normal environment. According to Bichi (2018) field trip is a visit to a place outside the regular classroom which is designed to achieve certain objectives that cannot be achieved by using other means. For example in a lesson on “industrial chemistry”, there is need for practical observation by the students for more understanding. In such a lesson, field trip exercise is required. Field trip increases students’ interest, and motivation in a subject matter like Chemistry and gives opportunity for students to get out of the classroom and experience something new from a given environment (Stephen, 2019). The located place for field trip

can be national or state, at industries like; cosmetics, Plastics, pharmaceutical science laboratories, museums, and schools, etc. Field trip facilitates the learning of both abstract, and practical concepts as in chemistry. Taking students on a field trip makes learning more effective as they will be able to gain vast ideas on the topic. Motivate students through increased interest, and curiosity (Asika, 2025).

Interest as defined in psychology is an individual behavioral tendency to be attracted towards a certain class or classes of activities. Interests are source of motivation which derive people to do what they want to do when they are free to choose. A person may be interested in something when he sees that such a thing will be of benefit to him (Okoro, 2022). Interest provides in human beings a strong motivation to learn it. An individual will not do so when he/she is less interested or bored. Interest is the involvement with or participating in something, that is, it is the feeling one has when he/she wants to learn or know more about something. It is the degree of like or dislike towards a phenomenon, object or concept. The strength of a person’s attitude is his interest. Interests are activated attitude an individual has in actually achieving a goal. However, the interest may remain entirely latent with no associated behavior manifest movement to gratify it. Interest is the feelings which one has for something he/she feel is valuable and beneficial.

Interest is a state of curiosity about something. It is an influence due to personal importance or capability (Collins, 2022). Interest is an emotion that causes an attention to be focused on an object, event or process. Interest is the feeling somebody has when he/she wants or learn more about something. It is the quality that something has when it attracts someone’s attention or makes one wants to know more about it. Interest

has been conceived as a conceptual and propositional knowledge that is inconsistent with or different from the commonly accepted scientific consensus (Sanger and Green Bower, 2020). Interest promotes intrinsic motivation which has been shown to drive and sustain students’ engagement in a particular task. Motivation to learn science benefits students who aspire to be scientists in the future (Bripan, Glynn and Kittleson, 2021), by sustaining their aspiration and promoting their academic achievement. Interest is regarded as learned response which provides a set of readiness for behavior (Nwachukwu, 2019). Interest involves a combination of what one could like to achieve and how confident one feels about achieving it. A major determinant of student’s academic performance is interest (Mkparo, 2020).

Teaching and learning of chemistry has been seriously frustrated in recent times owing to the number of failures on students’ academic achievement. This can be attributed to the fact that there exist some elements of difficulties in translating the ideas of chemistry concepts, terms and theories into visual practical realities. There have also existed some counter accusation on who is to be apportioned the blame. Teachers are being accused of not teaching with the use of appropriate method and instructional materials which has culminated to poor performance of students, especially in examinations and in practical field, while students argued that they have not been exposed to practical learning environment and concrete materials that would facilitate their understanding of the subject matter.

In any teaching and learning process, the cardinal objective is to see that the learners perform tasks based on what he/she had learnt or based on knowledge acquired and if possible, transfer the experience in solving problems in a

new situation. One of the objectives of teaching and learning chemistry in secondary schools is to promote an understanding of chemistry concepts being taught with a view to applying such knowledge in solution of real-life problems. This objective is hardly been achieved over the years. The poor performance in internal and external examinations in chemistry in recent times is a matter of concern; many suggested that this ugly trend might have been the poor foundation of students in chemistry. This may also be connected to the method of teaching used by chemistry teachers, because a good learning is a product of a good method of teaching.

Chemistry has been reported as one aspect of senior secondary school curriculum that students find difficult to answer questions as they perform poorly in questions bothering on chemistry concepts. (WAEC Chief Examiner’s reports 2021, 2022, and 2024). This persistent poor performance in chemistry concepts among others leaves no doubt about the ineffectiveness of the teaching method used by chemistry teachers for teaching these concepts. Students may have seen chemistry as abstract and meaningless concept. Students neither understand the basic concepts nor the underlying process that gave rise to the chemistry concepts. This may be because the teaching methods used by the chemistry teacher were teacher-centered methods and does not allow students participation, therefore imposing poor concept formation and reducing motivation of students in learning chemistry. The prevailing practices during chemistry instructions where emphasis is on transmission of information from the teacher and textbooks to the students makes students resort to learning by memorization, which results in consistent poor performance. It is against this backdrop that this study is necessitated to investigate the influence of field trip on students’ interest on learning of

chemistry in secondary school.

Research Questions

The following research questions guided the study:

- 1. What are the influence of field trip on students’ interest in learning of chemistry?
- 2. What are the benefits of field trip on students’ interest in learning of chemistry?
- 3. To what extent do the chemistry teachers utilize field trip to stimulate students’ interest in teaching and learning of chemistry?
- 4. What are the problems hindering the use of field trip to stimulate students’ interest in teaching and learning of chemistry?

Methodology

The study adopted a descriptive survey research design. The population of the study comprised of 1,632 chemistry students in all the public secondary schools Onitsha Education Zone. Purposive sampling was used to sample 435 chemistry students for the study. The instrument for data collection was structured questionnaire developed by the researchers. The questionnaire consists of two (2) sections A and B. While Section A will consist of response on the personal data of the respondent, while Section B is further split into four (4) clusters with the intention of addressing individual research question. Cluster one (1) was designed to elicit information on the influence of field trip on students interest in learning of chemistry., cluster two (2) elicited information on the benefits of field trip on students’ interest in learning of chemistry, while cluster three (3) was on the extent of utilization of field trip to stimulate students’ interest in teaching and learning of chemistry by secondary, cluster (4) elicited information on the problems hindering utilization of field trip to stimulate students’ interest in teaching and learning of chemistry. The instrument was

validated by three experts; two from chemistry education unit and one from measurement and evaluation, all in Nwafor Orizu College of Education Nsugbe. The instrument was trial tested on 35 (thirty-five) Chemistry students in Ogidi educational zone that are not part of the study but share similar characteristic with the study area. The data obtained was computed using Cronbach Alpha reliability estimate to determine the internal consistency of the instrument and was found to be 0.79 which shows that the instrument is reliable. The method of data analysis for answering research questions was mean and standard deviation. Interpretation is based on real limit of numbers, where a mean of 3.50 - 4.50 implies Very Often (OV), 2.50 - 3.49 implies Often Used (O U), 1.50 - 2.49 implies Rarely Used (RU) and 0.9.50 -1.49 implies Not Used (NU).

Results

Research Question One

What is the influence of field trip on students’ interest in learning of chemistry?

Table 1: Mean score and standard deviation of respondents on influence of field trip on students’ interest in learning of chemistry.

S/n	Item Statement	Mean	Standard Deviation	Decision
.1	I enjoy embarking on field trips	2.93	0.87	Agreed
2.	Field trip stimulates students’ interest in learning	3.62	0.49	Agreed
3	Field trip enable students to develop authentic experience, curiosity and interest	3.19	0.42	Agreed
4.	It strengthened students’ interest in Chemistry	3.13	0.54	Agreed
5.	It promotes students	2.68	0.46	Agreed

when they are actively engaged in observing, collecting, classifying, studying relationship and manipulating real objects and situations

Cluster Mean

3.11

Agreed

The result in Table 1 shows the mean and standard deviation of respondents on the influence of field trip on students’ interest in learning of chemistry. The mean rating scores of item 1 to 5 are above the 2.50 benchmark. This mean that the respondents agreed that they enjoy embarking on field trips, it stimulates students’ interest in learning, enable them to develop authentic experience, curiosity and interest, strengthened students’ interest in chemistry and promotes active engagement in observing, collecting, classifying, studying relationship and manipulating real objects and situation. The cluster mean of 3.11 with standard deviation of 0.32 was obtained which implies that the respondents agreed that field trips influences the interest of chemistry students in learning chemistry.

Research Question Two

What are the benefits of field trip on students’ interest in learning of chemistry?

Table 2: Mean score and standard deviation of respondents on the benefits of field trip on students’ interest in learning of chemistry.

S/n	Item Statement	Mean	Standard Deviation	Decision
1.	Helping Students to Develop Social Skills	2.87	0.58	Agreed
2.	Exposing Students to Different Situations	3.04	0.68	Agreed
3.	Creating Connections to the Curriculum	3.72	0.60	Agreed
4.	Helping to Translate	2.68	0.75	Agreed

the Theoretical Lessons to Reality			
5. Development of Affective Domain of the Students	3.44	0.58	Agreed
Cluster Mean	3.15	0.33	Agreed

The analysis of the result in Table 2 shows the mean and standard deviation on benefits of field trip on students’ interest in learning of chemistry. The mean rating scores of item 1 to 5 are above 2.50 benchmark, which implies that the respondents agreed that field trips help students to develop social skills, exposes students to different situations, creating connections to the curriculum, helping to translate the theoretical lessons to reality and developing the affective domains of the students. The cluster mean of 3.15 with a standard deviation of 0.33 was obtained which implies that the respondent agreed with the item statement on the benefits of field trip on students’ interest in learning of chemistry.

1. To what extent do teachers embark on field trips with the students	2.81	0.67	OU
2. Teachers often use field trip to practicalize learning	1.64	0.66	RU
3. To what extent do teachers take students outside the classroom to obtain direct experience from a natural setting.	1.98	0.51	RU
4. The teacher often exposes students to first-hand activities	1.60	0.49	RU
5. The teacher exposes the students to learning through visiting chemical industries site and chemistry related company	1.82	0.39	RU
Cluster Mean	1.86	0.22	RU

The analysis of the result in Table 3 shows the mean and standard deviation on the extent to which chemistry teachers utilize field trip to stimulate students’ interest in teaching and learning of chemistry. The result shows that items 1 had a mean score of 2.81 and above set as the criterion for often used, while item 2, 3, 4 and 5 had a mean score of 2.49 and below set as the criterion for rarely used. However, the cluster mean of 1.86 with a standard deviation of 0.22 was obtained which implies that chemistry teachers rarely utilizes field trip to stimulate students’ interest in teaching and learning of chemistry.

Research Question Four
What are the problems hindering the use of field trip to stimulate students’ interest in teaching and learning of chemistry?

Table 4: Mean score and standard deviation on the problems hindering the use of field trip to stimulate students’ interest in teaching and learning of chemistry students.

S/n	ItemStatement	Mean	Standard Deviation	Decision
1.	Time Constraints	3.389	0.71	Agreed
2	Financial Constraints	3.17	0.85	Agreed
3	Inadequate support from School Management or Authorities	3.15	0.55	Agreed
4	Poor students’ behavior and attitudes	3.05	0.70	Agreed
5	Inadequate Support from Some Teachers	3.17	0.78	Agreed
	Cluster Mean	3.18	0.63	Agreed

The result in Table 4 shows the mean and standard deviation of respondents on the problems hindering the use of field trip to stimulate students’ interest in teaching and

learning of chemistry. The mean rating scores of item 1 to 5 are above the 2.50 benchmark. This mean that the respondents agreed that time constraints, financial constraints, inadequate support from school management or authorities, Poor students’ behavior and attitudes and inadequate support from some teacher are problems hindering the use of field trip to stimulate students’ interest in teaching and learning of chemistry. The cluster mean of 3.19 with standard deviation of 0.40 was obtained which implies that the respondents agreed that on the item statements on the problems hindering the use of field trip to stimulate students’ interest in teaching and learning of chemistry.

Discussions of the findings
The finding of the study revealed that students enjoy embarking on field trips, it stimulates students’ interest in learning, enable them to develop authentic experience, curiosity and interest, strengthened students’ interest in chemistry, and promotes active engagement in observing, collecting, classifying, studying relationship, and manipulating real objects, and situation. The reason for the enhanced interest could be because students had the opportunity to become actively engaged in observing, collecting, classifying, studying relationship, and manipulating real objects and situations, also they had a better understanding of certain concepts, and phenomena.

The finding of this result could be because students are able to see things practically, and so that prepared their background knowledge for their schema and equipped learning of chemistry. Akuto (2022) reported that field trip provides direct, and first hand learning experiences with realities of the social and physical environment, makes learning more permanent and meaningful, helps students to develop interest, stimulates, and makes teacher’s work easier.

However, Mayers and Jones (2024) stated that field trip encourages new interest among students make them more aware of community resources, and help them relate their school experience to the outside world. This is in line with the findings of Prem (2022), Ahmad (2024), Denen and Isah (2025), Amosa, Ogunlade and Atobatele (2025) and Zumyil (2023) who in their different researches found out that field trip enhances students’ interest, and achievement in science.

The study’s finding revealed that field trips help students to develop social skills, exposes students to different situations, creating connections to the curriculum, helping to translate the theoretical lessons to reality, and developing the affective domains of the students. Field-trip makes lasting impression upon the students, though it involves a lot of efforts, energy, and time on the part of the teacher, and the learners. However, Obadiora (2020) noted that field-trip strategy helps students to retain knowledge better. Gormez (2024) who revealed that field-trip strategy spurs the attitude of students as regards learning, and improves their academic performance. Field trip exposes students to new experiences, and can increase interest and engagement in science regardless of prior interest in a topic (Omeodu and Abara, 2018). On field trips, learners sharpen their skills of observations, perception and objective report of observations by utilizing all their senses (Shakil, Faizi and Hafeez, 2021). It makes the students to be more imaginative, and inquest live observers (Anderson, Kisiel, and Storksdieck 2019).

Also, Claiborne, (2020) in his study reported that field trip help in developing social, and person skills, observation, and perception skills, add relevance and meaning to learning, provides first-hand real word experience, and enhance,

and interest in the subject.

The finding of the study revealed that chemistry teachers rarely utilizes field trip to stimulate students’ interest in teaching and learning of chemistry. The result of this result could be due to the fact teachers are always interested in finishing their scheme of work and as such they often tend to utilizes the lecture teaching method which is a passive one interaction of learning. Another reason for this could be that there is adequate information on the side of the teacher on how to plan field trip, and make it effective. Hence, some teachers are not properly aware of how field trip could be effectively utilized to stimulate students’ interest in teaching and learning. The result of this finding is in line with the findings of Osorung (2022) who revealed that many science teachers rarely utilize some of the innovative teaching strategies that could promote student’s achievement, and interest in learning. Ogbeba (2025) reported that most science teachers in Nigeria do not make use of varying strategies to cope with the difficulties associated with the teaching of science.

The study’s finding revealed that time constraints, financial constraints, inadequate support from school management or authorities, Poor students’ behavior, and attitudes, and inadequate support from some teacher are problems hindering the use of field trip to stimulate students’ interest in teaching and learning of chemistry. The challenges of implementation of field trips range from one nation to another and from one region to another. Most teachers face a lot of challenges in using field trips as a teaching method since their

preparation requires more time as compared to other methods. The participatory field trip is more time-consuming than any other method. Supervision of learners during excursions tends to be very difficult. However, it is important to appreciate the value of the field trips as learners would observe, touch, and analyze to construct knowledge. Thus, the process needs more time as compared to other activities on the school teaching timetable (Kyriacou, and Kunc, 2017).

Asikina (2020) reported that field trip method of teaching, and learning, experience is an expensive verdure. The resources and fund required to run it are expensive and not easy to acquire. Most school administrators have lukewarm attitudes toward releasing funds for field trip work.

Conclusion

From the findings of the study, the following conclusions were made; Field trip influences chemistry students’ interest in learning Chemistry. There are various benefits associated with utilization of field trips on students’ interest among others which include developing social skills, exposing students to different situations. Chemistry teachers rarely utilizes field trip to stimulate students’ interest in teaching and learning of Chemistry. Time constraints, financial constraints, inadequate support from school management or authorities, Poor students’ behavior and attitudes, and inadequate support from some teacher are problems hindering the use of field trip to stimulate students’ interest in teaching, and learning of chemistry

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Entrepreneurial Orientation and Unemployment Reduction among Business Educators in Nigeria

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Abstract

This study examined the empirical relationship between entrepreneurial orientation and unemployment reduction. The study focused on four selected local Government Area of Anambra State, Nigeria. The population for the study was 400 and samples of 35 youths were drawn from the population of each Local Government Area through a convenience sampling technique. A total of 140 youths were sampled for the study. Three hypotheses were tested using primary and secondary data. The instrument was validated by one business education lecturer and two experts in Measurement and Evaluation. The reliability of the instrument was ascertained at 0.81 using Cronbach Alpha. Spearman ranking order correlation (r) was used for the test of the hypotheses. Out of one hundred and fifty (140) questionnaires administered, only one hundred and twenty (120) copies were retrieved. It was found out that there was a significant relationship between entrepreneurial Training (Skill acquisition and unemployment reduction; there was a significant relationship between innovativeness and unemployment reduction; and there was a significant relationship between risk taking and unemployment reduction). It was concluded that fighting the incessant increase in the plaguing rate of unemployment among business educators in Nigeria is a call to duty among governmental and non- governmental agencies through the adoption of entrepreneurial orientation mechanisms to promote self- employment and joint venture creation. It was recommended among other things that: Government should inculcate the spirit of entrepreneurial orientation among youths of business educators through the provision of enabling entrepreneurial orientation environment that entertains training, innovativeness, and risk taking environment for the youth to help reduce the rate of unemployment.

Keywords: Entrepreneurial orientation, unemployment reduction, training innovativeness, risk taking, self-employment, joint venture creation.

Introduction

Unemployment is one of the developmental problems that face every developing economy in this twenty- first century and Nigeria is not exempted (Ekong&Ekong, 2016). Though, youth unemployment rate in Nigeria decreased to 36.50 percent in the third quarter of 2022 from 38 percent in the second quarter of 2022, but there is an obvious disturbance of this societal ailment due to its high rate coupled with numerous enrollments of graduates into the circular world.

Entrepreneurship as a tool of enhancing unemployment reduction has continuously been beneficial to the Nigerian private sector among few individuals, comprising of small and medium enterprises which provide diverse employment opportunities (self-employed and joint ventures), thus contributes to the national development of the country. In the international domain, many other countries have been able to strengthen and transform entrepreneurship sub-sector to such a vibrant and exciting industry such that they have been able to reduce considerably their unemployment and poverty level because of the huge and enormous contribution of the sub-sector to their economic growth and development (Asogwa& Dim, 2016; cited Onugu, 2005). Stringent to Nigeria, the case is different. This negativity may be as a result of inadequate entrepreneurial orientation among youths of the country by business elites, government, and non-governmental entrepreneurial inclined bodies. Due to this pitfall in the Nigerian economy, there is need for aggressive entrepreneurial orientation among youths, to boost self-reliance and as well entrepreneurial development, thus reducing the rate of unemployment in the state.

According to Covin and Lumpkin (2011), the last three decades have witnessed the emergency of entrepreneurial orientation (EO) as an extensive

discussed concept in the management literature. Hundreds of studies exploring the entrepreneurial orientation concept have been published in a wide variety of scientific journals and presented at top conferences (Wales, Gupta, &Mousa, 2011). More so, EO research has historically and primarily focused on firm-level entrepreneurship (Slevin&Terijesen, 2011).To this end, this work was explored to ascertain the level of unemployment reduction enhanced by entrepreneurial orientation in the Nigerian state, through self employment and joint venture creation.

The Concept of Entrepreneurial Orientation (EO)

Andreas, johan, Lumpkin and Michael (2009) asserted that EO represents the policies and practices that provide a basis for entrepreneurial decisions and actions. To this end, EO is simply put as the entrepreneurial strategies and mechanisms which were used by key-decision makers to inculcate and enhance venture creation.

Entrepreneurial Training (Skill Acquisition)

Skills acquisition is the ability to learn or acquire skills. It involves the development of a new skill, practice of a way of doing things usually gained through training or experience (speelman, 2005). Thus, entrepreneurial training synonymous to skill acquisition is the process of inculcating relevant skills and knowledge tied to a vocation (craft or art) in the life of an individual, thus intriguing them to starting an enterprise. Vocation such as fish farming, poultry, rice processing, welding, trade, plumber, carpentry, bead making, fashion, hair making etc. are essential to entrepreneurial training.

Innovativeness

This is the predisposition to engage in creativity

and experimentation through the introduction of new products/services as well as technological leadership via R&D in new processes (Andreas et al, 2009). Thus, innovativeness is the shift from existing mechanism, procedures, processes and strategies to enhance new combinations, products and services.

Here, people are groomed to think tank on new ways to better life through the provision and enhancement of product and services. It also denotes the propensity for an individual undergoing an entrepreneurial orientation to engage in and promote new ideas, novelty and creative processes that necessitate new products, services or technological processes.

Risk Taking

Andreas et al, (2009) stressed that risk taking involves taking bold actions by venturing into the unknown, borrowing heavenly, and/or committing significant resources to ventures in as uncertain environments. In lighter terms, for risk to be taken it must be tied to a propensity, hence, Risk Taking Propensity (RTP). Brockhaus (1980) defined risk taking propensity as “The perceived probability of receiving the rewards associated with success of a proposed situation, which is required by an individual before he will subject himself to the consequences associated with failure, the alternative situation providing less rewards as well as less severe consequences than the proposed situation”.

The Concept of Unemployment Reduction

Unemployment denotes a scenario where individuals or persons eligible, capable and certified and willing to work are unable to find suitable paid employment for life sustainability. National Bureau of statistics (2011), unemployment rate is the proportion of those who are looking for work but could not find work for at least 40 hours during the reference

period to the total currently act(labor force) population.

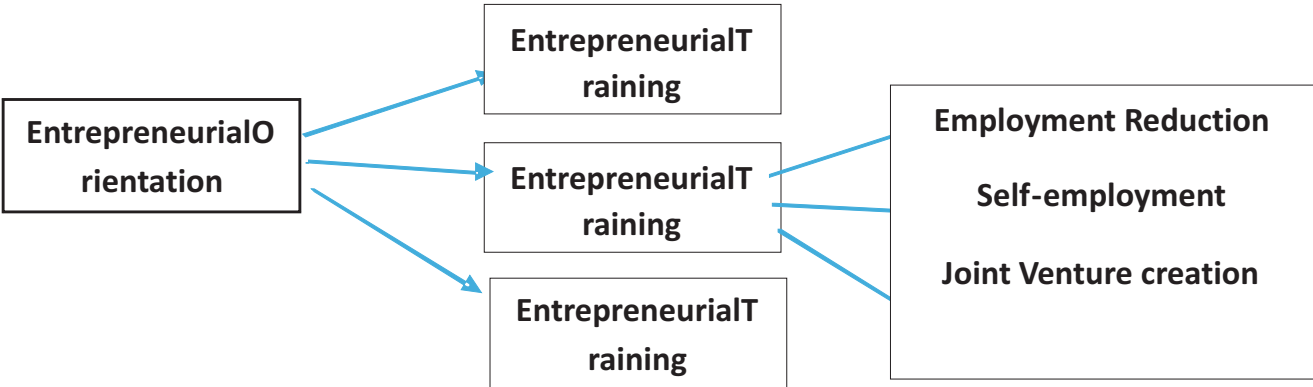
The significant need for entrepreneurship orientation in Nigeria today, more than ever, is permeated by the high rate of unemployment and its negative effect on both the populace and the nations socio- economic development, among others such as robbery, prostitution, human trafficking, militancy, terrorism, drug abuse, and political thuggery and assassination. To this end, there is a prime need for entrepreneurial orientation to be propagated, to enable individuals go into venture creation as self-employed or joint venture creation, thus promoting the advancement of small and medium enterprises, as well as reducing the rate of unemployment.

Patently, the rate of unemployment can only be reduced when people are endued with entrepreneurial skills, idea, knowledge, thus enabling them to startup businesses via self-employment or joint venture creation. Self-employment is when a person is posed to own, manage and run a business for his or her own benefits while enhancing societal needs satisfaction. While on the other words, joint venture creation is coming together of two or more persons to with explicit or implicit contractual agreement or owing managing and running a business enterprise for common benefits and societal needs satisfaction. Thus, through self-employment and joint venture creation, unemployment rate can be reduced to its minimal level.

Entrepreneurial Orientation and Unemployment Reduction

Ogundele, Akingbade, and Akinlabi (2012), asserted in their study that skill cquisition and training had helped reduced unemployment through youth empowerment and social welfare

service improvement, as it should be encouraged at all the level in the state especially at local



Statement of the Problem

Unemployment has grown large that the situation cannot be addressed by mere campaign or words of mouth (Nwankwo&Ifejiofor, 2014). This epidemic ailing situation has resulted in the continuous increase in crimes and other social vices such as robbery, kidnappings, yahoo, prostitution, human trafficking, drug abuse, militancy, etc. experienced in our society in recent time, inclusive of Anambra State. To overcome such menaces, it is therefore required of individuals, governmental and non-governmental bodies of the country to collaborate in formulating and implementing entrepreneurial orientation strategies and mechanisms such as among others; skill acquisition, innovativeness, and risk taking, inculcating them among youths to enhance entrepreneurship through self or joint venture creation, thus enhancing the reduction rate of unemployment in the state and the country at large.

Objective of the Study

The broad objective of this study is to investigate the relationship between entrepreneurial orientation and unemployment reduction in Nigeria. Specifically, this study aims to examine;

- 1. The extent of relationship between entrepreneurial training and unemployment reduction in Anambra state.
- 2. The extent of relationship between innovativeness and unemployment reduction in Anambra State.
- 3. The extent of relationship between risk taking empowerment and unemployment reduction in Anambra State.

Hypotheses H01: There is no significant relationship between entrepreneurial training and unemployment reduction in Anambra State of Nigeria.

H02: There is no significant relationship

between innovativeness and unemployment reduction in Anambra State of Nigeria.

Ho3: There is no significant relationship between risk taking and unemployment reduction in Anambra State of Nigeria.

Methodology

The study adopted the survey research design. The target population for this study comprises of selected unemployed youth from four selected Local Government Area which includes (Awka south, Onitsha North, Aguata and Oyi) whose age group falls between 20years to 40years. The population size is 400. Convenience sampling technique was employed and 40 youths were sampled from each of the four selected local government. A total of one hundred and sixty (160) youths were sampled from the selected local government council under study. Data were collected through primary (questionnaire) and secondary (textbooks, journal articles and internet). The instrument was validated by one Entrepreneurial and Business Management expert and 0.81 was elicited using Cronbach alpha. Spearman Ranking was used for the test, the researcher was able to retrieve one hundred and twenty (120) copies.

Results/Findings

H01: There is no relationship between entrepreneurial training and unemployment reduction in the four mentioned local Governments areas in Anambra State.

Entrepreneurial Orientation and Unemployment Reduction in Nigeria

Table 1: Relationship between Entrepreneurial training and Unemployment Reduction

S/N	X	Y	X2	Y2	XY	level of significance	Crft r value	calculated r value
1	20	36	400	1296	720			
2	30	14	900	Q96	420			
3	9	6	81	36	54			
4	1	4	1	16	4			
5	30	33	900	1089	990			
6	20	22	400	484	440			
7	8	4	64	16	32	0.05	0.497	0.836
8	2	1	4	1	2			
9	36	37	1296	1369	1332			
10	18	13	324	169	234			
11	2	8	4	64	16			
12	4	2	16	4	8			
2X=180 2Y=180 $\sum Y=180$? X2=4,258 ? Y2=4,590 ? XY								

Source: Field Survey, 2023

Decision: Since the calculated r2value 0.836 is greater than critical r2value 0.497, the null hypothesis is rejected and the alternate accepted. This implies that there is a significant relationship between entrepreneurial training

and unemployment reduction.

H02: There is no significant relationship between innovativeness and unemployment reduction in Nigeria.

Table 2: Relationship between Innovativeness and Unemployment Reduction

S/N	X	Y	X2	Y2	XY	level of significance	Crft r value	calculated r value
1	20	28	400	784	560			
2	15	16	225	256	240			
3	15	14	225	196	210			
4	10	2	100	4	20			
5	30	30	900	900	900			
6	20	19	400	361	380			
7	6	9	36	81	54	0.05	0.497	0.95
8	4	2	16	4	8			
9	35	35	1225	1225	1225			
10	21	20	441	400	420			
11	3	4	9	16	12			
12	1	1	1	1	1			
? X ? Y=180 ? X2 ? Y2 ? XY ? XY								

Source: Field Survey, 2023

Decision: since the calculated r2 value 0.95 is greater than the critical r2 value 0.497, the null hypothesis was rejected, and alternate accepted. This implies that there is a significant relationship between Innovativeness and Unemployment reduction.

Ho3:Three isno significant relationship between risk taking and unemployment reduction in Nigeria.

Table 3: Relationship between Risk Taking and Unemployment Reduction

S/N	X	Y	X2	Y2	XY	level of significance	Crft r value	calculated r value
1	20	36	400	1296	720			
2	30	15	900	225	450			
3	7	4	49	16	28			
4	3	5	9	15	15			
5	30	34	900	1156	1020			
6	21	18	441	324	378			
7	5	5	25	25	25	0.05	0.497	0.84
8	4	4	16	9	12			
9	35	33	1225	1089	1155			
10	15	20	225	400	300			
11	8	3	64	9	24			
12	2	4	4	16	8			
2X=180 ? Y=180 ? x2 ? Y2=4,590 ? XY=4,135 ? XY								

Source: Field Survey, 2023

Decision: Since the calculated r2 value 0.84 is greater than the critical r2 value 0.497, the null hypothesis was rejected. This implies that there is significant relationship between entrepreneurial orientation (entrepreneurial training, innovativeness and risk taking) and unemployment reduction (Self-employment and joint Venture creation) in selected Local Government Areas of Anambra State. These are in consonance with views of Asogwa& Dim (2016), Ekong&Ekong (2016), Anyadike et al (2012), Dandago, & Muhammad (2014, Oylola et la (2013), and Asad et al (2014), that entrepreneurship has a relationship with employment generation or otherwise, unemployment reduction (self-employment or joint venture), implying that entrepreneurial orientation has the potentials of increasing the proclivity for entrepreneurship other things being equal. To this end, when the youths are not adequately empowered by means of entrepreneurial orientation either formal or informal, they cannot be posed and inculcated to training, risk taking or innovativeness in nature. Thus, adequate attentions should be focused on the creation of entrepreneurial environment that would spur youths rationally in job creation

rather than having the mind- set of job seeking.

Finally, since entrepreneurial orientation is tied to entrepreneurial studies which constitute inter-disciplinary training that focuses on the tools needed to start a new business or vocation, it is crystal clear in collaboration with this study that the training of youths in entrepreneurial skills, knowledge, idea, risk taking, innovativeness are substantial to reduce the rate of unemployment parading in the Nigerian society.

Conclusion and Recommendations

Fighting the incessant increase in the plaguing rate of unemployment in Nigeria is a call to duty among governmental and non-governmental agencies through the adoption of entrepreneurial orientation mechanisms to promote self-employment and joint venture creation. While the government tasks its leading role in employment generation by providing the necessary enabling environment for economic activities, incorporation of entrepreneurial orientation (among others: training, innovativeness and risk taking) is essential in the development of youths for the betterment of self,

and the society at large.

In line with the findings of the study the following recommendations are made:

- Government should inculcate the spirit of entrepreneurial orientation among youths through the provision of enabling entrepreneurial orientation environment that entertains training, innovativeness, and risk taking environment for the youth to help reduce the rate of unemployment.

- The scope of the entrepreneurial orientation programme should be extended to include technical skills, managerial skills and business skills.
- Adequate financial, physical and human resources should be consistently provided by various stakeholders (government and non-governmental) for both potential entrepreneurs and existing entrepreneurs among youth in Anambra State.

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Effect of Ethnomathematics Strategy on Students' Achievement and Interest in the Teaching and Learning of Mathematics Concepts in Secondary Schools

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Abstract

This study investigated the effect of ethnomathematics strategy on students' achievement and interest in the teaching and learning of mathematics concepts in secondary schools. The persistent poor performance of students in mathematics and the need for innovative instructional approaches motivated the study. The study specifically examined the effect of ethnomathematics strategy on students' academic achievement and interest in mathematics concepts. The study adopted a quasi-experimental research design involving pre-test and post-test non-equivalent control groups. The population of the study consisted of 5,600 Senior Secondary School Two (SS II) students in public secondary schools in Onitsha North Education Zone of Anambra State, Nigeria. A sample of 200 students was selected from four secondary schools using multistage sampling techniques. Two schools formed the experimental group, while the other two schools served as the control group. The experimental group was taught using ethnomathematics strategy, while the control group was taught using the conventional lecture method. Two instruments, namely Mathematics Achievement Test (MAT) and Mathematics Interest Questionnaire (MIQ), were used for data collection. The instruments were validated by experts in Mathematics Education and Measurement and Evaluation. Reliability coefficients of 0.87 and 0.81 were obtained for MAT and MIQ respectively. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The findings revealed that ethnomathematics strategy significantly improved students' academic achievement and interest in mathematics concepts when compared with the conventional teaching method. The study concluded that ethnomathematics strategy is an effective learner-centered instructional approach for improving mathematics teaching and learning in secondary schools. The study recommended that mathematics teachers should adopt ethnomathematics strategy in classroom instruction. Keywords: Ethnomathematics, Teaching Strategy, Mathematics Concepts, Students' Interest, Secondary School Students.

Introduction

Mathematics is universally recognized as a fundamental subject that plays a significant role in scientific advancement, technological development, and national growth. In Nigeria, mathematics is a compulsory subject at the primary and secondary school levels because of its importance in everyday life, development of critical thinking and problem-solving skills. Despite its importance, students' performance in mathematics in Nigerian secondary schools has remained persistently poor over the years. Reports from public examinations such as the West African Senior School Certificate Examination (WASSCE) and the National Examination Council (NECO) often reveal low achievement rates in mathematics. This poor performance has been attributed to factors such as ineffective teaching methods, abstract presentation of mathematical concepts, and lack of instructional materials, mathematics anxiety, and students' negative attitudes toward the subject. Conventional teaching methods commonly used in secondary schools are mostly teacher-centered and emphasize memorization rather than practical understanding. Such approaches often fail to connect mathematics with the cultural experiences and daily lives of learners. Consequently, many students perceive mathematics as difficult, foreign, and irrelevant to their environment. This situation has generated increasing concern among educators, researchers, and curriculum planners in Nigeria, thereby creating the need for innovative teaching strategies that can improve students' understanding and interest in mathematics.

One of the emerging instructional strategies aimed at addressing these challenges is ethnomathematics. Ethnomathematics refers to the study and application of mathematical ideas embedded in the cultural practices, traditions, occupations, and daily activities of people. It emphasizes the integration of learners' cultural

background into mathematics teaching and learning. Ethnomathematics recognizes that mathematical concepts exist in indigenous practices such as trading, weaving, farming, building, counting systems, games, and measurements. By relating mathematics concepts to familiar cultural experiences, ethnomathematics makes learning more meaningful, practical, and understandable to students, as well as making them actively involved. The ethnomathematics strategy is gaining attention among mathematics educators because, it promotes active participation, creativity, critical thinking, and problem-solving abilities among learners. It also helps students to appreciate their cultural heritage while learning mathematics concepts. Research has shown that when students are taught using culturally relevant instructional approaches, they develop positive attitudes towards mathematics and demonstrate improved academic achievement. A systematic review of ethnomathematics integration in secondary education revealed that ethnomathematics enhances students' conceptual understanding, motivation, and higher-order thinking skills.

In Nigeria, several scholars have examined the relevance of ethnomathematics in improving mathematics teaching and learning. Adamu (2022) investigated the effect of ethnomathematics teaching approach on students' achievement, interest, and retention in geometry among secondary school students in Benue State. The study found that ethnomathematics improved students' interest and retention in geometry concepts when compared with conventional teaching methods. Similarly, Aduloju (2025) examined teachers' perceptions of ethnomathematics as a pedagogical strategy in Nigeria and reported that teachers viewed ethnomathematics positively because it connects mathematics learning with real-life experiences and increases student

engagement. However, the study also identified inadequate instructional materials and lack of teacher training as challenges affecting its implementation. Egara and Mosimege (2023) studied students' perceptions of mathematics teachers' use of ethnomathematics materials in teaching mathematics. Their findings showed that although ethnomathematics has the potential to improve mathematics learning, its usage in secondary schools remains low due to inadequate teacher preparedness and insufficient learning resources. Also, Salihu, Yusuf, and Mohammed (2024) reported that ethnomathematics teaching strategy significantly enhanced students' retention of geometry concepts in secondary schools in Katsina State.

In another study, Eze (2023) found that the ethnomathematics approach improved pupils' achievement in plane shapes in Bayelsa State by incorporating local cultural practices and indigenous knowledge into mathematics lessons. Likewise, Adewumi, Akinbobola, and Akinbehinje (2024) emphasized that innovative learner-centered teaching strategies improve students' academic achievement in mathematics more effectively than conventional methods. The relevance of ethnomathematics in Nigerian secondary schools is further supported by the multicultural nature of Nigerian society. Nigeria is richly endowed with diverse ethnic groups, languages, and cultural practices that contain numerous mathematical ideas and applications. Integrating these cultural elements into classroom instruction can help students understand abstract mathematical concepts more easily. For example, local market transactions, indigenous games, architectural designs, traditional crafts, and farming practices can be used to teach concepts such as counting, measurement, geometry, probability statistics and algebra. This culturally responsive approach

can reduce students' fear of mathematics and encourage active participation during lessons.

Despite the growing interest in ethnomathematics, many secondary school mathematics teachers still rely heavily on traditional lecture methods. Consequently, students continue to experience difficulties in understanding mathematics concepts. There is therefore a need to investigate the effect of ethnomathematics strategy on the teaching and learning of mathematics concepts in secondary schools. Such a study is important because it may provide empirical evidence on the effectiveness of ethnomathematics in improving students' academic performance, interest, retention, and participation in mathematics. The findings may also assist curriculum planners, teachers, and educational stakeholders in adopting culturally relevant instructional strategies that can enhance mathematics education in Nigerian secondary schools.

The study will be beneficial to students, teachers, curriculum planners, educational administrators, and future researchers. Hopefully, the findings will benefit students by improving their understanding of mathematics concepts through the use of familiar cultural practices and real-life experiences. Ethnomathematics strategy will help students develop interest, confidence, and positive attitudes toward mathematics, thereby reducing mathematics anxiety and fear commonly associated with the subject. It will also enhance students' academic achievement and retention of mathematics concepts. The study will be significant to mathematics teachers because it will expose them to innovative and learner-centered instructional strategies that can make mathematics lessons more meaningful and practical. Teachers will gain knowledge on how to integrate indigenous cultural knowledge and

local experiences into classroom instruction, thereby improving teaching effectiveness and classroom participation.

Curriculum planners and educational policymakers will benefit from the findings of the study because it may provide useful information for curriculum review and development. The study may encourage the inclusion of culturally relevant teaching approaches in the mathematics curriculum in order to promote effective learning outcomes in secondary schools. The study will also be beneficial to school administrators and education stakeholders as it may provide evidence on the need for teacher training, workshops, and seminars on ethnomathematics instructional strategies. This can improve the quality of mathematics teaching and learning in schools. Finally, the study will serve as a useful reference material for researchers and scholars who may wish to carry out further studies on ethnomathematics, mathematics education, and innovative teaching strategies in Nigeria and beyond.

Scope of the Study

The study covers some aspects of Number and Numeration concepts in Algebra.

Purpose of the Study

The main purpose of the study is to examine the effect of ethnomathematics strategy on students' achievement and interest in the teaching and learning of mathematics concepts in secondary schools.

Specifically, the study sought to:

- 1. determine the effect of ethnomathematics strategy on students' academic achievement in mathematics concepts in secondary schools.
- 2. examine the effect of ethnomathematics

strategy on students' interest in mathematics concepts in secondary schools.

- 3. determine the difference in the performance of students taught mathematics using ethnomathematics strategy and those taught using conventional teaching methods.

Research Questions

The following research questions guided the study:

- 1. What is the effect of ethnomathematics strategy on students' academic achievement in mathematics concepts in secondary schools?
- 2. What effect does ethnomathematics strategy have on students' interest in mathematics concepts in secondary schools?
- 3. What is the effect of ethnomathematics strategy on students' retention of mathematics concepts in secondary schools?
- 4. What difference exists between the performance of students taught mathematics using ethnomathematics strategy and those taught using conventional teaching methods?

Research Hypotheses

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

- 1. There is no significant effect of ethnomathematics strategy on students' academic achievement in mathematics concepts in secondary schools..
- 2. There is no significant effect of ethnomathematics strategy on students' interest in mathematics concepts in secondary schools.
- 3. There is no significant difference between the performance of students taught mathematics using ethnomathematics strategy and those taught using conventional teaching methods.

Methodology

The study adopted a quasi-experimental research design, specifically the pre-test, post-test, non-equivalent control group design. This design is considered appropriate because it enables the researcher to determine the effect of ethnomathematics strategy on the teaching and learning of mathematics concepts in secondary schools without random assignment of subjects to groups. The design involved two groups: the experimental group, which was taught using ethnomathematics strategy, and the control group, which was taught using the conventional teaching method. The study was conducted in secondary schools in Onitsha North Education Zone of Anambra State, Nigeria. The state is selected because of the persistent concern over students’ poor performance in mathematics and the need for innovative teaching strategies to improve mathematics learning outcomes among secondary school students. The population of the study will consisted of five thousand, six hundred (5,600) Senior Secondary School Two (SS II) students offering mathematics in public secondary schools in the selected area of study. SS II students are chosen because they have sufficient background knowledge of mathematics concepts and are actively preparing for external examinations.

A sample of 200 SS II students was selected from four public secondary schools using a simple random sampling technique, although purposive sampling was used to select schools with qualified mathematics teachers and adequate classroom facilities. Simple random sampling technique was used to select two schools for the experimental group and two schools for the control group. Intact classes will be used to avoid disruption of normal school activities. The experimental group consisted of 100 students, while the control group also consists of 100 students. The instrument for data collection was

a researcher-developed Mathematics Achievement Test (MAT) and Mathematics Interest Questionnaire (MIQ). The Mathematics Achievement Test (MAT) consists of multiple-choice and structured questions based on selected mathematics concepts taught during the experiment. The test was used for both pre-test and post-test assessment. The instruments were validated by experts in Mathematics Education and Measurement and Evaluation from a recognized university. Their corrections and suggestions regarding clarity, relevance, and appropriateness of the items were incorporated before final administration.

The reliability of the Mathematics Achievement Test (MAT) was determined using the Kuder-Richardson Formula 20 (KR-20), while the reliability of the Mathematics Interest Questionnaire (MIQ) was established using Cronbach Alpha reliability method. A reliability coefficient of 0.87 and 0.81 respectively were established. The experimental group was taught selected mathematics concepts using ethnomathematics strategy, which will involve the use of indigenous cultural practices, local examples, counting systems, market activities, traditional games, and other culturally relevant materials to explain mathematical ideas. Also, the control group was taught the same mathematics concepts using the conventional lecture method.

Method of Data Analysis

The data collected were analyzed using both descriptive and inferential statistics. Mean and standard deviation was used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. ANCOVA helped to control the effect of initial differences between the experimental and control groups using pre-test scores as covariates.

Results

Research Question One

What is the effect of ethnomathematics strategy on students’ academic achievement in mathematics concepts in secondary schools?

Table 1: Mean Achievement Scores of Students in Experimental and Control Groups

Group	N	Pre-test Mean	Post-test Mean	Mean Gain
Experimental Group	100	42.15	74.30	32.15
Control Group	100	41.82	58.14	16.32

Table 1 shows that students taught mathematics using ethnomathematics strategy had a higher mean gain score of 32.15 compared to the control group with a mean gain score of 16.32. This indicates that ethnomathematics strategy improved students’ academic achievement in mathematics concepts.

Research Question Two

What effect does ethnomathematics strategy have on students’ interest in mathematics concepts in secondary schools?

Table 2: Mean Interest Scores of Students in Experimental and Control Groups

Group	N	Pre-test Mean	Post-test Mean	Mean Gain
Experimental Group	100	2.41	3.58	1.17
Control Group	100	2.38	2.79	0.41

The result in Table 2 reveals that students exposed to ethnomathematics strategy recorded greater improvement in interest toward mathematics than students taught using the conventional method.

Research Question Three

What difference exists between the performance of students taught mathematics using ethnomathematics strategy and those taught using conventional teaching methods?

Table 3: Comparison of Students’ Performance

Group	N	Mean Score	Standard Deviation
Experimental Group	100	74.30	8.42
Control Group	100	58.14	9.10

The result shows that the experimental group performed better academically than the control group.

Test of Hypotheses

Hypothesis One

There is no significant effect of ethnomathematics strategy on students’ academic achievement in mathematics concepts in secondary schools.

Table 4: ANCOVA Result on Students’ Achievement

Source	Sum of Squares	df	Mean Square	F	Sig
Corrected Model	1824.56	2	912.28	18.43	.000
Group	1450.21	1	1450.21	29.31	.000
Error	5787.12	117	49.46		
Total	7611.68	119			

Since the significance value of .000 is less than 0.05, the null hypothesis is rejected. Therefore, there is a significant effect of ethnomathematics strategy on students’ academic achievement in mathematics.

Hypothesis Two

There is no significant effect of ethnomathematics strategy on students’ interest in mathematics concepts in secondary schools.

Table 5: ANCOVA Result on Students’ Interest

Source	Sum of Squares	df	Mean Square	F	Sig
Group	38.24	1	38.24	21.17	.001
Error	211.45	117	1.81		

Since the significance value (.001) is less than 0.05, the null hypothesis is rejected. Thus,

ethnomathematics strategy significantly improved students' interest in mathematics.

Discussion of Findings

The findings of the study revealed that ethnomathematics strategy significantly improved students' academic achievement in mathematics concepts. Students exposed to culturally relevant instructional methods performed better than those taught using the conventional lecture method. This finding agrees with Adamu (2022), who reported that ethnomathematics strategy improved students' achievement and retention in geometry.

The study also revealed that ethnomathematics strategy enhanced students' interest in mathematics. The integration of local cultural practices and familiar examples made mathematics more meaningful and enjoyable to learners. This finding supports the study of Aduloju (2025), which found that ethnomathematics increased student engagement and participation in mathematics lessons.

It was also indicated that students taught with ethnomathematics strategy retained mathematics concepts better than students taught with conventional methods. This may be because culturally related learning experiences improve understanding and long-term memory retention, thereby showing a better or improved performance.

The overall findings suggest that ethnomathematics strategy is an effective learner-centered instructional approach capable of improving mathematics teaching and learning in secondary schools. It also made students to participate actively in the classroom.

Conclusion

Based on the findings of the study, it was concluded that ethnomathematics strategy is an effective instructional approach for teaching mathematics concepts in secondary schools. The strategy improves students' academic achievement, increases their interest in mathematics, and enhances retention of learned concepts. Integrating cultural practices and indigenous knowledge into mathematics instruction makes learning more practical, meaningful, and learner-centered, hence, encouraging active involvement of students in the classroom.

Therefore, ethnomathematics strategy should be encouraged in secondary schools to improve mathematics teaching and learning outcomes.

Recommendations

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

1. Mathematics teachers should adopt ethnomathematics strategy in teaching mathematics concepts in secondary schools.
2. Curriculum planners should incorporate ethnomathematics into the mathematics curriculum at the secondary school level.
3. Government and educational stakeholders should organize workshops, seminars, and training programs to expose teachers to ethnomathematics instructional strategies.
4. Schools should provide adequate instructional materials and cultural resources that support the effective implementation of ethnomathematics strategy.
5. Researchers should conduct further studies on ethnomathematics using different mathematics topics, locations, and educational levels.

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Assessment of Teachers Qualities in Teaching-Learning for Sustainable Development in Anambra State

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Abstract

The study assesses teachers' qualities in teaching-learning for sustainable development in south-south Nigeria. Hence, teaching-learning for sustainable development is an approach that seeks to empower students of all ages to assume responsibility for creating and enjoying a sustainable future. It also prepares students in all work of life to plan for, cope with and find solutions for issues that threaten the sustainability of our environment and encourages changes in our behaviour that will create a more sustainable future in our society. Six hundred (600) teachers were sampled by means of stratified sampling techniques from six (6) education zones of the states. A self-development questionnaire which was validated by the researcher and two other experts in measurement and evaluation was used for data collection. Mean rating and standard deviation was used in answering the research questions, while Pearson product moment correlation coefficient was used to test the stated hypothesis at 0.05 level of significant. The results of the study shows that the competence levels and professional levels of teachers qualities influences teaching-learning for sustainable development in south-south Nigeria. The result also revealed that there was no significant relationship between the competence levels and professional levels of teachers' qualities in teaching-learning for sustainable development in south-south Nigeria. It is recommended that there should be capacity building process that aims at providing tools and competences to teachers and schools in their teaching practice. It is also recommended that pedagogical resources and curriculum innovation should be encouraged at local and national levels.

Keywords: Assessment, Teachers Qualities, teaching-Learning and Sustainable Development.

Introduction

Teaching-learning for sustainable development has become an important issue in assessing teacher's qualities generally in the world. The United Nations has encouraged innovative approaches in teaching-learning by teachers in order to contribute to the societal transition towards sustainability through both formal, non-formal and informal learning setting (Buckler and Creech, 2024). Learning does not take place in separate silos but with the inter connection of different stakeholders that are seen as necessity in teaching-learning for sustainable development.

Teaching-learning for sustainable development is to think about work towards a live able world now and in future for ourselves and for others, here and elsewhere on the planet (Van and Loone,, 2021, p.5). However, the world is constantly and rapidly undergoing different changes that what we look as sustainable today might not be sustainable tomorrow (Wals, 2025). Sustainability issues are described by complexity and uncertainty of teaching-learning for sustainable development by teachers who needs to evolve themselves in order to be able to provide skills and competencies that enable them cope with this complexity and uncertainty (Lambrechts, Mula, Ceulemans, Molderez and Gaeremynck (2023). Moreso, in dealing with future sustainability issues, societies and stakeholders in educational sectors needs to become flexible, adaptive and resilient.

Teaching-learning for sustainability is defined as the learning that is needed to maintain and improve our quality of life and the quality of life of generations to come. Teaching-learning for sustainable development is about equipping individuals, communities, groups, businesses and government to live and act sustainably by giving them an understanding of the

environment, social and economic issues involved (Makrakis, 2019, p. 411). The vision for teaching-learning for sustainable development by teachers emphasizes a holistic, interdisciplinary and cross disciplinary approach to developing the knowledge and skills needed for a sustainable future as well as changes in values, behaviour and lifestyles. Nevertheless, to achieve teaching-learning for sustainable development, we need teachers who are well prepared and committed to the principles of sustainability (UNESCO, 2020).

Teachers' beliefs are among the significant qualifications regarded as an agent for supporting community participation to achieve the goals of sustainable development (Taylor, Nathan &Coll, 2023). All teachers have beliefs concerning teaching-learning process, students, their classroom activities and their responsibilities assigned to them (Pajares, 2022). Teachers' belief on teaching-learning for sustainable development revealed that teachers do not have consensus with regards to different aspects of sustainability (Boon, 2021; Corney& Reid, 2007; Winter & Firth, 2017). For instance, some teachers believed that local issues were more suitable to be included in the teaching-learning process regarding sustainability, such that students could easily associate these issue with their daily life. Summers, Corney& Childs (2023), observed that some teachers held another view that global issues were more interesting among students. Hence, some teachers believe that in explaining correct ideas and principles may be helpful for students learning (Summer et al., 2024). Nevertheless, teachers have different beliefs on teaching-learning for sustainable development which are faced with difficulties and are pointed out that teachers perceive lack of knowledge, lack of supports of the heads of the schools, inconsistency between teaching academic fields and sustainable development

and their personal characteristics as a problem towards sustainability in teaching-learning.

The principal idea behind teaching-learning for sustainable development is to focus on the study of real-life problems and the learning process which should be learner-centered through problem identification, identification of learning needs and tasks, processing and refinement of needs and tasks, construction and reconstruction of new knowledge and continuous reflective feedback.

Statement of the Problem

Teachers who are well prepared and committed in the teaching-learning for sustainable development are needed to maintain and improve the quality of life for generations to come. The crops of some teachers employed by the teaching services commission shows that these teachers lacks subject matter knowledge and pedagogical content knowledge for sustainable development. Hence, the study is to assess the competence and professional teachers' qualities in teaching-learning for sustainable development in south-south Nigeria.

Research Questions

- 1. What is the competence level of teachers' qualities in teaching-learning for sustainable development in Anambra State?
- 2. What is the professional level of teachers' qualities in teaching-learning for sustainable development in Anambra State?

Hypothesis

There is no significant relationship between the competence level and professional level of teachers' qualities in teaching-learning for sustainable development in Anambra State.

Method

The study employed the descriptive research design. The population of the study consisted of

all the 6,000 teachers in public secondary schools in Anambra State. The sample of the study was made up of six hundred (600) teachers randomly selected from the six education zones of the state by the means of stratified random sampling techniques. One hundred (100) teachers from each zone were taken.

The instrument used for the study was a self-developed questionnaire that was validated by the researchers and two other experts in Measurement and Evaluation, Nnamdi Azikiwe University, Awka. The instrument was titled "Assessment of Teachers qualities in Teaching-Learning for Sustainable development in south-south Nigeria". Four points scale of Strongly Agree (4), Agree (3) Disagree (2) and Strongly Disagree (1) was used.

The researchers and three trained research assistants administered the instrument in the study areas for three weeks. The 600 copies of the instrument were administered to the respondents and after the completion, the instrument were retrieved back from the respondents immediately.

The mean rating and standard deviation were used in answering the research questions and a mean rating of 2.50 was taken as the cut off mark in taking decision. That is, the mean of 2.50 and above was regarded as agreed while the mean responses of below 2.50 was taken as disagreed. Pearson Product Moment correlation coefficient analysis was used to test the stated hypothesis at 0.05 level of significant.

Results

Data collected were presented and summarized in the table below:

Research Question 1

What is the competence level of teachers' qualities in teaching- learning for sustainable

development in Anambra State?

Table 1: Mean rating and standard deviation on the competence level of teachers qualities in teaching-learning for sustainable development

S/n	Competence level of Teachers Qualities	Mean N=600	SD	Decision
1	Teaching-learning for sustainable development requires trans-disciplinary learning	3.32	0.62	Agreed
2	Teachers uses understanding of individual learning difference in ensuring sustainable development	3.19	0.68	Agreed
3	Teachers supports diverse learning through various means of communication, teaching methods to engage for sustainable development	3.27	0.81	Agreed
4	Learning-behavioural changes are important in achieving sustainable development	3.13	0.74	Agreed
5	Teaching-learning for sustainable development is about transforming students perceptions, attitudes towards sustainability	3.19	0.78	Agreed
Total Grand Mean				

Table 1, shows the competence level of teachers qualities and items 1-5 had mean rating range of 3.19-3.32 and a grand mean of 3.22 which were above the cut off mark of 2.50 that was regarded as accepted. Hence, all the items under competence level of teachers' qualities were considered acceptable. This implied that the competence level of teachers' qualities influences teaching-learning for sustainable development in Anambra State

Research Question 2

What is the professional level of teachers' qualities in teaching learning for sustainable development in Anambra State?

Table 2: Mean rating and standard deviation on the professional level of teachers' qualities in teaching-learning for sustainable development.

S/n	Professional level of Teachers Qualities	Mean N=600	SD	Decision
6	Teaching-learning for sustainable development prepares learner for active role in society	3.37	0.76	Agreed
7	Teaching-learning for sustainable development requires the promotion of knowledge, abilities to combat urgent issues.	3.11	0.81	Agreed
8	Teaching-learning for sustainable development is about what people learn, it's relevance to today's world for future generations	3.27	0.63	Agreed
9	Teaching-learning for sustainable development is to equip students with skills needed to work	3.20	0.68	Agreed
10	Teaching-learning for sustainable development requires teachers who are well prepared, committed to the principles of sustainability	3.50	0.83	Agreed
Total Grand Mean		3.29		

Table 2, revealed the professional levels of teachers qualities. Item 6-10, had mean rating range of 3.11-3.50 and a grand mean of 3.29 which were above the cut off mark of 2.50 that was taken as accepted.

This shows that the professional level of teachers qualities influence teaching-learning for sustainable development in Anambra State.

Hypothesis

There is no significant relationship between the

competence level and professional level of teachers’ qualities in teaching-learning for sustainable development in Anambra State

Table 3: Pearson’s Product Moment Correlation Coefficient on the Competence Level and Professional Level of Teachers Qualities in Teaching-learning for Sustainable Development.

Variable	N	Pearson’s r	Sign (2-tailed)	Decision
Competence level of teachers qualities	600	0.05	0.212	Accepted
Professional level of teachers qualities				

Table 3, indicates the Pearson’s r value of 0.051 and a p-value of 0-212. Testing the null hypothesis at an alpha level of 0.05, the p-value of 0.212 was greater than the alpha level of 0.05. Thus, the null hypothesis which states that there is no significant relationship between the competence level and professional level of teachers’ qualities in teaching - learning for sustainable development in Anambra State was accepted.

Discussion

The result in Table 1, revealed that the competence levels of teachers’ qualities for sustainable development include: Requires trans-disciplinary learning, understanding of individual learning difference, supports diverse learning through various means of communication and teaching methods, learning behavioural changes of students and transforming students perceptions-attitude. This finding supports the view of Lambrechts Mula Ceulemans, Molderez and Gaeremynch (2023), who observed that teachers who needs to be

evolve in teaching-learning for sustainable development should be able to provide skills and competencies that enables them cope with complexity and uncertainty in the society.

Table 2, show the professional levels of teachers qualities for sustainable development as follows: Prepares learners for active role in the society; requires the promotion of knowledge, abilities to combat urgent issues; to understand what people learn, it’s relevance in today’s world for future generation; to equip students with skills needed to work; and required teachers who are well prepared and committed. The finding concur with the studies of Makrakis (2021), who noted that teaching-learning for sustainable development is about equipping individuals, communities, groups, businesses and government to live and act sustainably by giving them an understanding of the environment, social and economic issues involved.

Table 3, indicated that there is no significant relationship between the competence level and professional level of teachers qualities in teaching-learning for sustainable development in south-south Nigeria. This finding is in line with UNESCO (2020), that in order to achieve teaching-learning for sustainable development, we need teachers who are competent and professionally prepared and committed to the principles of sustainability.

Conclusion

In teaching-learning for sustainable development, teachers’ competence levels and professional levels are required for teachers’ qualities for sustainability. It is recommended that there should be capacity building process that aims at providing tools and competences to teachers and schools in their teaching practice. It is also recommended that pedagogical resources and curriculum innovation should be encouraged at the local and national levels.

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Development of an ESP32-Enabled Smart Electrical Energy Metering System

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Abstract

The growing demand for efficient energy management and real-time power monitoring has accelerated the development of smart metering technologies. This study presents the development and performance evaluation of an ESP32-enabled smart electrical energy metering system for accurate measurement, processing and cloud-based transmission of electrical parameters. The system utilizes the ESP32 microcontroller due to its integrated Wi-Fi capability, low power consumption and high processing performance. The measured data are processed in real time and transmitted to a cloud-based platform (Blynk) for remote monitoring, storage and analysis. Voltage and current signals are acquired using precision voltage divider and current transformer (CT) sensing circuits, interfaced with the ESP32 12-bit analog-to-digital (ADC) for digital signal processing. The system computes RMS voltage, RMS current, active power, apparent power, power factor and cumulative energy consumption using embedded algorithm implemented in C/C++. Experimental results demonstrate stable operation, accurate energy computation and efficient cloud synchronization, validating the stability of the system for residential and small-scale industrial smart metering applications. The developed system provides a scalable and cost-effective solution for smart grid integration and advanced energy management systems.

Keyword:ESP32, Energy, RMS Voltage and Current, Blynk, Current Transformer.

Introduction

Electrical energy consumption has increased significantly in recent years. Consequently, there is a growing need to expand energy supply to meet the rising demand driven by population growth, economic development, urbanization and industrial expansion. This trend has resulted in a persistent imbalance between energy demand and supply. (Benzi, Anglani, Bassi&Frosini, 2011). According to the current

scenario, the power generated, which is mostly derived from fossil fuels, will be depleted within the next 20 years. Electronic energy monitoring solutions are currently available on the market that is extremely accurate. In the case of residential applications, the majority of these monitor the power utilized in a domestic household. Consumers are frequently disappointed with their power bills since they do not display the power used at the device level

(Rashed, Fung, Mohammadi & Raahemifar, 2014). The Internet of Things (IoT) is a new sector and IoT-based devices have ushered in a revolution in electronics and information technology.

Energy usage, particularly electricity consumption, is one of the most critical issues we face today. An effective technique to monitor this energy consumption is required (Rashed, Fung, Mohammadi & Raahemifar, 2014 and Amin, Wollenberg, 2005). The Internet of Things (IoT) offers a solution to these issues. Hardware, software, and the cloud are all interconnected. As a result, we offer an energy consumption model. Household appliance monitoring system that can be used to calculate energy consumption of the family and to keep the user up to date on his or her electricity usage and be able to make informed decisions (Chooruang, Komkrit, Kraison Meekul, 2018). With the advent of Internet of Things (IoT) technology (Govindarajan, Meikandasivam & Vijayakumar, 2020), an existing energy meter with an industrial communication protocol can be adapted to improve connection and observability of power and energy consumption. This can be accomplished by utilizing IoT technology (Galina, Mia, Muhammad, &Joni, 2019). As a result, this study presents an approach that incorporates IoT technology so that current digital energy meters in buildings can be modified to enable for online monitoring.

Review of literature

An IoT-based smart energy meter was developed by Kumar L, using ATmega 328p microcontroller, voltage sensor, current sensor, ESP 8266 wi-fi chip and a SIM 900 GSM module (Kumar, Indragandhi, Selvamathi, Vijayakumar, Ravi, & Subramaniaswamy, 2021). The ESP 8266 sends data to the ThingSpeak cloud platform through the internet. When updating

data to the cloud fails, an alternative solution is a 4G GSM module that sends data to the appropriate contacts as an SMS. The energy meter calculates the amount of energy consumed each hour using Fast Fourier Transform as well as the cost of that consumption. However, because the ATmega 328p is expensive, a low-cost microcontroller is required for use in smart meters.

Yaghmaee M. developed a smart energy metering system that can be used in industrial and residential settings to measure how much energy each electrical device consumes and to control electrical appliances (Yaghmaee&Hejazi, 2018). Sensor nodes, a gateway and a server make up the system. Power consumption, power line parameters and environmental variables such as gas leakage, temperature and humidity are all collected by the sensor node. The data is sent from the sensor node to an Android HTTP gateway running on a Raspberry Pi 3.

The gateway connects to the Internet in order to send data to a central server. PIC microcontroller PIC16F877, CT sensor and voltage transformer are used in a smart meter proposed in (Faisal, Karim, Ridwan, Hossen, Hossain, 2019). The meter regulates the energy supply and evaluates power usage depending on the load demand. Most importantly, this meter can calculate the cost of grid and solar energy consumption for settings that use both. Using NodeMCU with built in Wi-Fi chip ESP 8266 and a GSM module, Prathik M. proposed the design and implementation of an energy monitoring system in (Prathik andAnitha, 2018). This system provides daily power consumption of electrical equipment and manages the appliances, thereby saving energy. The electricity board section of the system informs customers about their bills, payments and scheduled outages. If the consumer does not pay on time, the user is

notified. If the customer does not pay, an alarm message is sent and the power to the remote server is turned off.

Visalatchi S. designed a system based on Atmega328P. The system is leveraged by the energy meter for power theft detection and control (Visalatchi, Kamal, 2017). When a fault is found, an algorithm is used to connect and disconnect the meter. The meter is connected to and unplugged from the utility devices using relay logic. The GSM module allows the central authority server and energy meter to automatically send SMS messages to the consumer.

A novel LDR-based method for monitoring the energy usage of an autonomous meter reading system is proposed in by Anirudh Kumar. It is impossible to modify or tamper with this energy because the energy meter belongs to the utility company (Kumar, Thakur, &Bhattacharjee, 2018). Each AMR energy meter operates at a particular frequency and the LED will either shine or flash for that frequency. This frequency is connected to the energy usage that was recorded on the memory card. The power consumption utilization factor is calculated using LED flashing. Through HTTP and the ESP 8266 module, estimated energy data will be sent to the server.

A Bluetooth-enabled energy meter was proposed for wireless reading in (Koay, Cheah, Sng, Chong, Shum, Tong, Wang, Zuo, Kuek, 2003). To obtain meter readings with minimal human intervention, the system employs automatic meter reading and an automatic polling mechanism. To develop a low-cost and dependable Bluetooth-enabled energy meter, a CSR Bluetooth BlueEZ module and an Analog Devices ADE7756 energy meter are used. Bluetooth has limited communication range

hence cannot be adopted for long distance communication.

In Kaur M. proposed an energy consumption monitoring system based on Arduino-Uno and Ethernet. A user accesses the information using an IP address on their devices. However, this system requires a high initial installation cost. An Automatic Meter Reading system was proposed in(Kaur, Mathew, Alokdeep, Kumar, 2018). which consists of an external module that reads data from existing analog energy meters without the need for the energy meters to be replaced (Ahmed, Miah, Islam, &Uddin, 2012). A WiMAX transceiver is used to send data from the meter to the server.

A system-on-a-chip (SoC) for energy monitoring and measuring with a revolutionary lowpower digital signal processor (DSP) architecture is proposed in (Wu, & Tan, 2019). The SoC based on CotexM0 can monitor electrical signals and tally both active and reactive energy. Additionally, it can monitor the grid by directly accessing and analyzing waveforms. Measuring and metering methods are implemented in a unique DSP architecture with fewer instructions. By virtue of the DSP's flexibility, the SoC can be utilized in applications with varying bandwidth and response time requirements. SoC achieves increased metering precision and reduced power usage.

WoongHee Kim et al. (2011), suggested an energy management system that uses a ZigBee wireless sensor network and an intelligent home gateway to sense, record and update electricity data in real time to enable real-time electricity consumption monitoring (Woong, Sunyoung&Jongwoon, 2011). Information collecting, information processing and information presentation are three technological components of the method. The system uses online and mobile interfaces to identify and

operate electrical appliances.

Aims and objectives

The following specific objectives support the main goal of this research study, which is to design and develop an ESP32 electric energy consumption meter.

- To calculate Root Mean Square (RMS) voltage
- To calculate Root Mean Square (RMS) Current
- To calculate the power and energy consumption of a user Load

Proposed block diagram

The building blocks of the ESP32 Electric energy consumption meter is based on the ESP 32 as a heart Microcontroller receiving sensor data from the SCT-013 current transformer and Voltage sensor and relaying it to the blynk cloud servers.

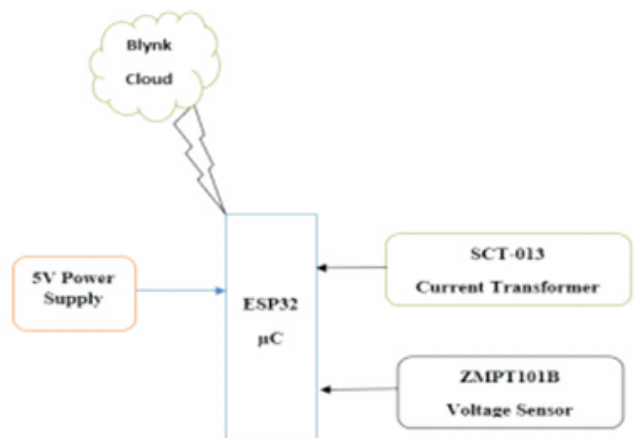


Fig 1: Block Diagram of ESP32 Electric Energy consumption Meter

Hardware equipment

SCT-013 Current Transformer

The SCT-013 is a non-invasive AC current sensor that measures up to 100 amps of AC current using a split core clamp meter sensor. Alternating current is measured by sensors called current transformers (CTs) (Abubakar, Khalid, Mustafa, Shareef, & Mustapha, 2017). They are particularly helpful for figuring out how much electricity a facility uses overall. The SCT-013

current sensors can be connected directly to the live or neutral wire, negating the need to rewire high-voltage electrical work. A current transformer is made up of a primary winding, a magnetic core and a secondary winding (Abubakar, Khalid, Mustafa, Shareef, &Mustapha, 2017). The secondary winding is contained within the transformer's casing and is made up of several twists of thin wire.



Fig 2: SC-013 Current Transformer

ZMPT101B AC Voltage Sensor

A high-precision ZMPT101B voltage transformer is the foundation of the ZMPT101B AC Single Phase voltage sensor module, which is used to detect precise AC voltage (Abubakar, Khalid, Mustafa, Shareef, &Mustapha, 2017 &Babiuch, Marek, Petr, &Pavel, 2019). With an Arduino or an ESP32, you can measure AC voltage quite effectively using this method. The analog output of the ZMPT101B sensor can be adjusted in response to the sensor's ability to measure voltage up to 250V AC. The module contains a multi-turn trim potentiometer for calibrating and adjusting the ADC output, and it is simple to use (Abubakar, Khalid, Mustafa, Shareef, &Mustapha, 2017). In the prototype, the voltage signal is being measured and sent to the ESP32 microcontroller.

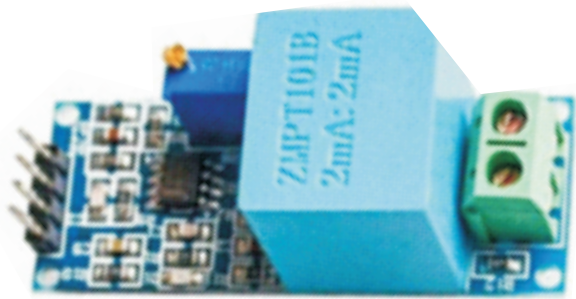


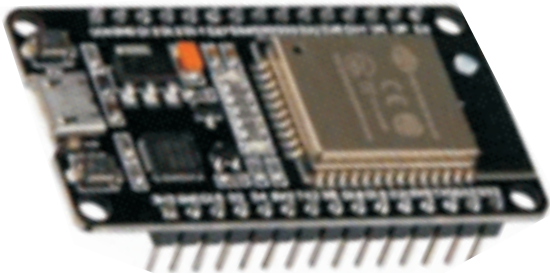
Fig 3: ZMPT101B AC Single Phase Voltage Sensor

ESP32 Microcontroller

The ESP32 family of system-on-a-chip microcontrollers are inexpensive and low-power devices that come equipped with dual-mode Bluetooth and built-in Wi-Fi (Kareem, Husam, & Dmitriy, 2021). The ESP32 series' TensilicaXtensa LX6 dual-core or single-core, TensilicaXtensa LX7 dual-core, or Tensilica RISC-V single-core microprocessors have integrated antenna switches, RF baluns, power amplifiers, low-noise receive amplifiers, filters and power-management modules. Espressif Systems, a Chinese business with its headquarters in Shanghai, invented and created the ESP32, which is produced by TSMC using their 40nm technology. (Fezari, Mohamed, & Ali, 2018). The ESP 32 microcontroller is the prototype's brains.

Specifications	ESP32
Operating Voltage	2.2 – 3.6V
GPIO	36 Ports
ADC	14 Ports
DAC	2 Ports
Flash Memory	16Mbyte
SRAM	250 Kbyte
Clock Speed	Up to 240 MHz
WI-FI	2.4 GHz
Sleep Current	2.5 μ A

Table 1: Specifications for ESP32 Microcontroller



16X2 I2C LCD Display

This LCD display screen has an I2C interface and a 16x2 resolution. It can show two lines of 16x2 characters on a blue backdrop (Kabir, Mohsin, & Khan, 2017). This I2C 16x2 Arduino LCD Screen uses the I2C communication interface. The LCD display only needs four pins: VCC, GND, SDA, and SCL. It will spare at least four digital/analog pins on the Arduino. The connectors are all XH 2.54 compliant (Breadboard type). The jumper wire allows direct connection.



Fig 5: 16X2 I2C LCD Display

Software requirements

Arduino IDE

It is open source Arduino software that allows you to build and test instructions that compose a program or a sketch for Arduino boards (Putra, & Kanigoro, 2015). It facilitates the writing of code. It's simple to use and allows you to upload sketches to the microcontroller boards. It is compatible with Windows, Linux, and Mac OS X (Putra, & Kanigoro, 2015). Before designing the programming for the ESP32, various considerations were considered in this study. To begin, the ESP32 package has been added to the IDE. Secondly, an EmonLib and Blynk libraries has been added.

EmonLib Library

The Emonlib Library is utilized by Electricity Energy Meter. Every 5 or 10 seconds, EmonLib, a Continuous Monitoring of Electricity Energy, repeats a series of voltage and current measurements (Todica, 2016). The voltage and current input channels are continuously measured in the background by EmonLib, which then determines a real average value for each channel and notifies the sketch when the measurements are ready to be read and processed.

Blynk libraries

The most popular Internet of Things platform, Blynk, allows you to scale up your deployed products, connect any device to the cloud and create apps to control it (Abubakar, Khalid, Mustafa, Shareef&Mustapha, 2017). More than 400 hardware models, including Arduino, ESP8266 and ESP32, can be connected to the Blynk Cloud using the Blynk Library. Users can control any IoT-based application using the Blynk application, which is available for both Android and iOS mobile devices. It enables users to create their own custom graphical user interface for an IoT application. The Blynk

application will display data from IoT electric energy consumption meters in the prototype (Abubakar, Khalid, Mustafa, Shareef&Mustapha, 2017).

Technological description

Circuit Schematic Diagram

The circuit schematic diagram's link is simple to understand. Both the SCT-013 Current Transformer and the ZMPT101B Voltage Sensor VCC are connected to the ESP32's 5V supply, Vin. The ESP32's GND is connected to the GND pins of both modules. The ESP32's GPIO35 is connected to the analog output pin of the ZMPT101B Voltage Sensor. The analog output pin of the SCT-013 Current Sensor is connected to ESP32's GPIO 34 in a similar manner. The voltage divider and filter circuit consist of a 10uF capacitor, two 10K resistors, one 100-ohm resistor, and two 10K resistors. The input AC terminal of the voltage sensor is wired with the AC wires that need to be measured for current and voltage. The current sensor clip is similarly unconnected, with only a single live or neutral wire is put within the clip as illustrated in figure 6 (Abubakar, Khalid, Mustafa, Shareef & Mustapha, 2017).

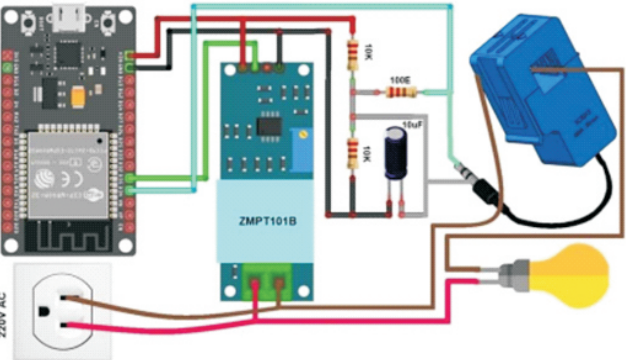


Fig 6: Circuit Schematic Diagram of Electric Energy Meter

Experimental Results

The operation of the created ESP32 electric energy consumption meter in this section. The user-interface dashboard is displayed in Figure 9; the web dashboard of the sensor node was used as an example. Blynk app was used to generate the

dashboards. The dashboard is made up of gauges that show the RMS voltage, current and power utilized as well as energy consumed. The 16X2 LCD displays how the measured energy data changes over time. The sensor data was gathered and transferred to the blynk server from the energy sensor

Implementation Results

The implemented prototype outlines the Vrms to 246.82 V and Irms to 0.0067A displayed on the 16x2 LCD display. The energy profile of the light bulb was effectively captured in the energy monitoring system, as shown in Figure 7. It devoured, according to the widgets. As a result, this type of power and energy consumption exists. Tracking can be a highly valuable technique for determining the power and energy of a system in companies and households, consumption patterns of appliances or electrical machinery are studied and analyzed for decision making.

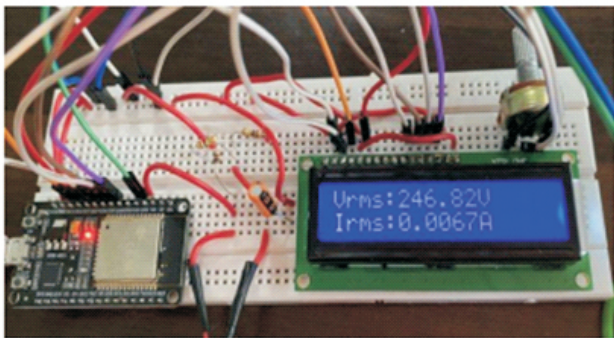


Fig 7: Electric energy consumption displaying RMS Voltage and Current

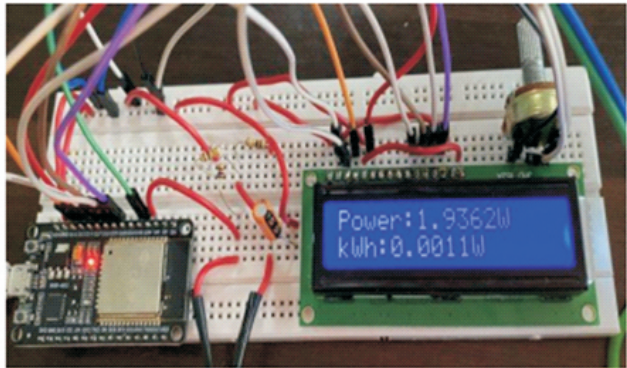


Fig 8: Electric energy consumption displaying Power usage

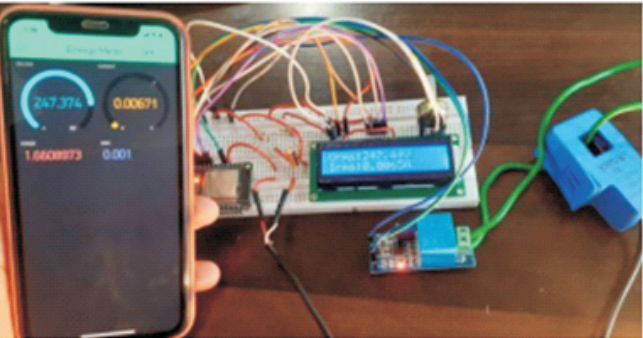


Fig 9: Electric energy consumption with Blynk App on smartphone

Serial Monitor Results

The sensor data comprising of Vrms, Irms, Power and Energy consumption can be observed on Serial Monitor COM port 4 as from the ESP32 electric energy consumption meter using the baud rate of 9600.

```
13:30:47.288 -> [761] Connecting to blynk-cloud.com:80
13:30:47.527 -> [1135] Ready (ping: 101ms).
13:30:54.833 -> Vrms: 246.81V Irms: 1.0380A Power: 306.0986W kWh: 0.00072kWh
13:31:02.193 -> Vrms: 249.25V Irms: 0.0129A Power: 3.2253W kWh: 0.00072kWh
13:31:09.519 -> Vrms: 248.00V Irms: 0.0133A Power: 3.3038W kWh: 0.00072kWh
13:31:16.735 -> Vrms: 247.75V Irms: 0.0139A Power: 3.4362W kWh: 0.00073kWh
13:31:26.020 -> Vrms: 249.12V Irms: 0.0150A Power: 3.7301W kWh: 0.00073kWh
13:31:33.454 -> Vrms: 246.79V Irms: 0.0140A Power: 3.4498W kWh: 0.00073kWh
13:31:40.740 -> Vrms: 247.83V Irms: 0.0124A Power: 3.0808W kWh: 0.00073kWh
13:31:48.172 -> Vrms: 246.56V Irms: 0.0135A Power: 3.3356W kWh: 0.00073kWh
13:31:57.359 -> Vrms: 247.34V Irms: 0.0140A Power: 3.4651W kWh: 0.00074kWh
13:32:04.650 -> Vrms: 251.55V Irms: 0.0172A Power: 4.3377W kWh: 0.00074kWh
```

Fig 10: Serial Monitor Results

Business benefits

The business benefits of employing smart energy meters to the homes and businesses are quite vast. Esp32 electric energy consumption meters are connected to the blynk cloud system and take automatic readings of your company's energy consumption. This eliminates the need to manually take and submit readings(Govindarajan, Meikandasivam & Vijayakumar, 2019). The electric energy consumption process is fully automated, which saves time for households as well as industrial processes.

Households, factories and business entities may have a better understanding of their energy usage and track usage patterns with ESP32 electric energy consumption meters. This enables users to gain a better understanding of their electric energy usage and take the appropriate actions to achieve their objectives and also be able to connect whether those objectives are related to boosting energy efficiency or lowering corporate costs which in turn adds business benefits (Macheso, Sibomana & Gatare, 2021).

Conclusion

In today's smart world environment, the coexistence of many networks with different characteristics and energy efficiency is at the top of the list of hurdles to the realization of an automated ESP32 electric energy consumption meter. The architecture for the energy monitoring was outlined in this study. A monitoring system that is aware of both energy and power consumption. The proposed smart home energy monitoring system is automated. To collect sensor data and control the system, the ESP32 Microcontroller interfaced with the current transformer and voltage sensor where prototyped and the blynk cloud was used for retrieving sensor data to web clients.

The results of the experiments revealed that the designed energy monitoring system can successfully monitor voltage, current, active power, temperature and electricity consumption over time. This work could be improved in future research discover more about the energy usage profile and how to detects which appliance is in use automatically using machine learning techniques.

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The Extent of Utilization of Digital Technologies for Business Education Instructional Delivery in Colleges of Education in Anambra State

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Abstract

The purpose of the study was to examine the extent of utilization of digital technologies for business education instructional delivery in Anambra State. Two research questions and null hypotheses guided the study. Descriptive survey research design was adopted for the study. The population of the study was eighty nine (89) business educators from two Colleges of education in Anambra state. The entire population was used as sample because the population was a manageable size. A self-structured questionnaire on Utilization of Digital Technologies (QUDT) was the major instrument used for data collection. The Instrument was validated by two experts and a pilot test was used to establish the reliability of the instrument. Thus, the responses were analysed using Cronbach Alpha and 0.77 Coefficient value was obtained. Data analysis was done using descriptive statistics which comprised of mean and mean deviation whereas t- test was used to test the null hypotheses formulated at 0.05 level of significance. Findings of the study revealed that digital technologies were not adequately utilized for business education instructional delivery in colleges of education in Anambra state. The study concluded that the level of utilization of digital technologies for business education instructional delivery in colleges of education in Anambra state is not adequate for equipping students with digital skills required for employability and entrepreneurship success of business education graduates in today digital world and labour market. Based on this, it was recommended among others that colleges administrators/management should intensify efforts to procure adequate modern technological tools to enhance effective instructional delivery of business education and beef up the quality of graduates that can compete favourably with graduates from other tertiary institutions in the labour market.

Keyword: Business Education, Digital Technologies, Utilization and Instructional Delivery

Introduction

The exact conceptualization of the word business education has not been well ascertained because it is viewed from different perspectives by various authors. To some, it is designed for the training of business teachers, while to others, it is a programme designed for equipping people with saleable skills. It is agreed generally that business education is a sub-set of Vocational and Technical Education (VTE) that is geared towards the economic and technological development of the nation. As an aspect of VTE offered in colleges of education, it is designed to equip the learners with necessary knowledge, skills and attitude required to meet labour challenges either as an employer or employee. It is a programme that builds learners' confidence if properly designed and implemented. This is because it is designed for skill acquisition, knowledge and competences and which make a recipient or learner to be proficient and self reliant. Okeke (2020) asserts that, business education is a skill driven course of study which has the capacity to distinguish its recipients from among other graduates in other fields of study in the labour market. This is due to the content and design of business education programme.

The association of business education of Nigeria (ABEN) (2017) defines business education as an education that equips the students with skills necessary to perform particular functions in an office, and also provide them with the understanding and knowledge needed for conducting personal affairs and render services in the business world. This infers that the students are guided through carefully planned experiences that offer the opportunity to master the knowledge, skills competence and attitudes. Consequently, all these competencies helps the students not only to succeed in business but also to have equal opportunity to compete with their peers and succeed in life. Business education

prepares the recipients for self-reliance and empowerment. According to Abimiku and Duktur (2014), business education is an educational process which has the primary objective of preparing learners for roles in enterprises and conditions them to become self-employed, employers of labour or employees. They added that business education is an important tool needed to alleviate the increasing rate of unemployment and poverty in Nigeria today. Oriola (2016) concurs that business education is a type of training that gives occupational identity to the recipients. Accordingly, it prepares the students for entry into and advancement in business and other jobs. Students are trained in business skills and competencies that they will use in offices and business policy analysis -.

Business education according to Akinlabi (2017) is described as an education processes that is concerned with teaching the skills, attitudes and knowledge needed to succeed in a business career. He emphasized that business education involves general education, study of technologies and related sciences and the acquisition of practical skills such as entrepreneurial, data base, management information system (MIS), and other digital skills. Indeed, there is no doubt that business education as a programme of instruction should be focused on creativity, innovation, critical thinking, communication and collaboration. This is to ensure that business education students develop soft skills needed for today's work place.

The current dispensation of business education program is to ensure that the teachers/ lecturers and students have adequate knowledge of the use of online platforms and digital technologies for accessing online materials as well as other online learning. Business education is an aspect of general education that provides distinctive skills,

knowledge, aptitude and attitudes necessary for occupational competence to match the labour market situation in the country. (Ohaka&Bupo, 2019).

From the discussion so far, business education connotes an educational program that is geared towards equipping students with necessary skills and competences for successful establishment, operation and management of business ventures. Since business education equips the students with needed skills and competencies, it is very vital to say that this can only be achieved through instructional delivery by business educators. In other words, achieving the objectives of business education is dependent on how well the students are taught. Thus, instructional delivery refers to the interaction which takes place between the student, the teacher and the content which helps to bring out the knowledge and skills needed by students for learning and working together with others in a diverse society and ever changing world. Battiola (2014) describes instructional delivery as the education interaction among the two major implementers of the educational curriculum; the teacher and the students on one side, the content, the knowledge, skills and dispositions that students will need for learning and in collaborating with other students and their counter parts elsewhere. The process of instructional delivery involves an application of repertoire of instructional strategies to communicate and interact with students around academic content, and to support the students in different academic engagements. According to Okiridu and Godpower (2021), instructional delivery entails various methods and approaches that a teacher instructor or lecturer adopts to explain lessons to the students for better understanding

It is worthy to note that major activity or task of a teacher or lecturer is to deliver

instruction/lessons or lectures as the case may be. It is a complex phenomenon especially as it relates to the concept of utilization of digital technology for delivery of lesson. Consequently, the way the teacher prepares her scheme of work, and plan lesson goes a long way to determine the extent the lesson will be delivered in the classroom. Therefore, business education is expected to employ active instructional models for lesson delivery to enhance learning.

Deductively, for effective impartation or instructional delivery of business education, it is expected that the business education lecturer should build on existing knowledge, differentiate instruction and incorporate technology into lessons. This is to say that the teacher instructor should have adequate skills including digital competency to be able to manipulate and incorporate the digital technologies into delivery of lectures. This will help the students to be abreast with the use of technological tools for academic learning and for other purposes. Unfortunately, years of experience as a business education lecturer shows that most instructional delivery in the colleges of education in Nigeria is facing serious challenges due to inadequate provision and use of digital technologies (Matto & Brado, 2012).

Digital technologies in the context of this paper are those learning devices that support the digitalization of the learning experiences and facilitate online learning and improve teaching generally. According to Stockle (2012), digital technology includes all the technological tools and devices which are needed by the teacher to provide help and encouragement to the students' learning activities. They are electronic tools, devices, systems and resources such as social media, phones, online games, multimedia, computers, projectors, internet services, video conferencing, podcast, smart board, e- book, e-

library, e-presentation through power point slides, e-mail and wikis which generates and stores or process data. Onojetah (2014) states that there is a relationship between availability and utilization of digital technologies. This signifies that it is when the digital technologies are available and accessible that they can be put into use. Johnston, Kevin and Wyeth (2022) opined that digital technologies are tools, systems and devices which can create and store or process data through microprocessor which are programmed to perform various functions. According to them, such devices include personal computers and tablets, tools

like cameras, calculators and digital toys, systems such as software and apps, augmented and virtual techs like power point and less tangible forms of technology such as the internet. Indeed, it is important to note that for effective instructional delivery of business education, all or at least most of the listed digital technologies above are expected to be utilized. This is because these technologies support interactive learning, enable access to digital resources, and bridge traditional classroom limitations (Al-Saraj, 2023). In Nigeria, national educational policies emphasize the integration of information and communication technologies (ICTs) to enhance teaching and learning (Federal Ministry of Education, 2019). Despite this, studies suggest that integration in practice remains uneven, particularly in teacher training institutions (Okeke-Ezeanyanwu, Makwe, & Ezenwaji, 2025)

Utilization simply means use. It is a systematic way or process of making use of something. In this context, it is the approach to the process and use of educational resources to aid the learning process. Nwazor and Udegbonam (2016) see utilization as the part of putting digital resources that are tangible to proper use. According to

them, the term refers to the application of any tool or device to facilitate instructional delivery for better understanding and performance required. Therefore, utilization of digital technology connotes the judicious use of technological tools and resources for effective implementation of business education content. The extent to which these digital technologies are utilized cannot be easily ascertained based only on mere experiences and assumption or observation except by critically analyzing the responses that will be gathered in the course of this research study.

One constraining factor in the context of the extent of utilization of digital technology is experience and knowledge or mastery. Nwazor and Udegbonam (2016) affirmed that experience is a factor that could influence low teacher utilization of digital technologies for instructional delivery. They listed other constraining factors as; inadequate provision of digital technologies, power supply issues, obsolete digital facilities, inadequate time allocated for lectures, inadequate skilled personnel and poor infrastructures. However, researches on ICT utilization in Nigerian colleges of education highlighted infrastructure deficiencies, limited professional training, and institutional policy gaps as major constraints (Uzo-Onkonkwo, Osinuga, & Alawode, 2020). Specifically, studies in Anambra state show that although digital resources exist, their pedagogical use is limited (Nebolisa, 2024; Igboanugo, 2025). But Agbonaya and Akele (2017) maintained that business educators require proper training in order to utilize appropriately the resources available for effective instructional delivery process. According to them, there is a strong need to update their knowledge in the use of these resources of which digital technologies is part of. This is because the instructional delivery

becomes easier and learning become goal oriented as such it facilitates immediate result in the learning outcome.

It is very obvious that the instructors must possess undiluted skills in digital technologies to teach the students. This is to enable them to produce skillful, knowledgeable, competent and digital proficient business education graduates from colleges of education in Anambra state. It is against this backdrop that this research is conducted to establish the extent of utilization of digital technologies for instructional delivery of business education in Anambra state.

Statement of the problem

Business education is an educational process that equips the students with soft skills such as creative, innovative, critical thinking and digital skills for self employment and job creation. To achieve these lofty aims, digital technologies are to be adequately utilized to facilitate effective instructional delivery. Some of the digital technologies to utilize include; computers, e-library, e-books, smart or interactive boards, digital cameras and the internet. All these when used and learnt by the students will improve their proficiency in manipulative skills and can give them edge against the competition for jobs in the labour market. Better still, it will make them to become employers of labour through creative and innovative ideas of establishing their businesses on graduation.

Sadly, the extent of utilization of digital technologies by business educators for instructional delivery in colleges of education is not clearly known. This has created a gap to empirically study and ascertain the extent to which digital technologies are utilized for instructional delivery of business education in colleges of education in Anambra state. This will help the researchers to make a conclusive remark

that may enable stakeholders to take objective measures that will encourage the use of digital technologies for teaching and learning process for better empowerment and business success of the students after graduation.

The major purpose of the study is to examine the extent of utilization of digital technologies for business education instructional delivery in colleges of education in Anambra state. Specific purpose include to:

- 1. Determine the extent to which business education lecturers utilize digital technologies for instructional delivery in colleges of education in Anambra state.
- 2. Describe likely constraints to effective utilization of digital technologies by business education lecturers for instructional delivery in colleges of education in Anambra state.

Research questions

The following research questions guided the study.

- 1. To what extent do business education lecturers utilize digital technologies for instructional delivery in colleges of education in Anambra state?
- 2. What are the constraints to effective utilization of digital technologies by business education lecturers for instructional delivery in colleges of education in Anambra state?

Hypotheses

These null hypotheses were formulated and tested at 0.05 level of significance.

- 1. There is no significant difference in the mean responses of business education lecturers in colleges of education on the extent to which digital technologies are utilized for instructional delivery in colleges of

education in Anambra state.

- 2. There is no significant difference in the mean responses of business education lecturers in colleges of education on the constraints to effective utilization of digital technologies for instructional delivery in colleges of education in Anambra state.

Methodology

The study adopted descriptive research design. The population of the study was eighty-nine (89) business education lecturers from Federal College of Education Technical, Umuze and Nwafor Orizu College of Education, Nsugbe. The entire population was used as sample and studied because it was a manageable size. The instrument for data collection was a self-designed Questionnaire titled: Digital Technology Utilization Questionnaire (DTUQ). The questionnaire was structured on a four point rating scaletype with twenty-two (22) items to answer the research questions. Options for research question one was structured along VHE-4 points, High extent(HE-3), Low extent (LE-2) and Very low extent (VLE-1) while research question two followed the line of Strongly agree(SA-4 points), Agree(A-3), Disagree (D-2) and Strongly disagree(SD-1). Two experts, one in test and measurement and the other in business education from NwaforOrizu College of Education validated the instrument. Crombach Alpha reliability test was used to determine the consistency of the instrument and which yielded 0.79 to the first cluster and 0.84 for the second cluster with an overall coefficient value of 0.77. Data collected were analyzed with descriptive statistics of mean and standard deviation to answer the research questions and 2.50 was used as the benchmark for acceptance or rejection. On the other hand, t-test inferential statistics was used to test the hypotheses formulated at 0.05 level of significance.

Acceptance or rejection of the null hypotheses was dependent on whether t-calculated value is less than t-critical value or is greater than the t-critical value.

Results

Research question 1: To what extent do business education lecturers utilize digital technologies for instructional delivery in colleges of education in Anambra state?

Table 1: Mean rating and standard deviation of

S/N	Utilizationof digital technology	? fx	x	SD	Decision
1	Projection	219	2.46	0.97	LE
2	Internet service in the college	222	2.49	0.92	LE
3	Smart board used in the classroom instruction	215	2.42	1.82	LE
4	Videoconferencing	192	2.16	1.50	LE
5	Digital camera	132	1.48	1.56	LE
6	E-library in the department and the college for use by both lectures and students	222	2.49	0.92	LE
7	Scanners to aid instruction	214	2.41	1.21	LE
8	Computers	235	2.64	0.73	HE
9	Podcast for academic purpose	133	1.49	1.54	LE
10	Weblog for academic purpose	183	2.06	1.54	LE
11	Wikis for academic purpose	124	1.49	1.54	LE
12	PowerPoint slide	214	2.41	1.21	LE
Grand mean and SD		192	2.16	1.27	LE

Source: Field survey, 2025

The data presented in Table 1 above shows that items 5, 9 and 11 has mean scores and corresponding standard deviations(SD) of; 1.48 (1.56), 1.49(1.54) and 1.49(1.54) signifying very low extent of utilization of available digital technologies for instructional delivery of business education. Besides, item 8 which has mean and standard deviation of 2.64(0.73) implying that computer is used to a high extent,

all other items 1, 2, 3, 4, 6, 7, 8, 10 and 12 were utilized by business education lecturers for instructional delivery to a very low extent in colleges of education in Anambra State.

Research question 2: What are the constraints to effective utilization of digital technologies by business education lecturers for instructional delivery in colleges of Education in Anambra State?

Table 2: Mean ratings and standard deviation of the constraints to utilization of digital technologies by business education lecturers for instructional delivery in colleges of education in Anambra State.

S/N	Constraints to the use of digital technologies	? fx	x	SD	Decision
1.	Poor internet access	223	2.50	1.20	A
2.	High service cost of the ICT	259	2.91		SA
3.	Poor investment in ICT by the colleges	255	2.87	0.83	SA
4.	Poor power generation in colleges of education	255	2.87	0.83	SA
5.	Poor ICT literacy level and technical ability of business education	253	2.84	0.83	SA
6.	Low literacy level of business educators	192	2.16	1.50	D
7.	Resistance to change	259	2.91	0.81	SA
8.	Poor awareness by business educators	193	2.17	1.49	D
9.	Poor infrastructure	219	2.46	1.20	D
10.	Inability to change obsolete digital technology facilities by the colleges	210	2.36	1.21	D
	Grand Mean and SD	231	2.60	1.07	A

Source: Field survey, 2025

Table 2 above shows that the respondents strongly agreed that items 2, 3, 4. 5 and 7 were the constraints to utilization of digital technologies for instructional delivery by business education lecturers. This was seen from their mean scores that were highly above 2.50. Also, items 1 and 2

were agreed while the respondents disagreed on items 6, 8, 9, and 10 based on their mean scores and standard deviation of below 2.50

Test of Hypotheses

Hypothesis 1: There is no significant difference in the mean responses of business education lecturers in colleges of education on the extent to which digital technologies are utilized for instructional delivery in colleges of education in Anambra state.

Table 3: Summary of t-test analyses of business education lecturers on the extent to which digital technologies are utilized for instructional delivery in colleges of education in Anambra State.

Variable	N	X	DF	SD	t-cal	t-critical	Decision
FCETU	72	2.19		1.38			
			87		0.10	2.00	Accepted
NOCEN	17	2.13		1.16			

From the above table 3, the calculated t-value of 0.10 is less than the t-critical value of 2.00, and as such, the null hypothesis was upheld. This implies that there is no significant difference in the mean responses of business education lecturers in colleges of education on the extent to which digital technologies are utilized for instructional delivery in colleges of education in Anambra state.

Hypothesis 2: There is no significant difference in the mean responses of business education lecturers in colleges of education on the constraints to effective utilization of digital technologies for instructional delivery in in Anambra State.

Table 4: Summary of t-test analyses of business education lecturers on the constraints to effective utilization of digital technologies for instructional delivery in colleges of education in Anambra State.

Variable	N	X	DF	SD	t-cal	t-critical	Decision
FCETU	72	2.35		1.20			
			87		0.27	2.00	Accepted
NOCEN	17	2.31		1.18			

From the above table 4, the t-calculated of 0.27 is less than t-critical value of 2.00. Thus, the null hypotheses was upheld showing that there is no significance difference in the responses of business education lecturers in colleges of education in Anambra state on the constraint to the utilization of digital technologies for instructional delivery in colleges of education in Anambra State.

Discussion of findings

The result of data analysis as presented in table 1 revealed that computer is the only digital technology that is used to a high extent whereas wikis, digital cameras, podcast for academic purpose are still utilized to a very low extent by business education lectures for instructional delivery. Also, other digital technologies like internet services, smart board, e-library, scanners, and PowerPoint slide and so on are used to a very low extent for instructional delivery business education in the two colleges of education studied. This is in consonance with the views of Onojetah (2014) and Nebolisa (2024) that there is correlation between availability and utilization of digital technologies. This finding was also proved in table 3 where the t-test value of 0.10 was less than the critical value of 2.00 which made the researcher to accept the null hypothesis. The implication is that there is no significant difference between the responses from FCETU and NOCEN business educators in Anambra State.

In table 2, the result of the data analysis as presented showed that besides low literacy level of business education lecturers, poor awareness, poor infrastructures and inability to change obsolete digital technologies that the

respondents disagreed on, all other items listed such as: poor internet access, high cost of ICT, resistance to change and so on were strongly agreed to be constraints to the utilization of digital technologies for instructional delivery by business education lecturers. These results were also proven by the test analysis of the hypothesis tested where the null hypothesis was upheld. This was because the t- critical of 0.27 was less than t-critical of 2.00 indicating that there is no significant difference in the responses from the business education lecturers based on the constraints to utilization of digital technologies for instructional delivery of business education in the two colleges of education studied. This result is in line with the views of Nwazor and Udegbumam (2016) and Uzo-Ononkwo etal (2020). According to them, experience, power supply issues, obsolete digital facilities, inadequate time allocation for lectures, inadequate skilled personnel and poor infrastructures affect instructional delivery of business education in colleges of education.

Conclusion

The world today has gone digital compared to the past. It is important to note that the more digital a person is, the more likely it is for the person to cope with business and labour challenges. Hence, if lecturers have digital competencies, they can easily manipulate the available digital technologies for instructional delivery, because it is what one has that he will give. Therefore, the researchers conclude that the level of utilization of digital technologies for instructional delivery of business education in colleges of education in Anambra state is inadequate for equipping students for business success and meeting labour challenges on graduation.

Recommendations

Based on the findings, the researchers

recommend the following;

1. The college management should intensify efforts to procure adequate digital technologies to enhance utilization and effective instructional delivery of business education.
2. The management of colleges of education should increase organization of in depth training and skill development programmes targeted at acquiring manipulative skills by

business education lecturers in order to effectively utilize digital technologies for instructional delivery of the course contents.

3. For effective utilization of digital technologies and enhance instructional delivery of business education, the curriculum planners and school management should allocate more hours to courses that require the use of digital technologies.

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Effects of Music and Song on Early Childhood Care and Education in Onitsha North LGA of Anambra State

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Abstract

This study was designed to investigate “The effects of music and song on early childhood care and education in Onitsha North Local Government of Anambra State. Three research questions were formed to guide the study. The population of the study comprised of five hundred and sixty (560) preprimary school teachers from twenty seven (27) public preprimary schools in Onitsha North L.G.A. of Anambra State. A stratified sampling technique was used to select fifty preprimary schools in Onitsha North L.G.A. of Anambra State. From the fifty preprimary schools, six teachers were randomly selected in each. In all, 300 preprimary school teachers participated in the study. This study was a descriptive survey design. A structured questionnaire which had the reliability 0.83 after the pilot study was adopted as instrument for collection of data. Data collected were analysed using mean and standard deviation. The findings were that: Music and song are highly indispensable in early childhood care and education in Onitsha North L.G.A. of Anambra State because: They help children to speak more clearly and develop a larger vocabulary; improve children’s listening and remembering information; improve children’s social skills; among others. Recommendations were made based on the findings that rhymes and songs should be used more often in teaching the early years. Educational implications of the study as well as suggestions for further studies were also stipulated.

Keywords: Music and Song, Early Childhood, and Early Childhood Education.

Introduction

Apparently, the efficacy of music and song in early childhood care and education cannot be underrated. Music is the act of arranging sounds to produce a composition through the elements of melody, harmony, rhythm, and timbre. It is one of the universal cultural aspects of all human society (Campbell, 2013). Different styles of music may emphasize or de-emphasize certain elements. For instance, music formed with a vast range of instruments and vocal techniques ranging from singing to rapping. There are solely instruments pieces and solely vocal pieces that

combine singing and instrument.

The song is inseparable with music. Song is short lyric or narrative text set to music. The music often reproduces the mood of and lends a heightened emotional expression to the song's text, which is often a poem (Raphael, 2011). In modern usage, the term song is usually restricted to compositions for one or two voices, frequently with instrumental accompaniment. Song is the product of a trained musician and consists of melodies and accompaniments primarily of the musician's invention. It is distinguished from the folk song. This implies that a song is typical of a

musically unsophisticated culture which is originated by, and is part of the tradition of a people. A short description of the folk song is provided to indicate the background against which the more complex forms developed.

Furthermore, the art of music and song have become a long way from the primitive stage but have retained its connection with the accents of joy and sorrow, and tension. However, song and music play very significant roles in emotional management. Apart from refreshing the memory, they also provide some emotional stability (Okolo, 2016). Each of them or combination of them is capable of stimulating thinking, reflection or mediation, depending on the occasion and the mood of the entertainment. Music and song also develop the power of appreciation and expression. They are believed to stimulate wholesome character.

Music is the most imitative of arts. This implies that music disposes one to imitate different emotional dispositions. It is having a therapeutic effect. In his own view, Aristotle, a student of Plato was familiar with the custom of the Corybantics priests who employed the music of the flute to cure a person suffering from acute emotional tension. He posited that drama, music and song had cathartic value. Hence, music is important in human life.

Moreover, music and song improve the listening skill. This is because, they make fine auditory discrimination easy (Okafor, 2015). As such, the ability to differentiate instruments sounds and tonal qualities increases when music is consistently exposed to children. This is because, every song or rhyme has new vocabularies. If children get hold of the words correctly, they tend to enrich their vocabulary development considerably. It may be appreciated that a child who is handicapped by language barrier tends to

feel more at ease singing in a group. According to Alfred (2010), children enjoy singing. Intoning a relevant song at the beginning of a lesson reminds the children that a new lesson is about to begin. In taking the children outside the class for a change of environment, a song could be intoned. This puts the child in the mental frame to prepare for the new lesson or activity. It is in a way highly motivational.

On the other hand, early childhood education according to the National Policy on Education (2014), is a form of education given in educational institution to children aged between zero to five (0-5) years, prior to their entering the primary school. It includes crèche, the nursery and the kindergarten. At early stage, education starts from learning all the physical and mental activities; then comes formal learning like identifying body parts, alphabets, digits, colours and shapes. According to Piaget’s theory, early childhood learning starts with play. It is believed that children learn more effectively and gain more knowledge through play (Wenner, 2019). Thus, early childhood education plays great roles in ensuring quality performance in education. This is because, it provides a foundation on which the entire educational processes are built.

UNESCO (2019) defines early childhood as the period from birth to 8 years old. UNICEF (2017) recalls that what happens or does not happen to children in the earlier years of their lives is of critical importance, both to their immediate well-being and their future. Similarly, MoE (2018) sees early childhood as the period of child’s life from conception to age five. Nigeria’s upper limit of early childhood differs from the international one, which is eight. Early childhood is a crucial period for every child all over the world. This is the period when the child needs the cooperation and the supervision of the parents and other relatives the most (Iffat, 2013).

Most of the learning of a child’s life begins at this period. Early childhood education is the foundation of the child’s formal educational development. The quality of teaching at this stage will not only influence the child’s rate of learning, but will to a very large extent determine the quality and direction of his academic achievements and career later in life (Mezieobi, 2016). This underscores the need to make teaching and learning very interesting, stimulating and meaningful to the child. One of the ways of achieving this is through the proper utilization or assessments of teaching materials.

Early childhood Care and education (ECCE) consists of varied formal or informal initiatives required for children from birth to pre-school age to make them thrive. These activities are intended to affect developmental changes in children prior to their entry into primary school. Mitchelle (2011) describe ECCE as the foundation for a life-long education for children which provides for the physical, motor, healthy, nutritional, intellectual, aesthetic, emotional, and social development of the pre-school child. According to Mezieobi (2016), if a child’s education can provide these vital fundamental necessities, it is likely to have an important input at secondary and tertiary levels. Developmental ideologies and theories of Dewey, Piaget, Vygotsky and possible others influenced the practices of ECCE. Contextually, ECCE is the bedrock upon which excellent basic and sound education is built for children through vigorous activities that lead to mental abilities at this stage.

Maduewesi (2012) refers to early childhood care and education as the education offered to children who have not yet reached the statutory age of beginning primary school. He further maintained that it is a semi-formal education arrangement, usually outside home where by young children from about the age of 3 years are

exposed through play like activities in a group setting through mental, social, and physical learning suited to their developmental stage, until mandatory age of government approved formal schooling. Federal Republic of Nigeria (2014) refers to early child hood care and education as an education given in an educational institution to children aged 3-5 plus prior to their enrollment in the primary school. Studies have investigated the importance of music in early childhood development. Two facts that are widely accepted are that children do not express music in the same way as adult and that the years from birth to the age of six is the most important period for a child’s musical development. This is because, even the youngest toddlers receive the tones of music and unintentionally differentiate in frequency, melody and stimulation. According to Mitchelle (2011), the early years of childhood are critical to learn to unscramble the tones of music and build up a mental organization system to memorise the music. This means that, like language development, toddlers develop their musical skills through imitating and memorizing rhythms and tones of songs such as clapping to a beat and singing in tune. Without this ability, children could not be able to develop their musical skills. Music ignites all areas of child development and skills for school readiness, including intellectual, social-emotional, motor, language, and overall literacy. It helps the body and the mind work together. Exposing children to music during early development helps them learn the sounds and meanings of words. Dancing to music helps children build motor skills while allowing them to practice self-expression. For children and adults, music helps strengthen memory skills. In addition to the developmental benefits, music and song bring joy to the child.

Considering the foregoing discussions, these researchers tend to investigate the effect of music

and song on early childhood care and education in Onitsha North Local Government Area (LGA) of Anambra State.

Statement of the Problem

The objective of Early Childhood Education is to lay a sound foundation on which other levels of education thrives on. This is because the performance of pupil in primary school and beyond depends solely on the knowledge or learning acquired in early years. But for a good number of children, the transition from home to school is not cordial. For the three year old child who derives love from mother and members of the family, leaving home for the school is very painful. Also in Onitsha North L.G.A., year after year, numerous pre-primary schools produce pupils for primary schools with insignificant language development, short interest span, lack interest in teaching and learning, etcetera. Not having cordial transitional from home to school, inability to acquire language skills, listening and speaking skills or develop interest span, and the likes may be attributed to inability of the early childhood teachers and government to give attention in identifying the need for songs and music in early childhood education. It may also be attributed to the hurried way the teachers teach the early years without making it a fun using songs and music. Their inadequacies also may be blamed on the old traditional teaching methods such as repeat after me and memorization methods largely in use.

Due to the nature of children, music and songs appear to be a sine qua non in early childhood education. The researchers have decided to check if an alternative technique method such as the use of music and songs will fill the gap created by the inability of the teachers and government to give attention in identifying the needs of children in early childhood education. Observation and available literature have proven

that songs and music have been used successfully in many places in Nigeria and beyond. Therefore this research seeks to investigate the effect of music and songs on early childhood education in Onitsha North L.G.A. of Anambra State.

Research Questions

The following are the guiding research questions for the study:

- i. To what extent has music and song been indispensable in early childhood care and education in Onitsha North L.G.A. of Anambra State?
- ii. To what extent has music and song affected the development of children’s interest span?
- iii. To what extent can music and songs be promoted for the early childhood care and education in Onitsha North L.G.A. of Anambra State?

Methodology

This study is a descriptive survey research design. Survey research design is a valuable tool for assessing and collecting opinions and trends without any manipulations. Maduakonam (2014) sees survey as a form of descriptive research that is aimed at collecting large and small samples from population in order to examine the distribution incidences and interaction of educational and sociological phenomena. This design was chosen because the study elicited the respondents of teachers on the impact of music and songs on early childhood care and education in Onitsha North L.G.A. of Anambra State. The area of study is Onitsha North L.G.A. of Anambra State. The population of the study comprised of five hundred and sixty (560) preprimary school teachers from twenty seven (27) public pre-primary schools in Onitsha North L.G.A. of Anambra State (ASUBEB Statistical Unit, 2015). The sample for this study was three hundred (300) pre-primary school teachers.

An instrument entitled “music and song impacts on children’s learning scale” was used for data collection. It was designed by the researchers to illicit information from the respondents on the issues of study. The instrument has two sections, A and B. The section A comprised of the personal information of the respondents: While the section B comprised of fifteen (15) items rating the interest of the respondents on the topic of study. For the purpose of validity, the research instrument for this study was subjected to face validity to ensure it measures what was intended to measure. The researchers presented the initial draft of the instrument to the project supervisor and an expert in the area of measurement and evaluation from Nwafor Orizu College of Education, Nsugbe who made some corrections in terms of clarity, appropriateness of language and adequacy of items. Their inputs were taken into account before the final correction of the instrument was made.

The instrument used was pilot tested using test re-test. Copies of the questionnaire were administered to ten (10) pre-primary school teachers at Development Primary School, Nsugbe which was outside the sampled schools. The second set of questionnaires was administered after two weeks to the same group. The scores collected from the two tests were computed using Pearson product moment correlation co-efficient. Coefficient value stood

S/N	Item	VHE	HE	LE	VLE	Total	Σ fx	$\bar{X}$	SD	Decision
1.	Music and song from early childhood onwards help children to speak more clearly and develop a larger vocabulary	160	120	10	10	300	1030	3.43	0.71	Accepted
2	Music and song improve children’s listening and remembering information	100	140	53	7	300	933	3.11	0.77	Accepted
3.	Music and song improve children’s social skills such as taking turns, sharing ideas and values	124	136	32	8	300	976	3.25	0.75	Accepted
4.	Music and song promote children’s physical balance and development of motor skills	140	129	23	8	300	1001	3.33	0.73	Accepted
5.	Music and song assist to improve children’s language and communication	134	134	26	6	300	996	3.32	0.71	Accepted

at 0.83 which showed a very high relationship indicating that the instrument was reliable enough for the study. The questionnaire was administered by the researchers and a research assistant in each school. Three hundred (300) copies of the questionnaire were administered and collected the same day. This promoted a hundred percent returns of the questionnaires. The entire three hundred questionnaires were later returned and worked with. The data collected from the respondents were analyzed using mean and standard deviation on a four point rating scale of: Very High Extent – VHE, High Extent – HE, Low Extent – LE and Very Low Extent – VLE weighted 4, 3, 2 and 1 point respectively. Since the standard mean is 2.50, this implies that any mean response of the respondent which is up to 2.50 and above will be accepted; while any score below 2.50 will be rejected.

Results

Research Question 1: To what extent has music and song been indispensable in early childhood care and education in Onitsha North L.G.A. of Anambra State?

Table I: Mean and Standard Deviation rating the extent at which music and song have been indispensable in early childhood care and education in Onitsha North L.G.A. of Anambra State

In the Table 1, items 1-5 with the responding means and standard deviations of (3.43 & 0.71), (3.11 & 0.77), (3.25 & 0.75), (3.33 & 0.73), and (3.32 & 0.71) respectively were all accepted. This was because, they were up to and above the accepted mean level of 2.5 respectively. Therefore, the results showed that music and song are highly indispensable in early childhood care and education in Onitsha North L.G.A. of Anambra State because: They help children to speak more clearly and develop a larger vocabulary; improve children’s listening and remembering information; improve children’s

S/N	Item	VHE	HE	LE	VLE	Total	Σ fx	$\bar{X}$	SD	Decision
6	Music and song engage the brain and sustain the child’s interest	149	118	26	8	300	1006	3.35	0.75	Accepted
7.	Music and song allow children to express themselves	148	120	26	6	300	1010	3.36	0.72	Accepted
8.	Music and song contribute to child’s creativity and imagination	118	142	29	11	300	967	3.22	0.76	Accepted
9.	Music and song ignite all areas of child development and skills for school readiness	136	123	33	8	300	987	3.29	0.76	Accepted
10.	Exposing children to music and song during early development help them learn the sounds and meanings of words	129	136	27	8	300	986	3.28	0.73	Accepted

In the Table 2, items 6-10 with the responding means and standard deviations of (3.35 & 0.75), (3.36 & 0.72), (3.22 & 0.76), (3.29 & 0.76), and (3.28 & 0.73) respectively were all accepted. This was because, they are above the accepted mean level of 2.50. Therefore, the results of five items in Table II showed that music and song highly affect the development of children’s interest span through: Engaging the brain and sustain the child’s interest; allowing children to express themselves; contribute to child’s creativity and imagination; igniting all areas of child

social skills such as taking turns, sharing ideas and values; promote children’s physical balance and development of motor skills; and also improve children’s language and communication.

Research Question 2: To what extent has music and song affect the development of children’s interest span?

Table II: Mean and Standard Deviation Ratings the extent of which music and song affect the development of children’s interest span

development and skills for school readiness; and also helping them learn the sounds and meanings of words.

Research Question 3: To what extent can music and songs be promoted for the early childhood care and education in Onitsha North L.G.A. of Anambra State?

Table III: Mean and Standard deviation Ratings the extent at which music and songs could be promoted for the early childhood care and education in Onitsha North L.G.A. of Anambra State

S/N	Item	VHE	HE	LE	VLE	Total	? fx	$\bar{X}$	SD	Decision
11	Music and songs could be highly promoted by using rhymes and songs to communicate with the child	141	113	37	9	300	986	3.28	0.79	Accepted
12	Music and songs could be highly promoted by making simple instruments at home	129	132	39	8	300	974	3.24	0.77	Accepted
13	Introducing children to different kinds of music from varied backgrounds and genres can promote music and songs	136	124	27	13	300	983	3.27	0.80	Accepted
14	Having musically-inclined parents and teachers visit the service to share their talents with the children can promote music and songs	145	126	21	8	300	1008	3.36	0.72	Accepted
15	Having a variety of musical toys and instruments available to children to explore at any time can promote music and songs	111	144	37	8	300	958	3.19	0.75	Accepted

In the Table 3, items 11-15 with the responding means and standard deviations of (3.28 & 0.79), (3.24 & 0.77), (3.27 & 0.80), (3.36 & 0.72), and (3.19 & 0.75) respectively were all accepted. This was because, they are above the accepted mean level of 2.50. Therefore, the results of five items in table III showed that music and songs can be highly promoted for the early childhood care and education through: Using rhymes and songs to communicate with the child; making simple instruments at home; introducing children to different kinds of music from varied backgrounds and genres; having musically-inclined parents and teachers visit the service to share their talents with the children and by having a variety of musical toys and instruments available to children to explore at any time.

Discussion of the Findings

The findings of the study were discussed based on results of the research questions. Thus, the research question I examined the extent at which music and song have been indispensable in early childhood care and education in Onitsha North L.G.A. of Anambra State. Items 1-5 were constructed to response to this research question and data collected were all accepted. The findings revealed that music and song are highly indispensable in early childhood care and

education in Onitsha North L.G.A. of Anambra State because: They help children to speak more clearly and develop a larger vocabulary; improve children’s listening and remembering information; improve children’s social skills such as taking turns, sharing ideas and values; promote children’s physical balance and development of motor skills; and also improve children’s language and communication. The findings of the study were in agreement with that ofBrain and Creativity Institute (2015) that musical experiences in childhood can speed up the development of children’s brains in processing sound, language development, speech perception and even reading skills. Similarly, the exposure to music and song from early childhood onwards helps children to speak more clearly, develop a larger vocabulary, and strengthen social and emotional skills (Anne, 2016).

Research question II examined the extent of which music and song affect the development of children’s interest span. Items 6-10 were constructed in response to the research question for data collection which was all accepted respectively. The findings revealed that music and song highly affect the development of children’s interest span through: Engaging the

brain and sustain the child’s interest; allowing children to express themselves; contributing to child’s creativity and imagination; igniting all areas of child development and skills for school readiness; and also helping them learn the sounds and meanings of words. These findings were in agreement with the assertions of Kari (2018) who posited the benefits of music and song on child’s interest span development to include: engaging the child’s brain, helping to cultivate communication skills, allowing children to express themselves, helping to foster children’s physical skills and also contributing to child’s creativity and imagination.

Research question III examined the extent at which music and songs be promoted for the early childhood care and education in Onitsha North L.G.A. of Anambra State. The findings revealed that music and songs can be highly promoted for the early childhood care and education in Onitsha North L.G.A. of Anambra State through: Using rhymes and songs to communicate with the child; making simple instruments at home; introducing children to different kinds of music from varied backgrounds and genres; having musically-inclined parents and teachers visit the service to share their talents with the children and by having a variety of musical toys and instruments available to children to explore at any time. The findings were in agreement with that of Busy Bees Blog (2021), who posited that the ways to incorporate music and song into the children’s play to promote their education include: Being musical with the child by simple clapping a beat and singing a nursery rhyme; making simple instruments at home; Using rhymes and songs to communicate with the child among others. In the same vein, Kelley and Sutton-Smith (2012) assert that a rich musical environment at home fosters a child’s exposure to music and improves a child’s music ability. Parents develop a stronger bond to their children when they enjoy music together.

Conclusion

It was concluded in this research that:

- I. Music and song are highly indispensable in early childhood care and education in Onitsha North L.G.A. of Anambra State because: They help children to speak more clearly and develop a larger vocabulary; improve children’s listening and remembering information; improve children’s social skills such as taking turns, sharing ideas and values; promote children’s physical balance and development of motor skills; and also improve children’s language and communication.**
- ii. Music and song highly affect the development of children’s interest span through: Engaging the brain and sustain the child’s interest; allowing children to express themselves; contributing to child’s creativity and imagination igniting all areas of child development and skills for school readiness; and also helping them learn the sounds and meanings of words.**
- iii. Music and songs can be highly promoted for the early childhood care and education in Onitsha North L.G.A. of Anambra State through: Using rhymes and songs to communicate with the child; making simple instruments at home; introducing children to different kinds of music from varied backgrounds and genres; having musically-inclined parents and teachers visit the service to share their talents with the children and by having a variety of musical toys and instruments available to children to explore at any time.**

Recommendations

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

- I. Rhymes and songs should be used more often in teaching the early years. Music matters in adult, but matters more in the development**

of young children.

ii. Parents can make a huge impact by involving themselves to ensuring that quality practice happens on a regular basis. This means positively encouraging, reminding, and helping a child to stay on track, and most importantly, paying attention to what is happening at the piano or other instrument.

- iii. Children should not be discouraged when they are singing, dancing or simply listening to music as it is vital in children’s development.
- iv. Music and songs should be an important part of the curriculum of preschoolers as it helps in language and reasoning.

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Adoption of Artificial Intelligence (AI) for Bolstering Teaching and Learning of Business Education in Colleges of Education in Anambra State.

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Abstract

This study examined the adoption of Artificial Intelligence (AI) for bolstering teaching and learning of Business Education in colleges of education in Anambra State, focusing on Nwafor Orizu College of Education, Nsugbe, and Federal College of Education (Technical), Umunze. The study determined the extent to which AI tools are available and the extent to which educators adopt these tools in instructional practices. To guide the study, two research questions were formulated and two null hypotheses tested at 0.05 level of significance. A descriptive survey research design was employed, and the entire population of 70 Business Educators was studied. Data were collected using a structured questionnaire, validated by experts, and analyzed using mean, standard deviation, and independent samples t-test. Findings revealed that AI tools are moderately available, with basic tools such as plagiarism detection software, speech-to-text applications, and learning management systems being more accessible than advanced AI technologies like adaptive learning systems, AI-powered chatbots, and business simulation software. Educators reported a high level of adoption of AI for improving students' understanding, productivity, personalized learning, and assignment accuracy, though adoption of sophisticated tools remained low. Gender was found to have no significant effect on perceptions of AI availability or adoption. The study recommends targeted institutional investment, professional training, and infrastructural improvements to promote full integration of AI in teaching and learning Business Education.

Keywords: Artificial intelligence, Business Education, Colleges of Education, Adoption, Bolstering teaching, Learning.

Introduction

The global educational landscape is undergoing accelerated transformation driven by the advancement of artificial intelligence (AI) and its integration into instructional systems. Artificial intelligence refers to computational systems capable of performing tasks requiring human cognitive functions such as reasoning, learning, pattern recognition, and decision making (Russell & Norvig, 2020). In higher education, AI applications include intelligent tutoring systems, adaptive learning platforms, automated grading mechanisms, predictive analytics, and conversational agents. These technologies reshape pedagogical design, assessment processes, and learner engagement strategies.

Empirical scholarship confirms that AI integration enhances personalization of learning, improves formative assessment, and supports data-driven instructional decisions (Zawacki-Richter et al., 2019). UNESCO (2021) emphasizes that responsible AI deployment can improve teaching quality and expand equitable access to education. Consequently, AI adoption represents not merely technological enhancement, but structural transformation in knowledge delivery and management.

In Nigeria, digital transformation in education is supported by policy frameworks such as the National Policy on Information and Communication Technology in Education (Federal Ministry of Education, 2019). However, implementation across tertiary institutions remains uneven. Studies on ICT integration in Nigeria consistently report infrastructural instability, inadequate funding, and limited institutional readiness as major barriers (Aduwa-Ogiegbaen and Iyamu, 2005; Nwosu & Ugwoke, 2014). Even where policy direction exists, institutional capacity often determines practical integration outcomes.

Colleges of Education occupy a strategic position within Nigeria's educational system as teacher training institutions. Their technological orientation shapes pedagogical practices that extend across primary and secondary education. If pre-service teachers are trained within digitally enriched environments, they are more likely to replicate such practices in their professional careers. Conversely, weak technological exposure reinforces traditional instructional methods. Research on Nigerian tertiary institutions indicates that lecturer competence and institutional support significantly influence technology adoption levels (Ifinedo et al., 2020).

Business Education, by its applied nature, is inherently aligned with technological innovation. The discipline develops competencies in accounting systems, entrepreneurship, management processes, marketing analytics, and office technology. Contemporary business environments increasingly rely on enterprise software systems, automated accounting platforms, and data-driven decision tools. The World Economic Forum (2020) identifies digital literacy and analytical reasoning as core workforce competencies. It is expected that, Business Education programmes must align instructional delivery with evolving technological realities.

Artificial intelligence offers substantial pedagogical potential for Business Education. AI-enabled systems support adaptive learning, automate feedback processes, and facilitate experiential learning through business simulations (Zawacki-Richter et al., 2019). However, some studies on educational technology adoption revealed that institutional support structures, professional development opportunities, and infrastructural stability determine integration depth (Oyelere et al., 2016; Ifinedo et al., 2020). Without these

enabling conditions, technological initiatives remain superficial.

Despite growing global momentum, empirical evidence regarding AI availability and adoption within Colleges of Education in Anambra State remains limited. Given persistent infrastructural challenges reported in Nigerian institutions (Aduwa-Ogiegbaenand Iyamu, 2005), it is necessary to examine the extent to which AI tools are accessible and utilized within Business Education departments. Such examination provides evidence for institutional planning and policy refinement.

Statement of the Problem

Business Education programmes are expected to produce graduates equipped for technology-driven economic environments. Rapid transformation in business operations through automation and intelligent systems has altered required competencies. Without corresponding instructional innovation, programme relevance may decline.

Artificial intelligence offers clear pedagogical advantages, including personalized learning, automated feedback, and predictive learning analytics (Zawacki-Richter et al., 2019). Yet technology integration literature consistently demonstrates that adoption depth depends on infrastructural stability, financial investment, and educator competence (Tondeur et al., 2017). While Nigeria’s ICT policy advocates digital advancement (Federal Ministry of Education, 2019), empirical evidence regarding AI integration in Colleges of Education in Anambra State remains limited.

If AI adoption remains partial or superficial, Business Education graduates may lack exposure to intelligent systems increasingly embedded in professional environments. This gap may weaken labour market competitiveness, and

reduce institutional relevance. Consequently, systematic investigation into AI availability, adoption levels, perceived benefits, and integration challenges is necessary to guide strategic intervention.This situation raises critical concerns. Hence the investigation into the adoption of artificial intelligence in bolstering the teaching and learning of business education in colleges of education in Anambra State.

Purpose of Study

The main purpose of this study was to investigate the adoption of artificial intelligence for bolstering the teaching and learning of business education in colleges of education in Anambra state.

Specifically, the study sought to:

- 1. determine the extent to which AI tools are available for use in teaching and learning business education in colleges of education in Anambra State.
- 2. investigate the extent to which AI is adopted in the teaching and learning of business education in colleges of education in Anambra State.

Research Questions

Two research questions guided the study. They include:

- 1. What AI tools are available for use in teaching and learning of business education in colleges of education in Anambra State?
- 2. To what extent is AI being adopted in the teaching and learning of business education in colleges of education in Anambra State?

Hypothesis

Two research null hypothesis were tested at 0.05 level of significance.

- 1. There is no significant difference in the perceived availability of AI tools for use in teaching and learning Business Education in

colleges of education in Anambra State based on gender of the Business Educators

- 2. There is no significant difference in the adoption of AI tools for teaching and learning Business Education in colleges of education in Anambra State based on gender of the Business Educators.

Methodology

This study adopted a descriptive survey research design to investigate the adoption of artificial intelligence (AI) in bolstering the teaching and learning of Business Education in colleges of education in Anambra State. The design was appropriate because it allowed the researcher to gather data directly from Business Educators regarding both the availability and extent of use of AI tools in real institutional contexts. The area of the study comprised two institutions:Nwafor Orizu College of Education, Nsugbeand theFederal College of Education (Technical), Umunze, both in Anambra State. The population consisted of 70 Business Educators across the two colleges. Because the population was manageable, the entire population was studied without sampling. A structured questionnaire titled Artificial Intelligence Adoption in Business Education Questionnaire (AIABEQ) was developed by the researchers and used for data collection. The instrument was divided into two sections: Section A captured demographic information, while Section B contained items designed to address the two research questions using a four-point scale type of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). To ensure validity, the questionnaire was subjected to expert review by specialists in Business Education and Measurement & Evaluation, and their suggestions and modifications were incorporated.

The instrument’s reliability was established using theCronbach Alpha method, which

produced a correlation coefficient of 0.82, indicating high internal consistency. The questionnaire was administered personally by the researcher and trained assistants using a direct-delivery and retrieval method, ensuring maximum return. The data collected were analyzed using descriptive statistics, specifically mean and standard deviation, to answer the research questions. A decision benchmark of 2.50 was set, meaning any item with a mean of 2.50 or above was interpreted as high extent/available, while items below 2.50 were judged low extent/not available. Inferential statistics, particularly the independent samples t-test, were used to test the null hypotheses at the 0.05 level of significance to determine whether gender significantly influenced the responses of Business Educators on the availability and adoption of AI tools.

Results

Research Question 1

To what extent are AI tools available for teaching and learning Business Education in colleges of education in Anambra State?

Table 1: Mean scores on the AI tools available for teaching and learning Business Education in colleges of education in Anambra State

AI tools		Mean	SD	Decision
1	AI enabled LMS with analytics	2.71	0.89	High
2	Automated grading tools	2.50	0.97	High
3	AI plagiarism checkers	3.10	0.83	High
4	Chatbots/virtual assistants	2.34	0.96	Low
5	Adaptive learning systems	2.20	0.91	Low
6	AI business/accounting simulation software	2.45	0.94	Low
7	Speech to text/text to speech tools	2.76	0.87	High
8	AI data analysis tools	2.60	0.82	High
9	Internet connectivity supports AI use	2.40	0.95	Low
10	ICT infrastructure supports AI	2.69	0.88	High
Grand		2.28	0.90	Moderate

Table 1 shows moderate availability of artificial intelligence tools for teaching and learning of business education in Colleges of Education in Anambra State. Respondents show close agreement in their ratings. Some artificial intelligence tools support instructional activities in the institutions. Several advanced tools for interactive learning and simulation remain limited. This condition affects the level of integration of artificial intelligence in business education classrooms.

Research Question 2
What is the level of business educators’ adoption of artificial intelligence for bolstering the teaching and learning of business education in colleges of education in Anambra State?

Table 2
Mean ratings on the extent of business educators’ adoption of artificial intelligence in teaching and learning of business education in colleges of education in Anambra State.

S/N	AI Adoption Item	Mean (x)	SD	Decision
1	Frequent use of AI tools	2.80	0.78	High
2	AI improves understanding	3.20	0.71	High
3	Lecturers encourage AI tool	2.70	0.85	High
4	AI improves assignment accuracy	3.00	0.76	High
5	Use of AI-powered business simulations	2.40	0.90	Low
6	AI personalizes learning	3.05	0.74	High
7	Use of AI chatbots/virtual tutors	2.55	0.88	Low
8	AI enhances productivity	3.10	0.69	High
9	Confidence using AI tools	2.85	0.82	High
10	School provides AI training	2.46	0.91	Low
Grand		2.81	0.80	Low

Table 1 shows mean and standard deviation ratings on the artificial intelligence tools available for teaching and learning of business education in colleges of education in Anambra State. The grand mean score of 2.58 indicates moderate availability of artificial intelligence tools in the colleges of education. Some tools such as AI plagiarism checkers, AI enabled learning management systems, speech to text tools, and AI data analysis tools record high availability. Other tools such as chatbots, adaptive learning systems, business simulation software, and internet connectivity show low availability. This result indicates uneven distribution of AI tools across the institutions.

Test of Hypotheses
Hypothesis 1: There is no significant difference in the perceived availability of AI tools in teaching and learning Business Education in colleges of education in Anambra State based on gender of the Business Educators.

Table 3: T-test analysis of significant difference in the mean ratings of male and female business educators on the availability of AI tools in teaching and learning of business education in colleges of education in Anambra State.

Variable	N	Mean	X	SD	t-cal	df	t-critical	Decision
Male	20	2.57	0.91	0.32	68	2.00	0.75	Not
Female	50	2.61	0.89	1.18				Significant

The mean ratings indicate that male educators scored 2.57 and female educators scored 2.61 on AI tool availability, suggesting that both genders perceive the presence of AI tools in the colleges as moderate. The standard deviations (0.91 for males and 0.89 for females) show that responses were fairly consistent within each gender group. The calculated t-value (0.32) is far below the t-critical value (2.00) at a 0.05 significance level, and the p-

value of 0.75 is much greater than 0.05. This indicates that the observed difference in means between male and female educators is not statistically significant. Therefore, the null hypothesis (H0) is accepted, implying that gender does not influence perceptions of AI tool availability.

Hypothesis 2: There is no significant difference in the adoption of AI in teaching and learning Business Education in colleges of education in Anambra State based on gender of the Business Educators.

Table 3: T-test analysis of significant difference in the mean ratings of male and female business educators on the adoption of AI in teaching and learning of business education in colleges of education in Anambra State.

Variable	N	Mean	X	SD	t-cal	df	t-critical	Decision
Male	20	2.79	0.83	0.21	68	2.00	0.75	Not
Female	50	2.82	0.81	1.18				Significant

The mean adoption scores showed that male educators rated AI adoption at 2.79, while female educators rated it slightly higher at 2.82, indicating a high overall adoption of AI tools among both groups. Standard deviations of 0.83 (male) and 0.81 (female) suggest moderate variation in responses, meaning most educators adopt AI tools. The t-calculated value of 0.21 is below the t-critical value of 2.00, and the p-value of 0.83 exceeds 0.05. This demonstrates that the difference in adoption levels between male and female educators is not statistically significant. Consequently, the null hypothesis is accepted, meaning that gender does not significantly affect the extent to which AI is adopted in teaching and learning Business Education.

Discussion of the findings
The findings of the study revealed moderate

availability of artificial intelligence tools in Colleges of Education in Anambra State. Basic AI supported technologies are more available than advanced intelligent systems such as adaptive learning platforms and AI powered simulation tools. This pattern reflects the gradual integration of digital technologies in Nigerian tertiary institutions due to infrastructural limitations, financial constraints, and technical skill requirements.

The study also revealed a high level of adoption of artificial intelligence tools among Business Educators for instructional support activities. Educators use available AI tools to improve understanding of course content, enhance instructional productivity, and improve the accuracy of students’ assignments. AI tools which support routine academic tasks show higher levels of adoption than complex systems which require advanced digital competence.

The findings further revealed lower adoption of advanced AI technologies which require specialized training and institutional support. Limited professional development opportunities reduce educators’ confidence in integrating sophisticated AI tools into instructional practice. The study also found no significant gender difference in the perception of availability and adoption of artificial intelligence tools among Business Educators. Overall, the findings indicate gradual progress toward artificial intelligence integration in Colleges of Education in Anambra State. Institutional limitations such as inadequate infrastructure and insufficient training continue to influence the extent of AI integration in teaching and learning.

Conclusion
The study determined the adoption of AI in bolstering teaching and learning of business education in colleges of education in Anambra State. It was revealed that AI tools are

moderately available in the colleges studied. Basic tools, such as plagiarism detection software and learning management systems, are more accessible, while advanced tools like adaptive learning systems, AI chatbots, and business simulation software remain limited. The study also shows that Business Educators are generally making good use of AI tools in their teaching and learning. They particularly use these tools to improve students' understanding, enhance productivity, and provide personalized learning experiences. Gender does not appear to influence either the perception of AI tool availability or the adoption of AI in teaching, indicating that both male and female educators are equally engaged with AI technologies. Despite the positive adoption of AI, challenges such as limited institutional support, insufficient infrastructure, and lack of adequate training restrict the full integration and effective use of these tools in teaching and learning.

As AI is being increasingly used to support Business Education, there is still a need for greater access to advanced tools and stronger institutional support to fully maximize its potential.

Recommendations
Based on the findings, the following recommendations were made:

1. Colleges of Education should prioritize the acquisition of advanced AI tools such as adaptive learning systems, AI-powered chatbots, and business simulation software to improve teaching and learning outcomes in Business Education.
2. Continuous training programs, workshops, seminars, and certification courses in AI-based teaching should be organized for educators to enhance their digital competence and confidence in using AI tools effectively.
3. Colleges should invest in reliable ICT infrastructure, including high-speed internet, hardware, and software support, to facilitate smooth access and use of AI tools by educators and students.
4. Institutional policies should promote the integration of AI in curriculum delivery, including incentives for educators who effectively adopt AI tools in their teaching practices.
5. Since gender does not affect adoption or perception, training and access programs should target all educators equally, ensuring a unified approach to AI adoption across the institution.
6. Colleges should establish mechanisms to monitor and evaluate AI adoption, ensuring that available tools are fully utilized and gaps in access or competence are addressed proactively.

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The Roles of Stakeholders in Enhancing Information and Communications Technology (ICT) use for Health Education in Secondary Schools in Anambra State

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Abstract

This paper identified some roles of stakeholders (governments, private sectors organizations, ministries, principals, teachers, parents, communities and teacher education institutions) in enhancing ICT use in teaching and learning of health education in secondary schools in Anambra State. The study which was guided by two research questions, was a descriptive survey. Sample included 142 principals, 171 health education teachers and 12 lecturers in health education selected through proportionate stratified sampling method. A 20-item questionnaire was used to collect data, while mean scores were used for data analysis. Findings indicated that the stakeholders have roles to play in providing ICT infrastructure and training for secondary school health education teachers. Recommendations made include that the Ministry of Education should partner with the GSM and ICT providers, teacher education institutions, Nigerian Educational Research and Development Council and other private sector bodies to provide ICT infrastructure and training for secondary school health education teachers towards enhancing ICT use in the secondary schools.

Key words: Stakeholders, Information, Communication, Technology, Health Education, Anambra State.

Introduction

The importance of Information and Communication Technology in education makes it a topic for continuing research. As ICT evolves to emphasize more automated computers, Internet, cell phones, interactive multi-media,

and digital facilities for schools, efforts devoted to making secondary school curriculum ICT-driven will become increasingly important. ICT use has become an important part of school health education curricula across several counties (Day, Harris, Hadfield, Tolley, &

Beresford, 2020). This is particularly important when Health Education is recognized as a combination of learning experiences designed to facilitate voluntary adaptations of behaviour conducive to health. Kayode & Kayode (2023) viewed Health Education as people's orientation towards healthy living. Health education is the science of health behaviours, and a systematic programme for the development and maintenance of individual and community health. Dougherty, Knock, Sandas, & Aiken (2022) recognized that ICT use holds the promise of increased learning and productivity in the health education curriculum.

ICT use in school curriculum depends highly on the teachers who will use the ICT to teach the students. This requires that teachers have the capacity to incorporate ICT into teaching (Osadolor, 2018). Of course, having the capacity for ICT in the curriculum presupposes that it is available for students' use. Concerned with ensuring ICT availability in schools, the National Policy on Education (Federal Republic of Nigeria, 2021) stated that government shall provide facilities and infrastructures necessary for the promotion of ICT in schools. The government has gone ahead to implement this through school computer initiatives like the School Net programme (Ezekwesili, 2016). The Anambra State government had also made a key effort in this regard by providing computers to several secondary schools in the State.

One is worried that it is not enough to supply computers to schools only for the schools to fail to use them. Osadolor (2018) found that two basic challenges in non-use of ICT in secondary education are inadequate infrastructure and lack of teacher training. It is also certain that government alone cannot adequately provide the computers/ICT accessories and make them functional in schools as well. In addition to the government, the efforts of other stakeholders are

needed in providing ICT infrastructure and training for teachers (David, 2022, Egboka, 2017). These other stakeholders include private sectors organisations, ministries, principals, parents, communities and teacher education institutions teachers themselves. Studies have shown that several stakeholders contribute meaningfully to educational innovation (Silliman, Sidney & Games, 2023; David, 2022). To the best of the researchers' knowledge, no study has been published on the roles of stakeholders in enhancing ICT in secondary schools. Hence the present study.

Purpose of the Study

The major purpose of this study is to:

1. ascertain infrastructure roles stakeholders (governments, private sectors organisations, ministries, principals, teachers, parents, communities and teacher education institutions) can play towards enhancing ICT use in secondary school health education curriculum.
2. ascertain what training roles can the stakeholders can play towards enhancing ICT use in secondary school health education curriculum.

Research Questions

The study was guided by the following:

1. What infrastructure roles can stakeholders (governments, private sectors organisations, ministries, principals, teachers, parents, communities and teacher education institutions) play towards enhancing ICT use in secondary school health education curriculum?
- 2) What training roles can the stakeholders play towards enhancing ICT use in secondary school health education curriculum?

Methodology

The study was a descriptive survey carried in Anambra State, it has a population of six hundred

and fifteen (615) which comprised 261 principals and 342 health education teachers and twelve lecturers in health education who are teaching in the 261 government owned secondary schools in Anambra State. A sample of 325 respondents (142 principals, 171 health education teachers and 12 lecturers in health education).

Instrument for data collection was questionnaire of bio data in section A and stakeholders roles in ICT use in secondary schools health education in Section B. Section A had three items and section B had 20 items that were separated into two sections. Each of the section comprised 10 items on ICT facilities and health education teacher training respectively. The items were structured on a 4point likert scale of strongly agree – 4points, agree – 3points, disagree – 2points and strongly disagree – 1point.

The questionnaire was validated by two experts in health education department Nnamdi Azikiwe University Awka. Their inputs were used to develop the final draft of the questionnaire. Reliability was tested using test-retest method while the score obtained were correlated using Pearson Product Correlation Coefficient of 0.72 were obtained and considered satisfactory for the study. The questionnaire was distributed and collected on the spot. The percentage returns was 98.47 percent. Mean scores were used in answering the research questions. The acceptable level of mean score was 2.50 and above. The mean, 4,3,2 and 1 was calculated to be 2.5. Any mean score below 2.5 was taken as disagree while any mean above 2.5 was accepted as agree. Discussions, conclusion and recommendations were made.

Results
Research Question 1
What infrastructure roles can stakeholders (governments, private sectors organisations,

ministries, principals, teachers, parents, communities and teacher education institutions) play towards enhancing ICT use in secondary school health education curriculum?

Table 1: Mean ratings of stakeholders' infrastructure roles towards enhancing ICT use in secondary schools health education curriculum.

S/NItems	X P (N= 140)	X T (N= 168)	X HEL (N= 112)	Average	Decision
1.GSM providers should build and equip ICT parks or workshops in secondary schools.	3.50	4.00	3.78	3.79	Agree
2. Banks should donate and install ICT facilities to schools.	3.18	3.27	3.65	3.31	Agree
3. Communities should provide buildings for ICT in schools within their localities.	1.18	2.31	2.56	3.01	Disagree
4. Local Governments should provide Internet connectivity and electricity to schools.	3.61	3.77	4.00	1.74	Agree
5)Principals should generate funds from philanthropists and buy generators for schools.	2.48	3.83	3.61	2.92	Agree
6)The State government should engage policemen for ICT security in schools	2.68	2.63	3.73	3.80	Disagree

S/N Items	$\bar{X}$ P (N= 140)	$\bar{X}$ T (N= 168)	$\bar{X}$ HEL (N= 112)	Average	Decision
7)Communities should mobilise vigilante groups for school ICT security.	1.11	2.10	2.00	1.74	Agree
8)PTA should engage provide burglary proofs to safeguard ICT facilities in schools.	2.63	2.81	3.33	3.76	Agree
9)Teacher education institutions should develop ICT software in various subject areas for use in secondary schools.	3.73	3.81	3.87	3.37	Agree
10)Communities should refurbish/maintain buildings for ICT in schools.	3.00	2.93	3.53	2.02	Agree

Where:
P = Principal T = Teacher
HEL = Health Educators Lecturers

Only items 3 and 7 scored average means below 2.50. This indicates that that statements in these items were not accepted. The remaining 7 items scored above 2.50 indicating the respondents' agreement that the stakeholders could play the stated roles in enhancing ICT use in secondary school health education curriculum.

Research Question 2: What training roles can the stakeholders play towards enhancing ICT use in secondary school health education curriculum?

Table 2: Mean ratings of stakeholders' training roles towards enhancing ICT use in secondary schools curriculum.

S/N Items	$\bar{X}$ P (N= 140)	$\bar{X}$ T (N= 168)	$\bar{X}$ HEL (N= 112)	Average	Decision
11.Principals should sponsor heads of health education so that they in turn can train other teachers.	1.74	1.65	1.61	1.67	Disagree
12.Government should provide free and compulsory training on ICT-assisted instruction for the health education teachers.	3.46	3.87	3.52	3.62	Agree
13.The Federal Ministry of Education should design and introduce ICT Training Kits (containing ICT training manuals, illustrations and basic tips for ICT assisted instruction) for the teachers.	3.45	4.00	3.93	3.79	Agree
14.The National union of Teachers should partner with private bodies and provide ICT training for their members.	4.00	4.00	4.00	4.00	Agree
15.Special ICT training funds should be provided to principals for in-school ICT training for teachers.	4.00	4.00	4.00	4.00	Agree
16.Non-government Organizations should training teachers within their	3.51	3.44	3.72	3.56	Agree

S/N	Items	$\bar{X}$ P (N=140)	$\bar{X}$ T (N=168)	$\bar{X}$ HEL (N=112)	Average	Decision
	communities on ICT enhanced instruction.					
17.	ICT literate teachers should collaborative and mentor non-ICT literate teachers.	3.24	4.00	3.78	3.67	Agree
18.	Teacher education institutions should design and teach courses on ICT-assisted instruction for pre-service and in-service teachers.	3.78	4.00	4.00	3.93	Agree
19.	GSM providers, Hanks and industrialists should partner with schools and engage consultants to train teachers of ICT.	3.77	3.95	4.00	3.91	Agree
20.	Teachers should use self efforts and (rain themselves on the use of ICT in teaching.	1.00	1.30	2.30	1.53	Disagree
Where: P = Principal T = Teacher HEL = Health Educators Lecturers						

Only items 11 and 20 got mean rating below 2.50 showing that the respondents disagreed with these items. The rest of the items had mean above 2.50 indicating that the statements listed in the items depict the role which stakeholders could play to enhance ICT use in secondary schools.

Discussion of Findings
 This study has identified how various stakeholders can contribute in providing ICT infrastructure for ICT use in secondary schools

health education curriculum. This indicates that the respondents appreciate the fact that government alone cannot ensure functional ICT use in the schools. Hence, private sectors, ministries, principals, teachers, parents, communities and education institutions have to complement government efforts in enhancing ICT use in secondary schools. This finding is in line with that of David (2022) that public-private partnership is a viable tool for enhancing innovations in education. However, the respondents did not agree that communities should provide buildings for ICT in schools within their localities. This might be because they felt that the communities built many of the schools in the first place. Hence, requesting them to build more for ICT might be burdensome. Rather, they agreed that the communities should refurbish and maintain buildings for ICT. Moreover, the respondents disagreed that communities should mobilise vigilante groups for school ICT security. This might be because the vigilantes are often unauthorised ways of checking security and could be abused (Onuselogu, 2018). Rather they agreed that government should engage policemen. One might wish to add that the policemen need not be accommodated in the school compounds but they could patrol, engage in shift duties or even have police stations close to schools.

In addition, some ways though which the stakeholders can facilitate teacher training for ICT use in secondary schools health education were identified. The findings revealed what various stakeholders- Principals, Federal and State governments, government educational agencies, Ministry of Education, State Education Commission, principals, private sector and teachers themselves could do to prompt and sustain ICT training of teachers. Such training for health education teachers no doubt is likely to provide the teachers with the knowledge that

they need to use ICT in the classrooms. Osadalor (2018) similarly found that that the stakeholders have enormous roles to play in ICT training for teachers.

The findings point at the need to harness the potentialities of the private sector for enhancing ICT use in secondary schools health education curriculum. This is particularly important because Egboka (2017) found that corporations and banks in particular are making quite insignificant contributions to assist educational management and in the context of this study ICT. Such stakeholder participation needs to be mobilized as was initiated in the reform initiatives such as Adopt-A-School, Community Accountability and Transparency Initiative (CATI) and Public Private Partnership (PPP) Ezekwesili (2016). Hopefully, such initiatives would be clearly, transparently and justifiably implemented towards stakeholder participation in enhancing ICT use in schools.

Recommendations
 Based on the findings, the following recommendations are made:

1. Relevant stakeholders (companies, GSM providers, banks, PTA, communities, philanthropists, associations, and industries) should be mobilized by schools, government and government agencies to play the identified roles for enhancing ICT use in secondary schools health education in Anambra State.

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2. The Federal Ministry of Education should design and introduce free ICT Teaching Kits (containing ICT training manuals, illustrations and basic tips for ICT assisted instruction) not just health education teachers but for all the teachers.
3. The Ministry of Education should form strategic alliances with stakeholders such as the teacher education institutions, the Nigerian Educational Research and Development Council, and private bodies for ICT training of the health education teachers.
4. Health education teachers should adopt the mentoring approach to train one another on ICT applications in curriculum.

Conclusion
 The need for collaborative efforts of stakeholders in enhancing ICT use in secondary schools health education curriculum is quite critical. Problems of ICT infrastructure and teacher training impede ICT use in secondary schools and require that both government and the private sector must work together to address them. This paper has identified the various roles which stakeholders can play in enhancing ICT use in secondary schools health education. Involvement of various stakeholders supports the vision of a new collaboration for teaching and learning with ICT in line with educational reforms- That vision calls for harnessing the collective efforts of the stakeholders in the education system in nurturing excellence in the use of ICT in secondary schools health education.

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Effect of STEM-Based Physical and Health Education Learning Model on Physical and Health Fitness of Junior Secondary School Students in Anambra East LGA; Anambra State

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Abstract

This study calibrated and developed a valid, practical, and effective STEM (Science, Technology, Engineering, and Mathematics) -based physical education learning model to improve the physical fitness of junior secondary school students in Anambra East LGA, Anambra State. The calibrated model was adopted from Plomp and Nieveen (2019). This model consists of three stages, namely (i) preliminary research, (ii) prototyping phase, (iii) assessment phase. The study population were junior secondary students in Anambra East LGA. The research sampled 62 lower junior, secondary school students in Anambra East LGA, The study used a mixed, research method for data gathering. Data analysis was carried out using descriptive statistics. Results from the study findings depict that STEM-Based physical education learning model has significantly improved the physical fitness of junior secondary school students with a valid category of 3.94%, practical with a positive category with a value of 3.62% and effective with an average increase in the physical fitness component of 3.18%. Therefore, this study concluded that there is a positive association between STEM-Based physical education learning model and the physical fitness of junior secondary students in the study location. Following the results from the survey findings, it is recommended that government at all levels, stakeholders in private sector and NGOs should organize workshops for physical and health education teachers to use this model as an alternative in improving the physical and health fitness of junior secondary school students in order to improve the students upskills in STEM-based subjects.

Keywords: *STEM-Based Learning Model, Plomp and Nieveen Model, Physical and Health Education*

Introduction

The 21st century educational paradigm requires a different learning approach to be applied by placing students at the center with a curriculum, teaching and assessment that helps students

engage in learning and develop analytical, collaborative and communication skills (Guzey, Moore, & Moreno, 2021). Students in Junior Secondary School are in the age range of 11-13 years which is a time when a child experiences

many changes, both physically and psychologically. The characteristics are the development of self-concept, egocentric, curiosity, imagination, feeling, internal control, thinking, language skills, behavior and learning environment (Hermahayu, Wimbaili, Paramastri, & Lumintuarso, 2019).

When children enter formal school, they will be faced with the context of the physical environment, processes, types of interactions, social groups and even rules, which are different from their previous experiences (Ladd, Herald, & Koche-1, 2018). Through learning, Physical and Health education in schools has an effect on several aspects of life, including being able to support students' abilities in various things, - for example in learning several branches of sports, and encouraging students to be independent, so they can solve all the problems they face (Dharmawan & Priyono, 2020). Based on the situation in the field at the time of learning, most students just sit in class because they are not interested in physical learning and health itself. Another problem is that students who participate in class at the beginning and in the middle of learning lose interest, after that they just sit in class and become indifferent to class activities. Various teaching methods have been applied to solve problems related to teacher-directed learning. One of them is by using the STEM approach. STEM is part of a learning approach that develops pupil's creativity and focuses on collaboration, creativity, verbal and non-verbal communication, problem solving and critical thinking. Pupil's learning activities in junior secondary schools through STEM include play activities, where pupils are given the opportunity to freely explore their abilities (DeJarnette, 2018).

Teachers can encourage exploration of STEM during play and social interactions. Through this

learning approach, children are taught not only smart in academic aspects but also in social and emotional aspects (Tabiin, 2020). The characteristic of the STEM approach is that it emphasizes teaching a subject by grafting five disciplines in an integrated-planned manner (Al-Iiaj Bedar & Al-Shboul, 2020). Applying the STEM approach in the Physical Education learning process in elementary schools is expected to develop students' physical fitness. The purpose of this study is to produce a valid, practical, and effective STEM-based physical and health education learning model to improve the physical fitness of junior secondary school students in Anambra East. Therefore, it is based on this premises, that this study seeks-provide answer to the research question below:

Research Question

What is the effect of the STEM-based physical and health education learning model on improving the physical fitness of junior secondary school students in Anambra East LGA Anambra State?

Literature Review

Junior School Education is a coaching effort aimed at pupils through the provision of educational stimuli to help physical and spiritual growth and development so that children have readiness to enter further education. Munawar, et al (2019), opined that golden age, namely the growth and development of a child needs the light stimuli to /; achieve perfect maturity. Physical fitness in primary school settings is very important in reducing the health risks associated with obese and overweight children (Eamitale & Gbenga, 2019). The development of a child from the very beginning largely depends on the quality of the expressed movements. Children love to play and move freely without any obstacles. When children are allowed to move freely, the child's cognitive and affective

domains will increase greatly (Boreham & Riddoch, 2021). Getting involved in sporting activities is their only way of exploring, experimenting, and discovering the countless wonders of life. Exercise is also part of the method that contributes to a good quality of life. Sports can help students to increase social bonds and improve student personality characteristics (Kurniawan. Setiawan, Rozi, Rahman, & Shidiq, 2021).

One of the sports that can be applied to pupils at the lower junior secondary school, especially students in elementary schools, is playing. Playing is a very fun activity for children. By playing, children will learn various things that: happen around them (Felfe, Lechner, & Steinmayr, 2023). Children play is very fun, because they can express various feelings and ideas that they are thinking (Felie et al., 2023). In the usual learning process, children will feel bored with learning than just sits and do what the teacher tells them to do. Early childhood plays an important role in the growth and development of children. During this period, children experience many significant changes, such as posture, brain, language skills, motor skills, and emotions. A child's brain develops up to 75% of an adult's brain, by 3 years of age and up to 90% by 6 years of age (Zeng, Ayyub, Sun, Wen, Xiang, & Gao, 2018). In addition, myelin development is mostly completed at the end of childhood which makes the transmission of nerve impulses faster. This process allows children to respond to stimuli better than before, because early childhood conditions are the best period to provide various skills and exercises to children (Jones, Riethmuller, Hesketh, Trezise, Batterham, & Okely, 2022).

The term STEM emerged in the 2001 by the National Science Foundation (NSF) in the United States. STEM is considered a supportive

approach that emphasizes a multidisciplinary approach aimed at preparing students to compete in the global economy (Dare, Ellis, & Roehrig, 2018). Teaching and learning activities must be able to equip students with life skills that are in accordance with the environment and students' needs (Artobatama, 2019). The learning process in STEM has four disciplines, (Matsuura, & Nakamura, 2021) namely: a) Science; is a lesson that relates to the natural sciences, b) Technology; which relates technology to science which is usually associated with today's modern technology, c) Engineering; It operates or designs with correct procedures that can solve problems and benefit humans, d) Mathematics; can increase innovation from technology and can produce exact language of science in science, technology and engineering.

The STEM approach is a type of collaborative learning that leads to motivation and innovation that can shape creative individuals, which not only strengthens learning./ in scientific disciplines (Wahyuningsih. Pudyaningtyas, Hafidah, Syamsuclidin,, Ninjanah, & Rasmani, 2019). The STEM approach provides opportunities for students to explore between science, technology, engineering, art, and mathematics by utilizing existing facilities in their environment. Learning using STEM aims to provide the competencies, knowledge, and interdisciplinary perspectives that students need (Ata-Aktiirk, & Demircan, 2018). The STEM approach integrates related disciplines into a single lesson allowing children to apply their theoretical knowledge into practice, products and innovative inventions (Corlu. Capraro, & Capraro, 2019). The essence of the STEM approach is interdisciplinary.

The application of STEM in physical education learning helps increase student involvement in the learning process and improve student

academic achievement.

The following are the components of STEM in their application to physical learning on physical fitness material in elementary schools: i) Science: Students learn the theoretical concepts of running, jumping and throwing in everyday life. ii) Technology: In learning with physical fitness materials students perform good running techniques, jumping techniques and throwing techniques to improve physical fitness, iii) Math: The mathematical component, in STEM-based physical learning in the physical fitness material in this activity students learn the elements of multiplication, addition and division in a sports activity that includes running, jumping and throwing. It is hoped that STEM-based physical learning in junior secondary schools can develop critical thinking, communication, collaboration, problem solving and digital literacy in students. This is in accordance with the opinion of Becker and Park (Becker& Park,2022) that by utilizing S'TTM learning, students will be better trained in terms of psychornotor, cognitive and affective.

Methodology

This research employed quantitative research method by using questionnaire in eliciting information from respondents. The study equally used qualitative research method through the application of Plom and Nieveen STEM-based learning methodology in addressing the study research question (Becker& Park,2022). This model consists of three main stages, namely preliminary research, prototyping phase, and assessment phase. The research population were the 189 junior secondary school students in Anambra East LGA, Anambra State, Nigeria. The study sampled 62 students (comprising 20 from JSS1; 21 from JSS II and 21 from JSS III). Prior to this survey, consent letters were sent to all the affected parents

through the principal & masters of the sampled Junior secondary schools and the researcher consent letters were acknowledged by concerned parents.

First, preliminary research aims to i) find out the process of implementing the learning that has been carried out so far, ii) find out the obstacles faced during the learning process, iii) find out the profile of students' physical Fitness, iv) analysis of learning support devices. After the needs analysis was carried out, it was followed by a literature study aimed at examining learning theories that support the development of STEM-based physical education learning that will be used in the learning process.

Second, the prototyping phase aims to compile, develop, and evaluate the product. Prototype I is the result of the preparation and development Of products that are equipped with learning support devices. Prototype I was evaluated by one expert in the field of education, especially in learning strategies, one expert on the material, and one practicing teacher in the field. The level of validity and category of product validation developed adopted from Supartini(Supartini, Weismann, Wijeya, & Helaluddin, 2020). The evaluation was followed by a limited trial conducted over three meetings, to identify problems that occurred during implementation. Prototype 11 is the result of a product revision from the validator and a limited trial, which will then be implemented on a large scale in the assessment phase. Third, the assessment phase aims to determine the practicality and effectiveness of the products developed.

Practical data were obtained from the consistency of learning implementation and student response questionnaires after participating in STEM-based Physical Education

learning. Effectiveness data obtained from the initial test scores and the final physical fitness test of students were analyzed using a normalized gain formula to obtain an N-ga.in score. The N-gain score category was adopted from Erna (Erna, Elfiar, & Dewi, 2021), implementation of STEM-based Physical Education learning using the pretest-post test method of the experimental group (Physical and Health Education -I-STEM) which includes aspects of physical fitness including explosive power, speed, agility, flexibility and endurance. The pretest was conducted at the first meeting to test the students' physical fitness.

Data Presentation and Discussions

The results of the study consists of data on the validity, practicality and effectiveness of STEM-based Physical Education learning, The validity data has eight aspects analyzed, more detail can be seen in Table 1 below.

Table 1 is. Can be seen that the average value of learning validity is in the valid category. The second, fourth and fifth got the highest score of 4.00 with a very valid category. The addition, the second-high value is in the eighth aspect, and is followed by the sixth aspect. The smallest aspect in the validity test is found in the third aspect which gets a value of 3.89 with a valid category. The results obtained staled that the result can be continued to the product testing stage. Practicality data in the form of student responses to STEM-based Physical Education learning, more detail can be seen in Table 2. The results of the practicality analysis obtained that the highest aspect was in the eighth aspect, namely the applied learning could develop student discipline and confidence with a score of 3.82. The application of learning has an effect on student activity, this can be seen in the seventh aspect with the acquisition of an average score of 3.71 with a positive category. The effectiveness test

showed that the physical component of explosive power increased by 4.94%. The physical component of speed has increased by 3.14%. The physical component of flexibility increased by 1.68%, while the physical component of endurance (VO2 Max) increased by 3.07%. More details can be seen in Table 3 below.

Table 1: Validation Results of STEM-Based Physical and Health Education Learning

S/N STEM-Based PHE Learning Variables	Mean	Decision Rule
1 STEM-Based physical education Learning suitable with the needs of junior secondary schools students	3.89	Valid
2 STEM-Based physical education Learning suitable with learning materials in junior secondary schools students	4.00	Very Valid
3 Ease of acceding tools and facilities in STEM-Base Physical Education Learning	3.89	Valid
4 STEM-Based physical education Learning that was developed effectively improve the physical fitness of junior secondary schools students	4.00	Very Valid
5 STEM-Based physical education Learning suitable with Physical Education learning stages	4.00	Very Valid
6 Practically of STEM-Based physical education Learning developed in learning in junior secondary schools students	3.92	Valid
7 The STEM-Based physical education Learning that was developed is easy to operate in the field	3.81	Valid
8 The STEM-Based physical education Learning that was developed contains aspects of science, technology, art and mathematics	3.93	Valid
Mean	3.93	Valid

Source: Author's Computation

Table 2. Results of Student Responses to Learning

S/N	STEM-Based PHE Learning Variables.	Mean	Decision Rule
1	The develop learning is fun	3.52	Positive
2	learning is easy to follow	3.72	Positive
3	Learning is useful in everyday life	3.43	Positive
4	Learning is effective in improving physical fitness	3.59	Positive
5	STEM-Based physical education Learning suitable with Physical Education learning stages	3.51	Positive
6	The developed learning can increase mathematical knowledge	3.68	Positive
7	The developed learning contain elements of arts and technology	3.71	Positive
8	Learning can develop aspects of discipline and self-confidence.	3.82	Very Positive
	Mean	3.93	Valid

Source: .Author's Computation

Table 3. Results of Effectiveness Analysis

S/N	Physical Health Components	Mean score	Cate- gory	Mean score	Cate- gory	% Enhance- ment
Explosive		50.5	Poor	55.5	Fair	4.49
Speed		3.9895	Poor	3.9581	Poor	3.14
Agility		12.456	Good	12.421	Good	3.10
Flexibility		17.05	Fair	18.91	Fair	1.68
Endurance (Vol2 max		31.11	Poor	31.33	Poor	3.07

Source: .Author's Computation

Discussion

Based on the results of the analysis, it was found that STLM-based physical and health education learning had an effect on improving the physical and health fitness of junior secondary school students. STEM is very important because it can help teachers combine various disciplines. STEM can also provide learning experiences that allow children to mentally train and practice innovative building skills (Delarnette, 2018). Physical education learning based on STEM is done by students doing physical activity material using several posts. Each post students are asked to do physical activities to solve the problems given. The STEM-based physical education learning process is very beneficial for students. Students who engage in at least 60 minutes of

physical activity each day are more successful in school (Shin & Heo, 2020).

Physical education teachers who actively incorporate the STEM approach into the learning process by incorporating physical movement into integrated STEAM lessons have an impact on students' retention and understanding of science and math" concepts (Lee, 2021). Learning using STEM that utilizes the field of science outside the sports component has three components, namely goals, development, and instructional activities (Clements, Vinh, Lim, & Sarama, 2021). To achieve certain competencies in certain sports (goals), children develop through several levels of thinking, assisted by tasks and experiences of learning activities designed to build students' mentality (Van Horn, Karl in, Ramey, Aldridge, & Snyder, 2018). Pupils who are in junior secondary school will learn well if their physical needs are met and fee! comfortable in their environment (/eng et ah, 2018).

Students will learn from building an understanding of something, exploring the environment, rediscovering a concept to being able to make something valuable (Zeng el al., 2018). Therefore, students will learn through social interaction with both adults and peers in their environment (Van Horn, Karlin, Ramey, Aldridge & Snyder, 2018). Education of students in Junior Secondary School is an effort that is designed and implemented systematically to assist students in cultivating physical and mental fitness. Efforts made can be done by playing, by including traditional games in learning using the STEM approach. Traditional games for children combine cultural knowledge, values and skills. Traditional games are closely related to people's lives by using the surrounding environment (Paul & Nassis, 2019). In table 3, it can be seen that all components of the physical fitness test of

junior secondary school students have increased. This happens because the STEM approach can use a play approach for physical activities in every post activity, thus making junior secondary school students able to develop psychomotor skills, encourage collaborative learning for students, and provide social interaction so as to provide effective and permanent learning il.'gras., & Gene;. 2018; (jitay, & uilay, 2020). Physical and health Education integrated with the STEM approach will enhance the creativity, communication, and collaboration skills students need for lifelong learning (Maciomeroglu & Bulut, 2019).

Conclusion And Recommendation

This research produces a steam-based physical education learning model to improve the physical fitness of junior secondary school

students that is valid and practical. The steam-based physical and health education learning model is effective in improving the physical and health fitness of junior secondary school students. Therefore, this study concluded that there is a positive association between STEM-Based physical and health education learning model and the physical fitness of junior secondary students in the study location. Following the results from the survey findings, it is recommended that government at all levels, stakeholders in private sector and NGOs should organize workshops for physical and health education teachers to use this model as an alternative in improving the physical and health fitness of junior secondary school students in order to improve the students upskills in STEM-based subjects.

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Enhancing Entrepreneurial Capacity Among Physics Educators Through Innovative Teaching Approach

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Abstract

The rate of unemployment among graduate youths in Nigeria is a serious concern. Entrepreneurial skills are increasingly viewed as a viable solution to youth unemployment. It is essential that entrepreneurship skills be integrated into the undergraduate physics curriculum to enable students develop independence and establish their own businesses for sustainable income and self-employment. This paper examined the concepts of entrepreneurship, entrepreneurship education, and entrepreneurial skills. It further explored the role of physics graduates as entrepreneurs and identified goals that enhance entrepreneurial readiness among them. In conclusion, the paper emphasized the importance of self-employment for physics graduates and recommended that physics instruction should be delivered in a manner that equips students with technical competencies, advanced computational and analytical skills, and professional attributes such as teamwork. It is hopeful that these combined skills will position physics graduates to become effective and successful entrepreneurs.

Keywords: Physics, Physics Education, Entrepreneurship, Entrepreneurial Education and Entrepreneur Skills, Educators, Innovative, Teaching.

Introduction

Physics remains indispensable to humanity because of its significant contribution to global entrepreneurship development. Entrepreneurship serves as a major driver of national economies, fostering political stability, social progress, and economic growth. As a core science discipline, physics has contributed immensely to transportation, medicine, industry, electrification, warfare, and

entertainment, among other sectors (Obafemi, 2017). It is widely regarded as a foundational subject for achieving technological breakthroughs. Physics examines the fundamental laws of the universe, focusing on matter, energy, their structure and interactions.

Physics education cultivates precision, measurement skills, and careful observation, competencies that are valuable to students,

teachers, graduates, and society at large (Okori & Omenka 2019). Owolabi, Akintaye, and Adeyemo (2021) emphasized that the role of physics in scientific and technological advancement, which directly impacts human life, cannot be overstated. Egbo (2021) identified one of the primary goals of physics education as preparing individuals in a functional and utilitarian manner for community life, while reforming society to ensure relevance, adequacy, and global competitiveness. Physics education is therefore central to the advancement of science and technology upon which entrepreneurship development, national economic transformation, and global competitiveness depend. No society can achieve meaningful development without a strong foundation in physics, underscoring its critical importance.

In 2008, the Federal Government reviewed the physics curriculum to align with the Millennium Development Goals (MDGs) and the National Economic Empowerment and Development Strategy (NEEDS). Despite these reforms, the revised curriculum made limited impact on addressing unemployment, as the government continues to be perceived as the primary employer for a population exceeding 160 million (Utibe&Agah, 2019). The National Directorate of Employment (NDE, 2023) reported that over 200,000 graduates who completed the National Youth Service Corps (NYSC) within the last five years remain unemployed. Similarly, the National Population Commission (2023) indicated that only one out of every ten graduates in Nigeria, including physics graduates, secures employment. These statistics highlight the urgent need for instructional approaches that equip students with entrepreneurial skills to promote self-employment after graduation.

Physics has significantly contributed to knowledge creation and societal development.

Murenzi (2016) described it as an essential instrument for scientific and technological advancement and a driving force in the evolution of modern society. Validiya, cited in Amadalo, Ocholla and Memba (2022), also noted that physics plays dominant roles in technological innovation, wealth creation, health improvement, and industrialization. Given these wide-ranging applications, physics deserves a prominent position among senior secondary school subjects.

Despite its recognized importance, concerns persist regarding the practical competence of physics education graduates. Utibe and Ugah (2019) observed that many graduates appear unable to translate theoretical knowledge into practical application. This perceived deficiency in graduate quality has led some Nigerian employers to describe school leavers as unskilled and unemployable (Utibe&Agah, 2019).

In response to these challenges, this paper advocates for the development of entrepreneurial skills among physics students. It examines the concepts of entrepreneurship, entrepreneurship education, and entrepreneurial skills, as well as the role of physics graduates as entrepreneurs. It outlines goals that promote entrepreneurial readiness among physics graduates and provides recommendations aimed at enhancing the acquisition of entrepreneurial competencies necessary for sustainable self-employment and national development.

Concept of Entrepreneurship

Entrepreneurship has become a major topic of discussion in conferences, educational forums, and elite gatherings in Nigeria. This heightened attention is largely due to the increasing number of Nigerian graduates who continue to flood the labour market each year, seeking employment

primarily within government establishments. Given the persistent economic challenges and dwindling national resources in recent years, it is unrealistic to expect the government to absorb all graduates produced annually by the country’s numerous tertiary institutions. Consequently, there is an urgent need to cultivate an entrepreneurial mindset among Nigerian graduates, particularly physics graduates, so they can become “job creators” rather than “job seekers.”

The Final Report of the European Commission (2021) emphasizes the necessity for a transformation in educational approaches, advocating active learning and the provision of experiential opportunities beyond the traditional classroom setting. This underscores the need for a fundamental shift away from conventional teaching methods. Teachers play a central role in driving this transformation and must therefore be equipped to provide students with the appropriate skills, knowledge, and attitudes. By adopting innovative curricula, pedagogies, and learning environments, educators can better prepare students to acquire entrepreneurial competencies.

Entrepreneurs are generally regarded as risk-takers, innovators, creators, and individuals who establish businesses. Utibe and Agah (2019) describe entrepreneurs as people who strive to turn their dreams into reality. Alasi, Eke, Baruwa, Mesele and Rasheed (2018) identify key entrepreneurial traits such as self-confidence, a sense of ownership, effective communication skills, a passion for learning, teamwork, systematic thinking, dedication, optimism, sociability and the ability to serve as role models. Oviawe (2020) defined an entrepreneur as someone with both the willingness and the capacity to identify investment opportunities, establish enterprises, and manage them successfully. Such individuals create new

ventures, make strategic decisions, implement changes, and take calculated risks. Similarly, Agommuoh and Ogbonna (2020) explain that entrepreneurs develop new business ventures with the aim of generating income and achieving self-employment through financial risk-taking. Oviawe (2020) noted that, entrepreneurs initiate and organize enterprises with the objective of maximizing profit, while simultaneously generating employment, producing goods and services, introducing innovations, and enhancing productivity.

In essence, an entrepreneur can be described as an individual who possesses the skills, attitudes, and behaviours necessary to establish and manage a business enterprise, thereby creating employment opportunities for themselves and others. Ejilibe (2022) highlights that entrepreneurs are innovators capable of developing new technologies, products, and services, or adapting existing technologies for new purposes. Inegbenebor (2016) asserts that entrepreneurship enhances economic productivity by efficiently harnessing and utilizing available resources.

Entrepreneurship Education

Entrepreneurship education, according to Ovie (2021), refers to a form of education that provides learners with training experiences and skills suitable for entrepreneurial pursuits. Rinji (2023) asserted that, entrepreneurship education has become increasingly significant in the lives of Nigerians, as it equips individuals with the competencies required to manage business ventures effectively. It prepares learners to take calculated financial risks, while efficiently utilizing available human and material resources to achieve business objectives. It develops decision-making skills, fosters the ability to build business relationships, and enhances competencies in computation and record

keeping. Students exposed to such education tend to develop stronger entrepreneurial attitudes, which improve their prospects for employment after graduation. Ezema and Omofia (2018) also described entrepreneurship education as a process that equips individuals with the knowledge and ability to identify business opportunities, as well as the confidence, insight, and skills needed to act on them.

The implication is that entrepreneurship education prepares graduates by instilling in them practical and socially relevant knowledge and skills that promote self-reliance. In response to the high unemployment rate in Nigeria, and with the aim of creating employment opportunities for school leavers, the Nigerian educational curriculum has been revised at various stages to incorporate entrepreneurship education. This reform seeks to ensure that graduates acquire appropriate entrepreneurial skills for economic empowerment and national development.

Physics plays a vital role in achieving the broader goals of education. A proper understanding of physics concepts enhances individuals’ ability to appreciate, adapt to, and effectively interact with their environment. Such understanding contributes to improved living standards in society, which aligns with the broader objectives of entrepreneurship education. However, achieving this depends largely on how physics is taught. Physics instruction should enable students to transfer classroom knowledge and skills to new and practical situations, applying them to solve real-life problems. This practical orientation is essential if physics graduates from the Nigerian education system are to become self-reliant and innovative.

Entrepreneurship education has emerged in response to growing societal challenges. Enu (2020) argues that its curriculum must be

responsive enough to address the evident shortcomings of the current school system. Similarly, Ogunkunle (2019) noted that rapid global changes demand continuous innovation in school curricula. Entrepreneurship education is therefore designed to provide training and experiences that prepare individuals for entrepreneurial endeavors. It is also aligned with the objectives of the United Nations’ Millennium Development Goals (MDGs), which emphasize the need for school curricula to remain relevant and responsive to the present and future needs, challenges, and aspirations of learners (Emah, 2019). Igwe (2019) contends that, entrepreneurship education drives progressive, dynamic, and sustainable economies, although it requires substantial personal effort, innovation, research, and self-development. Aruma (2019) posited that, it contributes to poverty reduction, wealth creation, job generation, and enhanced local production of goods and services. Ultimately, entrepreneurship education fosters self-reliant graduates who can apply acquired skills to establish businesses and sustain themselves economically.

Given these benefits, physics education should focus on developing practical, marketable, and usable skills necessary for employment generation, wealth creation, and productivity. Ejilibe (2022) outlines several advantages of entrepreneurship education, including providing students with foundational knowledge of business operations and familiarizing them with the dynamics of the business environment, such as technological change and micro-enterprises. It also offers early opportunities for work experience, as well as earning, saving, and investing, thereby enhancing students’ self-worth and competence. It can significantly reduce unemployment rates by making self-employment and business ownership viable career options. It complements occupational awareness, job skills development,

and work experience acquisition. Therefore, the physics curriculum must be adaptable, engaging, and relevant to societal needs to ensure that graduating physics students can integrate successfully into the Nations’ economy.

Physics remains one of the most important science subjects at the secondary school level because it provides a solid foundation for further studies in physics-related disciplines at tertiary institutions, including engineering, medicine, pharmacy, and other professional fields. This importance underscores the need for physics teaching approaches that inculcate entrepreneurial and practical skills, enabling graduates to become self-employed where necessary.

Physics entrepreneurship education can thus be defined as a specialized form of education that empowers physics graduates to create employment opportunities for themselves and others. It equips them to apply physics knowledge and skills to address unemployment challenges and enhance income-generating capacity. In essence, physics entrepreneurship education integrates work-based experiences, leadership development, interpersonal competence, planning ability, financial literacy, and effective money management skills, thereby preparing graduates for sustainable economic participation.

Concept of Entrepreneur Skills

Skill refers to the ability to perform tasks competently and effectively. It is closely associated with practical know-how, while speed and accuracy are key characteristics of skilled performance (Adeyemo, 2019). Adeyemo emphasizes that the acquisition and reinforcement of skills through physics laboratory experiments and workshop practice represent natural and effective ways of

stimulating science education, and preparing learners for real-life work, ultimately leading to higher productivity. This underscores the importance of prioritizing skill development and assessment in physics teachers’ education and in-service training programmes.

Entrepreneurial skills are the competencies required for success in business ventures. They are the fundamental abilities that enable an individual to initiate, develop, finance, and sustain a business enterprise. In a country like Nigeria, where government employment opportunities are limited, it becomes essential to orient students particularly physics students towards the acquisition of entrepreneurial skills for the benefit of both the individual and society.

Entrepreneurial skill has the capacity to create something new and valuable by investing the necessary time and effort, assuming financial, psychological, and social risks, and ultimately gaining monetary rewards, personal satisfaction, and independence. (Oluremi&Agboola2021) Similarly, Adekunle and Kayode (2018) described entrepreneurial skills as the ability to undertake innovation, apply financial knowledge, and utilize business acumen to transform ideas into economic goods. In essence, entrepreneurial skills involve recognizing and exploiting environmental opportunities to create value. They can be understood as the capacity of an individual to develop ideas into enterprises not only for personal benefit, but also for social and economic development. Entrepreneurship skill education is widely regarded as a catalyst for employment generation due to its role in fostering national growth and development.

Entrepreneurial skills encompass qualities such as self-confidence, boldness, perseverance, passion, empathy, openness to expert advice, result orientation, vision, and the ability to

recognize opportunities. These skills empower individuals to manage scarce resources effectively, assume responsibility for internal operations, and drive the external growth and advancement of their enterprises (Agommuoh & Ogbonna, 2020).

The process of acquiring and developing entrepreneurial skills involves four major stages: first, objectively analyzing and identifying the current and future skill needs of the business in terms of managerial, administrative, and technical competencies; second, identifying the entrepreneur’s personal goals and evaluating their existing skills and resources in relation to those goals; third, developing a realistic personal development plan; and fourth, monitoring ongoing business performance and progress in acquiring the skills necessary for sustained success. (Pleshette, 2019)

In light of these perspectives, physics education should be delivered in a manner that intentionally cultivates entrepreneurial skills among physics students, equipping them not only with theoretical knowledge but also with the practical competencies required for innovation, self-employment and economic contribution.

Physics Graduates as an Entrepreneur

It is essential for physics teachers to adopt instructional approaches that prepare graduates not only with classroom-based competencies, but also with practical skills relevant to broader societal development. Physics graduates who aspire to become entrepreneurs must therefore acquire competencies that extend beyond theoretical knowledge to those applicable in real world contexts. According to Adeyemo (2019), this implies that for physics graduates to function successfully as entrepreneurs, they must be equipped with diverse, practical, and transferable skills that enable them to respond

effectively to societal and economic demands. The following entrepreneur skills/traits are very imperative;

- He must have requisite technical knowledge and expertise.
- He must seek out and listen to the advice of those who know the business better than him.
- He must always be ready to learn from his mistakes.
- He must have self -disciplined and must have the ability to make good and quality
- He must be hardworking, avoid distractions and have the expertise to produce the goods and services of its business.
- He must have communication, organizational, decision making, financial management, marketing and supervision skills.

Although the skills discussed above are important for successful entrepreneurship, it may be unrealistic to expect individuals to possess all of them. There are five fundamental skills that physics graduates must develop to function effectively as entrepreneurs. According to Adeyemo (2019), these core skills includes, sales and marketing, financial literacy, self-motivation, time management and administrative competence. This suggests that the understanding and acquisition of these essential entrepreneurial skills should be integral components of physics teacher education. Developing such competencies will enhance managerial capability among physics education graduates and, consequently, improve their employability and capacity for self-reliance.

Ways of Promoting Entrepreneurship Skills in Physics Graduates

Entrepreneurship skills can be promoted in physics graduates by:

- The Government employing Physics

teachers who are not only qualified and competent in the subject matter, but also have professional and potential skills and knowledge of business opportunity available in Physics. In this case, the teacher should know both the methodology and content (pedagogy) of the subject matter in order to foster effective teaching and learning.

- The school authorities organizing seminars and workshops for students where successful entrepreneurs and experts in Physics should be invited to deliver lecture on entrepreneurship to broaden the students mind.
- Schools establishing entrepreneurship clubs to promote and teach topics in Physics that create self-employment.
- Physics teachers should use appropriate teaching strategies such as field trips demonstration and inquiry in teaching entrepreneurship education so that physics students will understand the lesson very well.

Goals that Promote Entrepreneur Readiness in Physics Graduates

In 2016, the American Physical Society (APS) and American Association of Physics Teachers (AAPT) formed a Joint Task Force on Undergraduate Physics Programs to provide guidance to physics departments seeking to improve career readiness of their graduates. This Joint Task Force identified a set of learning goals which are physics-specific knowledge, scientific and technical skills, communication skills, professional and workplace skills. They suggested that Physics departments and faculty members wishing to effectively prepare graduates for success in diverse careers should take the following actions:

- Modify their programs to ensure that students have opportunities to acquire the knowledge and skills needed for the careers

that will be available to them.

- Promote a departmental and faculty culture that values non-academic careers and the students who pursue them.
- Provide mentoring and career advising to all students throughout the undergraduate program.
- Identify the types of jobs that physics graduates are currently finding, are likely to seek in the near future, or could seek if provided with appropriate preparation.
- Use the findings of this report as a guide to understanding the knowledge and skills needed to do those jobs.
- Adopt learning goals relevant to the knowledge and skills that graduates will need.
- Use the findings of this report to guide strategic planning for program improvement and enhanced student recruitment through faculty development, course modifications, changes in program requirements, and co-curricular activities that include fostering contact between students and physicists outside academia.
- Assess whether the changes made achieve the learning goals (perhaps with the assistance of external review) and use the results of the assessment to further modify and improve the program, maintaining a cycle of continuous program improvement based on experimentation and assessment.

Alasi, Eke, Baruwa, Mesele-Arokoyo, and Rasheed (2018) noted that, beyond technical competence, several additional skills are essential for enhancing the entrepreneurial readiness of physics graduates. These include the ability to work effectively in teams, apply physics concepts to real-world situations, communicate clearly in both written and spoken forms, and think critically about complex issues. They also emphasized the importance of

analyzing problems creatively in order to develop innovative and practical solutions. Considering the globalized nature of today's work environment, physics graduates must be able to apply their knowledge and skills in new and diverse contexts, use numerical and statistical tools to solve problems and communicate results effectively, uphold strong ethical standards, influence or persuade others when necessary, and plan, organize, and prioritize tasks efficiently. The implication of these competencies is that the undergraduate physics curriculum needs to be revised to equip students with the relevant knowledge, skills, and attitudes required to thrive in an era marked by high unemployment (Utibe & Ugah, 2019). Integrating professional skills such as teamwork, communication, and foundational business knowledge into the physics curriculum would significantly enhance graduates' effectiveness and success in the workplace.

Conclusion

Following the current high rate of unemployment in the country, it has become utmost important for university graduates to pursue self-employment. Entrepreneurial skills equip physics graduates with the capacity to become self-reliant and to create job opportunities not only for themselves, but also

for others. Physics undergraduates should be trained to develop independence and income-generating abilities, rather than relying solely on government employment after graduation.

Recommendations

Based on the findings, the following recommendations were made:

1. Physics teachers should teach physics for physics graduates to acquire technical skills, wider and deeper knowledge of computational analysis tools, professional skills such as teamwork, communications and basic business that will make them successful and effective entrepreneurs.
2. Government should employ qualified Physics teachers and the existing ones who have been working for years should be made to attend capacity building workshops and seminars on new development in physics and entrepreneurship skills.
3. Physics teachers should organize field trip for the students, this is to enable them get first-hand information and seeing things for themselves.
4. Physics teachers should use appropriate teaching strategies such as field trips, demonstration and inquiry in teaching entrepreneurship education so that physics students will understand the lesson very well.

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Application and Importance of Plant Growth Promoters as an Alternative for Chemical Fertilizers

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Abstract

The heavy reliance on chemical fertilizers in conventional agriculture has increased crop yields but also caused environmental degradation, soil nutrient imbalance, and health concerns. Plant growth promoters (PGPs), including microbial biofertilizers and biostimulants, have gained increased scientific attention as a sustainability alternatives capable of enhancing nutrient use efficiency, crop growth, and stress tolerance while reducing chemical inputs. This review synthesizes recent findings on the mechanisms, applications, and agronomic importance of PGPs, highlighting their potential to replace or reduce chemical fertilizers in sustainable agricultural systems.

Keywords: Fertilizers, Growth promoters, Biofertilizers, Biostimulants, Sustainability.

Introduction

The future of agriculture relies solely on achieving sustainability and maintaining long-term productivity. Sustainable food production is one of the greatest global challenges, particularly in the context of an ever-increasing human population and climate change due to various anthropogenic activities. Improving crop yield through the conventional way of using agrochemicals is a continuous challenge in agricultural production. Moreover, the extensive and non-targeted use of various agrochemicals creates a negative impact with respect to pesticide resistance, decrease in soil fertility, contamination of groundwater and crop-food,

etc. (Sustainability Special Issue, 2025).

Chemical fertilizers have traditionally been used to meet global food demand. However, their overuse has led to nutrient runoff, soil degradation, and negative environmental consequences. To address these challenges, research has increasingly focused on plant growth promoters (PGPs), which are biological or naturally derived substances that stimulate plant development through multiple mechanisms without relying solely on synthetic nutrient inputs. PGPs offer a holistic approach to crop nutrition that aligns with sustainable agriculture and climate-smart practices (Sun et al., 2024; Prisa & Jamal, 2025). Among the

various strategies used to enhance agriculture productivity, use of plant-beneficial microorganisms referred to as plant-growth-promoting rhizobacteria (PGPR) has been advocated as one of the most suitable strategies for sustaining the health of soil, crop, and the agro-ecosystem. (Sustainability Special Issue, 2025).

Agriculture plays a fundamental role in sustaining the rapidly growing global population by ensuring adequate food production and supply. Over the past several decades, the intensification of agricultural practices has largely depended on the extensive use of synthetic chemical fertilizers to enhance crop productivity and meet rising food demands. Chemical fertilizers, particularly those containing nitrogen (N), phosphorus (P), and potassium (K), have contributed significantly to the dramatic increase in crop yields witnessed during the Green Revolution. However, despite their benefits in boosting productivity, the continuous and excessive application of these fertilizers has generated numerous environmental, economic, and ecological concerns. These concerns have prompted researchers and agricultural practitioners to explore more sustainable alternatives, including plant growth promoters (PGPs), that can support crop production while minimizing environmental damage (Sun et al., 2024).

One of the most pressing challenges associated with the widespread use of chemical fertilizers is their negative impact on soil health and environmental sustainability. Excessive fertilizer application often leads to nutrient imbalances in the soil, soil acidification, and the degradation of soil structure and fertility over time. In addition, large amounts of applied fertilizers are not fully utilized by plants; instead, they are lost through leaching, volatilization, or runoff into nearby water bodies. This

phenomenon contributes to environmental issues such as eutrophication, which results from the accumulation of nutrients in aquatic ecosystems, leading to harmful algal blooms and the depletion of dissolved oxygen in water bodies (Jiang & Wang, 2024). These environmental consequences not only threaten aquatic life but also pose serious risks to human health and biodiversity.

Another major concern linked to chemical fertilizer use is the emission of greenhouse gases, particularly nitrous oxide (N₂O), which is released during nitrogen fertilizer transformation in soils. Nitrous oxide is a potent greenhouse gas with a global warming potential significantly higher than carbon dioxide. The agricultural sector is one of the primary contributors to global nitrous oxide emissions due to the heavy reliance on nitrogen based fertilizers. As climate change continues to intensify, reducing greenhouse gas emissions from agriculture has become a global priority. Consequently, alternative approaches that improve nutrient use efficiency while minimizing environmental impacts are urgently required (Sun et al., 2024).

In addition to environmental concerns, the economic burden associated with chemical fertilizers presents a significant challenge for farmers, particularly in developing countries. Many smallholder farmers struggle with the rising cost of fertilizers, which can limit their ability to maintain consistent crop productivity. This problem is particularly evident in regions such as sub-Saharan Africa, where limited access to fertilizers and declining soil fertility have contributed to reduced agricultural productivity. Therefore, there is a growing need for cost-effective and sustainable agricultural inputs that can enhance crop yields without imposing heavy financial burdens on farmers (Prisa & Jamal,

2025).

In response to these challenges, plant growth promoters have emerged as promising tools for sustainable agriculture. Plant growth promoters refer to a wide range of biological agents and organic substances that enhance plant growth, development, and productivity through various physiological and biochemical mechanisms. These promoters include plant growth-promoting rhizobacteria (PGPR), beneficial fungi such as arbuscular mycorrhizal fungi, organic biostimulants derived from natural sources, and microbial inoculants capable of improving nutrient availability in the soil. Unlike chemical fertilizers that primarily supply nutrients directly to plants, plant growth promoters function by enhancing natural biological processes that support plant growth and soil fertility (Sun et al., 2024).

Plant growth-promoting microorganisms, particularly those found in the rhizosphere- the narrow region of soil surrounding plant roots, play a critical role in plant development. These microorganisms interact closely with plant roots and can improve plant growth through several mechanisms, including biological nitrogen fixation, phosphorus solubilization, production of plant growth hormones, and suppression of plant pathogens. For instance, nitrogen-fixing bacteria convert atmospheric nitrogen into forms that plants can utilize, thereby reducing the need for synthetic nitrogen fertilizers. Similarly, phosphate-solubilizing bacteria release organic acids that convert insoluble phosphate compounds into soluble forms that plants can absorb (Prisa & Jamal, 2025).

In addition to microbial plant growth promoters, organic biostimulants derived from natural sources such as seaweed extracts, humic substances, and protein hydrolysates have gained

considerable attention in recent years. These substances are known to stimulate plant physiological processes, enhance root development, improve nutrient uptake, and increase plant tolerance to environmental stresses such as drought, salinity, and extreme temperatures. Unlike traditional fertilizers, biostimulants do not necessarily provide large quantities of nutrients but instead enhance the efficiency with which plants utilize available nutrients in the soil (Jiang & Wang, 2024).

Recent advances in agricultural biotechnology have further expanded the potential applications of plant growth promoters. Innovative formulations such as microbial consortia, nano-biofertilizers, and improved microbial inoculants are being developed to enhance the stability and effectiveness of plant growth-promoting microorganisms under field conditions. These innovations aim to overcome some of the limitations associated with conventional biofertilizers, such as inconsistent performance due to environmental variability. The integration of plant growth promoters with modern agricultural technologies offers a promising pathway toward improving crop productivity while maintaining environmental sustainability (Karunakaran et al., 2024).

The use of plant growth promoters is also consistent with the principles of sustainable and climate-smart agriculture. Sustainable agriculture emphasizes the efficient use of natural resources, conservation of biodiversity, and reduction of environmental pollution while maintaining high levels of agricultural productivity. Plant growth promoters support these objectives by improving soil microbial diversity, enhancing nutrient cycling, and reducing the need for synthetic fertilizers and pesticides. Furthermore, their ability to enhance plant resilience to environmental stresses makes

them particularly valuable in the context of climate change, where agricultural systems must adapt to increasingly unpredictable weather patterns and extreme conditions (Sun et al., 2024).

Despite the significant potential of plant growth promoters, their adoption in many agricultural systems remains limited due to several challenges. These include limited awareness among farmers, inconsistent performance under different environmental conditions, and the need for improved formulation and storage technologies. Continued research and development are therefore necessary to optimize the effectiveness of plant growth promoters and promote their widespread adoption in agricultural systems worldwide.

Given the increasing demand for sustainable agricultural practices and environmentally friendly inputs, plant growth promoters represent a promising alternative to conventional chemical fertilizers. By improving nutrient availability, enhancing plant growth, and promoting soil health, these biological and organic agents can play a crucial role in achieving long-term agricultural sustainability and food security.

This paper therefore examines the applications and importance of plant growth promoters as viable alternatives to chemical fertilizers, with particular emphasis on their mechanisms of action, methods of application, and contributions to sustainable crop production.

Specific Objectives

- 1. To identify the different types of plant growth promoters used in agriculture, including microbial inoculants, organic biostimulants, and phytohormones.
- 2. To evaluate the various methods of applying plant growth promoters in crop production, including seed treatment, soil application,

foliar spraying, and root dipping.

- 3. To assess the importance of plant growth promoters in improving soil fertility and crop productivity while reducing dependence on chemical fertilizers.
- 4. To analyze the environmental and economic benefits associated with the use of plant growth promoters in sustainable agriculture.
- 5. To highlight the challenges and future prospects of using plant growth promoters as alternatives to chemical fertilizers in modern agricultural systems.

Types and Mechanisms of Plant Growth Promoters

Microbial Growth Promoters

Plant growth-promoting rhizobacteria (PGPR) and other beneficial microbes are among the most studied PGPs. These microorganisms enhance plant growth by fixing atmospheric nitrogen, solubilizing phosphorus and micronutrients, producing phytohormones, and suppressing soil pathogens (Yang et al., 2024; Sustainability Special Issue, 2025). PGPR can directly influence plant growth by increasing the availability of essential nutrients and indirectly by enhancing stress tolerance and biocontrol capabilities (Sun et al., 2024; Prisa & Jamal, 2025).

Organic Biostimulants

Biostimulants include seaweed extracts, humic and fulvic substances, protein hydrolysates, and other organic compounds. These agents improve root architecture, nutrient uptake efficiency, and abiotic stress resilience (Jiang & Wang, 2024; Phyton 2024). Unlike fertilizers, biostimulants modulate plant physiological processes without directly supplying large quantities of nutrients, making them ideal for sustainable crop management (Phyton 2024).

Synergistic and Advanced Formulations

Recent research has explored advanced formulations such as nanoparticle-coated PGPR

biofertilizers, which enhance nutrient uptake and plant growth beyond conventional inoculants (Karunakaran et al., 2024). These innovations aim to improve the effectiveness and stability of microbial promoters under diverse field conditions.

Application Strategies

Seed and Soil Inoculation

Seed treatment with PGP inoculants enhances early root development and vigor, leading to better establishment and nutrient uptake. Soil application of biofertilizers and biostimulants improves soil microbial activity and nutrient cycling (Phyton 2024).

Foliar and Root-based Applications

Foliar application delivers biostimulants directly to plant tissues, allowing rapid absorption, especially under stress conditions. In hydroponic and soilless systems, introducing PGPR can substitute for mineral fertilizers and improve growth performance, as demonstrated in lettuce cultivation studies (Ikiz et al., 2024).

Integrated Use with Conventional Inputs

When applied in combination with reduced rates of chemical fertilizers, plant growth promoters can maintain or enhance yield while decreasing nutrient runoff and environmental impact. This integrative approach supports sustainable intensification.

Advantages over Chemical Fertilizers

Enhancing Nutrient Use Efficiency

PGPs improve nutrient acquisition and utilization, reducing dependency on synthetic fertilizers. By solubilizing phosphorus and fixing nitrogen, microbial promoters supplement essential plant nutrients naturally (Sun et al., 2024).

Environmental Benefits

Reducing chemical fertilizer use through PGP

application helps mitigate soil acidification, nutrient leaching, and greenhouse gas emissions. Biostimulants are biodegradable and environmentally benign, contributing to healthier agroecosystems (Jiang & Wang, 2024).

Crop Yield and Stress Resilience

PGPs enhance crop yields and quality by improving root growth, water uptake, and stress tolerance. Enhanced phytohormonal signaling and nutrient availability can lead to more robust plant performance under abiotic stresses such as drought and salinity.

Economic Sustainability

For smallholder farmers, especially in resource-constrained regions, plant growth promoters offer cost-effective alternatives to expensive chemical fertilizers, reducing input costs while sustaining productivity.

Challenges and future outlook

Despite widespread promise, the effectiveness of PGPs can vary across environments due to soil properties, microbial competition, and formulation stability. Future research should focus on enhancing field consistency, understanding plant - microbe interactions in complex ecosystems, and developing formulation technologies that maximize efficacy (Sustainability Special Issue, 2025).

Conclusion

Plant growth promoters present a viable and sustainable alternative to chemical fertilizers by improving nutrient use efficiency, enhancing crop resilience, and reducing environmental impacts. Advances in microbial inoculants, organic biostimulants, and innovative delivery systems underscore their critical role in future agriculture. Integrating PGPs into crop management practices aligns with global goals for sustainable food production and environmental stewardship.

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Place of Women Education in the Child's Upbringing in Aguata LGA of Anambra State

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Abstract

This study investigated the place of women education in the child's upbringing in Aguata Local Government Area, Anambra State. Three research questions and one null hypothesis guided the study. The population was three hundred and ninety (390) teachers in the thirty two (32) public nursery/primary schools in Aguata L.G.A. of Anambra State. A simple random sampling technique was used to select twenty (20) teachers each from the twelve (12) selected public nursery/primary schools in Aguata L.G.A. in Anambra State; making it a total of two hundred and forty (240) teachers on the whole. This represents 62% of the total number of teachers in the area. This study adopted a descriptive survey research design. A structured questionnaire which had the reliability of 0.83 after the pilot study was used as instrument for data collection. Data collected were analysed using mean, standard deviation and chi-square. The findings among others were that woman education has tremendous benefits to the society at large because, it increases their level of health condition and health awareness among others. It also has a significant place in child's upbringing through emancipating them from economic dependence on men while training their children. The government contributes a lot towards enhancing women education for child's upbringing through serving as intermediaries between the parents and their children. It was recommended that women education should be encouraged since it helps in training of their children and also improves the standard of living of these children.

Keywords: Education, Women Education, Parenting and Child's Upbringing.

Introduction

Education generally is the bedrock for any nation's success, and the process of acquiring knowledge. Education originated from a Latin word, "educare". According to Oladele (1997), education is an aggregation of all the processes

and other forms of behaviour of positive and negative values in the society where they live. It is a system through which a generation passes the deals to another. Ogwuire (1995) opined that education is a systematic instruction and training within and outside the school system which is

aimed at producing specific change in behaviour. It is seen as the process of developing one's mind through learning, which might take place within or outside the school.

Women are adult female person, and they are seen as special creatures because, they have unique and vital role to play in life. Women serve as wife as well as mother in the society. In the past, women were considered as household meant for marriage and procreation. Their participation in political, social and economic aspect of lives was at minimal level. They are also regarded as weaker sex, but withstanding, women should be seen as a special stone that should be preserved. As such, they should be allowed to partake in policy making because, many of them are intelligent and had contributed a lot towards the development of their countries socially, politically, economically and otherwise. They should be encouraged because, they do many things in the family in particular and the nation at large. This can be done through educating them because, there is a saying that "Educating a woman is as good as educating a nation".

Education however, is one of the major attributes that distinguishes man and woman from lower animals. According to Hurlock (1996), women education and empowerment have contributed a lot in social-economic and political aspect of their countries. Although Africans see women education in the olden days as waste; hence the popular saying that woman's education ends in the kitchen. Improving girls or women educational levels has been demonstrated to have clear impacts on the health and economic future of young women which in turn provides the prospects of their entire community (CAMFEDUSA, 2011). The infant mortality rate of babies whose mothers have received primary education is half that of children whose mothers are illiterate (Joel, 1995). In the poorest countries

of the world, 50% of girls do not attend secondary school. Improving female education and thus the earning potential of women improves the standard of living for their own children, as women remain effective in the society. For instance, in some African countries such as Burkina Faso, girls are unlikely to attend school for such basic reasons as a lack of private toilet facilities for women (Mogbadam, 2015).

Education increases a woman's health condition and health awareness. Women education not only increases their communication with their partners and employers but also, improves rate to civic participation such as voting or holding of office (Farzarch & Valentine, 2011).

Nevertheless, child upbringing is the process of raising children who will be sound physically, intellectually, socially and psychologically. It is the major duty of the parents especially the mothers to bring up their children with sound education. Thus a Latin adage has it that "Nemo that quad non havet", meaning that nobody gives what he or she has not. When a woman is not educated, it is least expected that she will have the zeal or interest to educate her children. Child upbringing is the process of promoting and supporting the physical emotional, social and intellectual development of a child from infancy to adulthood. Social class, wealth, culture and income are among the factors that will likely have impact on child upbringing (Lareau, 2002). Cultural values play a major role in how parent raises their children.

Parenting refers to the aspects of raising a child aside from the biological relationship (Bernstein, 2008). Parenting is always evolving as time changes, cultural practices and social norms and traditions changes (American Parenting Style, 2015). Government also has roles to play towards women education in child upbringing. Among

which is to serve as a mediator between the parents and their children. They educate the parents, especially the mother on the best parenting style and strategies. They also inculcate onto the mothers the ways to encourage their children positively. In line with this, the study seeks to examine the place of women education in the child's upbringing in Aguata Local Government Area, of Anambra State.

Statement of the Problem

There is a saying that when a woman is educated, a nation is automatically educated. Women generally spent much time with their children than men do; therefore, their education is very essential. When a woman is not well educated, she may find it difficult to tackle issues concerning the child's upbringing. Again, poor nutrition, lack of finance, lack of parental care, single parenting, emotional, physical and social problems among others are problems facing child's upbringing. This calls for a reason to examine the place of women education on the child's upbringing in Aguata Local Government Area, of Anambra State.

The general purpose of the study is to ascertain the place of women education in the child's upbringing in Aguata Local Government Area, of Anambra State. Specifically, the study sought to:

- ascertain the benefits of woman education in Aguata Local Government Area, Anambra State.
- examine the place of women education in child's upbringing in Aguata Local Government Area, Anambra State.
- ascertain the contributions of government towards enhancing women education for proper child's upbringing in Aguata Local Government Area, Anambra State.

The study has both theoretical and practical significance. Theoretically, the study is anchored on the cognitive learning theory by Piaget (1036) which considers how human memory work to promote learning. Similarly in child's upbringing, what one memorizes determine what the person has learnt. Practical wise, the findings will be beneficial to parents, children, education sector, society at large and future researchers. The findings of the study will help them to know the place of their education in their children's upbringing. This will enable them to shun illiteracy and embrace education which is paramount in their children's upbringing. It will also help them to know the best way to nurture their children's potentials thereby raising up a responsible and responsive children in our society at large. The findings of the study will encourage children's proper upbringing and make them to be more useful and productive in their families, societies and world all over. The findings will help the education policy makers in structuring curriculum that will encourage women education for a better child's upbringing. It will also provide information relating to socio-economic importance of women education for a greater development of the country. The result of the findings will also provide information for their further studies on related areas.

Scope of the Study

The study covered the place of women education on the child's upbringing in Aguata Local Government Area, of Anambra State. The study is specifically limited to the benefits of woman education; the place of women education in child's upbringing; and the contributions of government towards enhancing women education for proper child's upbringing.

Research Questions

The following research questions guided the

study:

- What are the benefits of woman education in Aguata Local Government Area, Anambra State?
- What is the place of women education in child's upbringing in Aguata Local Government Area, Anambra State?
- What are the contributions of government towards enhancing women education for proper child's upbringing in Aguata Local Government Area, Anambra State?

Research Hypothesis

One null hypothesis that guided the study stated that:

H0₁: There is no significant relationship between women education and child's upbringing in Aguata Local Government Area, Anambra State.

Methodology

The study adopted a descriptive survey research design. Descriptive studies try to investigate events in their natural setting without the researcher manipulating the independent or dependent variable. This design was chosen because the study elicited opinions of respondents on the place of women education in the child's upbringing in Aguata Local Government Area, Anambra State. The study was carried out in Aguata local government area of Anambra State. This L.G.A. has its headquarter in Aguata which major part falls into the city of Ekwulobia. It has thirteen (13) district areas or towns which are: Achina, Aguluezechukwu, Akpu, Amesi, Ekwulobia, Ezinifite, Igboekwu, Ikenga, Nkpologwu, Oraeri, Uga, Isuofia, and Umuchu. Economic activities take place in Ekwulobia and Igboekwu where their major markets were sited. People in rural areas engage themselves into farming; while those in urban areas are traders and civil servants. The population of the study is three

hundred and ninety (390) teachers in the thirty two public nursery/ primary schools in Aguata L.G.A. in Anambra State. The population was well represented because it was made up of both male and female teachers (ASUBEB Statistical Unit, 2023). The sample comprises twenty (20) teachers each from the ten (12) selected public nursery/primary schools in the area of study, making it a total of two hundred and forty (240) teachers on the whole. A simple random sampling technique was used to select the sample.

The instrument for data collection was a structured questionnaire constructed based on the three formulated research questions. The questionnaire used in this study was given to two (2) experts in the field of Early Childhood Care and Education Department, and one from Measurement and Evaluation Department for validation. Corrections were made on the questions, and modifications take care of.

Twenty copies of the questionnaire were administered to twenty respondents from a public nursery/primary school in Anaocha LGA. A test re-test method of reliability was used, which gave at 0.83 reliability coefficient index. The respondents were made to see the need for them to co-operate with the researcher, as the study findings would go a long way to improve our society at large. At that juncture, questionnaires were distributed to the sampled students who in the same day filled the questionnaires and returned to the researcher. Lastly, all the two hundred and forty (240) questionnaires administered were returned and worked with.

Data collected were presented in a table and analyzed using mean ($\bar{X}$) and standard deviation for testing the research questions, while chi-square was used to test hypothesis. For

the research questions, a bench-mark of 2.50 and above was established so that mean ratings of 2.50 and above indicates agreement; whereas that below 2.50 indicates disagreement for. For the chi-square statistics, if the p-value is less than the designated alpha level of 0.05, the result is significant. If the p-value is greater, the reverse is

S/N	Item	SA	A	D	SD	Total	Σ fx	$\bar{X}$	SD	Decision
1	Education increases woman’s level of health condition and health awareness	97	121	11	11	240	808	3.36	0.77	Agreed
2	It leads to higher roles of barriers and chemical contraceptive use	102	116	13	9	240	801	3.33	0.79	Agreed
3	It also increases the level of resources available to women who divorce or are in a situation of domestic violence	101	118	10	11	240	807	3.36	0.75	Agreed
4	Women education increases their communication with their partners and employers	94	126	9	11	240	849	3.53	2.04	Agreed
5	It improves rate to civic participation such as	112	106	13	9	240	801	3.33	0.74	Agreed

In the table I above, items 1-5 with the responding mean of 3.36, 3.33, 3.36, 3.53, 3.33 and standard deviation of 0.77, 0.79, 0.75, 2.04, 0.74respectively were all agreed. This was because, they are above the accepted mean level of 2.50. Therefore, the resultshows that woman education has tremendous benefits to the society at large.

S/N	Item	SA	A	D	SD	Total	Σ fx	$\bar{X}$	SD	Decision
6	It serves as a symbol of progress and a step towards gender equity at home as well as in the society	118	106	9	7	240	815	3.39	0.70	Agreed
7	It emancipates women from economic dependence on men while training their children	131	92	7	10	240	824	3.43	0.74	Agreed
8	It improves the standard of living for the children	122	102	4	12	240	814	3.39	0.75	Agreed
9	It promotes resource availability to women more to those who are divorced to care for their children	124	99	7	10	240	817	3.40	0.74	Agreed
10	It brings harmony and peace to various homes towards child upbringing	117	106	8	9	240	811	3.73	0.72	Agreed

In the table 2, items 6-10 with the responding mean of 3.39, 3.43, 3.39, 3.40, 3.73 and standard deviation of 0.70, 0.74, 0.75, 0.74, 0.72, respectively were all agreed. This was because, they are above the accepted mean level of 2.50. Therefore, the resultshows thatwomen education serves as a symbol of progress and a step towards gender equity at home as well as in the society among others.

the case.
Research Question I: What are the benefits of woman education in Aguata Local Government Area, of Anambra State?

Table I: Mean and standard deviation ratings the

S/N	Item	SA	A	D	SD	Total	Σ fx	$\bar{X}$	SD	Decision
1	Education increases woman’s level of health condition and health awareness	97	121	11	11	240	808	3.36	0.77	Agreed
2	It leads to higher roles of barriers and chemical contraceptive use	102	116	13	9	240	801	3.33	0.79	Agreed
3	It also increases the level of resources available to women who divorce or are in a situation of domestic violence	101	118	10	11	240	807	3.36	0.75	Agreed
4	Women education increases their communication with their partners and employers	94	126	9	11	240	849	3.53	2.04	Agreed
5	It improves rate to civic participation such as	112	106	13	9	240	801	3.33	0.74	Agreed

Research Question 2: What is the place of women education in child’s upbringing in Aguata Local Government Area, Anambra State?

Table 2: Mean and standard deviation ratings of the responses on the place of women education in child’s upbringing

S/N	Item	SA	A	D	SD	Total	Σ fx	$\bar{X}$	SD	Decision
6	It serves as a symbol of progress and a step towards gender equity at home as well as in the society	118	106	9	7	240	815	3.39	0.70	Agreed
7	It emancipates women from economic dependence on men while training their children	131	92	7	10	240	824	3.43	0.74	Agreed
8	It improves the standard of living for the children	122	102	4	12	240	814	3.39	0.75	Agreed
9	It promotes resource availability to women more to those who are divorced to care for their children	124	99	7	10	240	817	3.40	0.74	Agreed
10	It brings harmony and peace to various homes towards child upbringing	117	106	8	9	240	811	3.73	0.72	Agreed

Research Question 3: What are the contributions of government towards enhancing women education for proper child’s upbringing in Aguata Local Government Area, Anambra State?

Table 3: Mean and standard deviation ratings of the responses on the contributions of government towards enhancing women education for proper child’s upbringing

S/N	Item	SA	A	D	SD	Total	Σ fx	$\bar{X}$	SD	Decision
11	They serve as intermediaries between the parents and their children	120	96	11	13	240	803	3.34	0.83	Agreed
12	They enlighten the women that they are their children’s mirrors and role models	113	109	12	6	240	809	3.37	0.69	Agreed
13	They encourage the women to fully involve their children’s lives and upbringing	126	95	11	8	240	819	3.41	0.73	Agreed
14	They educate the mothers to treat their children with respect and make them have value for life	122	102	8	8	240	828	3.45	0.85	Agreed
15	They help women to set rules governing their children’s upbringing	148	89	7	7	240	836	3.48	0.69	Agreed

In the table 3, items 11-15 with the responding mean of 3.34, 3.37, 3.41, 3.53, 3.48and standard deviation of 0.83, 0.69, 0.73, 0.85, 0.69respectively were all accepted. This was because, all are above the accepted mean level of 2.50. Therefore, the result shows that the government serve as intermediaries between the parents and their children and also help women to set rules governing their children’s upbringing among others.

Research Hypothesis

Ho₁: There is no significant relationship between women education and child’s upbringing in Aguata Local Government Area, Anambra State.

Table iv: Chi-square statistics testing the relationship between women education and child’s upbringing

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.101a	1	0.02
Likelihood Ratio	4.189	1	.034
Linear-by-Linear Association	8.567	1	.012
N of Valid Cases	200		

a. 0 cells (0%) have expected count less than 5. The minimum expected count is 2.52.

The value of the chi-square statistic is 6.101 with

1 as the degree of freedom. The p-value is (.02). Since the p-value is less than the designated alpha level of .05; (X²(1)= 0.02< .05), the result is significant. Hence, we reject the null hypothesis that asserts that there is no significant relationship between women education and child’s upbringing in Aguata Local Government Area, Anambra State and accept the alternative hypothesis which states that; there is a significant relationship between women education and child’s upbringing.

Discussion of Findings

The findings of the study were discussed based on the order ofthe research questions. Thus, for research question I,the findings revealed that women education has tremendous benefits to the society at large. These were in agreement withthe assertion by World Education, (2011) that lack of education of women limits prospects, decreases family income, reduces health, puts women and girls at risk of trafficking and exploitation, and limits the economic advancement of the entire countries.

For research question 2, the findings revealed that women education helps to eliminate violence against women thereby making them more active at home. It serves as a symbol of progress and a step towards gender equity at home as well as in the society. These findings were in agreement withBlackmore and Cook-Sey (2001) whom emphasized that educated mothers have the ability to explain school work

to their children, encouraging them to read by buying those educative books, punishing them according to their school performances and making sure that they do their homework.

The research question III findings revealed that government serve as intermediaries between the parents and their children. They also enlighten the women that they are their children’s mirrors and role models among others. The findings of the study were in agreement withSteinberg (2005) who posited that the major duties of government is to educate the parents especially the women to be involved always in their children’s life. This involves showing up for the relationship and being there for the child mentally as well as physically.

Conclusion
Based on the discussion, the following conclusion were drawn:

1. The study identifiedthat woman education has tremendous benefits to the society at large because it increases their level of health and health awareness among others.
2. Women education has a significant placein child’s upbringing through emancipating

them from economic dependence on man while training their children.

3. The government contributions a lot towards enhancing women education for child upbriningg through serving as intermediaries between the parents and their children among others.

Recommendations
Based on the findings, the following recommendations were made:

1. Women education should be encouraged because it emancipates women from economic dependence on man, while training their children.
2. Women education should be encouraged because it improves the standard of living for their children.
3. Women education should be promoted because it promotes resource availability to women more to those who are divorced to care for their children.
4. Government through their tremendous services should encourage women education as it has a place in the child’s upbringing.

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Application of ICT Software Packages in Developing Skills and Academic Intelligence Among Business Education Students in Colleges of Education in Anambra State

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Abstract

This study investigated the application of ICT software packages in developing skills and academic intelligence of Business Education recipients in Colleges of Education in Anambra State. Four objectives and corresponding research questions guided the study; a descriptive survey research design was adopted. The population comprised of eight hundred (800) NCE II–III Business Education students and one hundred and twenty (120) lecturers in accredited Colleges of Education in Anambra State (e.g., Nwafor Orizu College of Education, Nsugbe; Federal College of Education (Technical), Umuze). Totally population 920, the sample size of 200. A multi stage sampling technique was use to select respondents across departments/options. A structured questionnaire titled “ICT Software, Skills and Academic Intelligence Questionnaire (ISSAIQ)” was used for data collection. Validity of the instrument were ensured by three experts and the reliability was also established using Cronbach’s alpha index. Data were analyzed using mean and standard deviation for research questions. Findings show that regular, guided use of word processing, spreadsheets, presentation, database, statistical, and learning management software significantly relates to improvements in business communication, numeracy, data management, information literacy, and higher order thinking (analysis, evaluation, problem solving). Recommendations include sustained capacity building for lecturers, curriculum embedded ICT tasks, improved access to devices/internet, and formative assessment through LMS analytics.

Keywords: ICT Software Packages, Skills Development, Academic Intelligence, Business Education, Colleges of Education, Anambra State, Application

Introduction

Information and Communication Technologies (ICT) play a crucial role in virtually all areas of modern business. Consequently, Business Education has been identified as a field of study that stands to benefit immensely from the application of ICT. In Nigeria, Business Education is mandated to develop competent, self-reliant graduates equipped with knowledge, skills, and values for gainful employment and entrepreneurship in accounting, office technology, marketing, and related fields.

Over the last decade, ICT has become central to realizing these goals because productivity and learning-support software now mediate how business information is created, analyzed, stored, presented, and communicated in schools and workplaces alike. Word processors, spreadsheets, databases, presentation tools, accounting/ERP applications, statistical packages, and Learning Management Systems (LMS) enable authentic tasks such as payroll modeling, records management, data storytelling, and report writing that deepen both discipline-specific skills and academic intelligence, encompassing critical thinking, problem-solving, and metacognition.

At the policy level, the Federal Republic of Nigeria's National Policy on ICT in Education (2019), together with the National Implementation Guidelines for ICT in Education (2019), positions ICT as an engine for quality improvement, access, and equity across the education sector. Likewise, the National Commission for Colleges of Education (NCCE) minimum standards emphasize ICT facilities and competence requirements for NCE programmes, including Business Education. Despite these policy frameworks, evidence from Nigerian tertiary institutions observed a persistent gap between the availability of ICT tools and their

effective application in classroom teaching and assessment.

In Anambra State, Colleges of Education play a pivotal role in preparing teachers and middle-level manpower. Challenges such as inadequate ICT infrastructure, lack of trained personnel, and inconsistent power supply hinder full utilization of ICT tools in teaching Business Education. There is growing but limited empirical work directly linking the application of specific ICT software packages to measurable gains in skills and academic intelligence among Business Education recipients in Colleges of Education. Addressing this gap will provide actionable insights for lecturers, programme leaders, and policymakers tasked with aligning NCE Business Education with national ICT policy aspirations and labour-market demands.

The main purpose of this study is to investigate the application of ICT software packages in developing skills and academic intelligence among business education students in colleges of education in Anambra state. Specifically the study sought to:

- Identify the ICT software packages commonly used in teaching and learning Business Education in Colleges of Education in Anambra State.
- Determine the extent to which these ICT software packages are applied in Business Education instruction and assessment.
- Examine the influence of ICT software application on the development of students’ business-related skills.
- Assess the influence of ICT software application on the academic intelligence of Business Education students.

Statement of the Problem

Despite the recognized importance of ICT, many Colleges of Education in Anambra State still rely

heavily on traditional teaching methods. Students often graduate with weak practical skills in business software and limited ability to apply ICT to solve real-world business problems. Factors contributing to this problem includes irregular power supply, insufficient internet connectivity, lack of licensed software, inadequate lecturer competence in ICT-integrated pedagogy, limited hands-on laboratory sessions, and over-reliance on theoretical instruction. These constraints reduce ICT integration to low-level substitution rather than transformational learning experiences. There is therefore a need to empirically investigate how ICT software packages are being applied and the extent to which they contribute to skill development and academic intelligence among Business Education recipients.

Research Questions

The following research questions guided the study:

- i. What ICT software packages are commonly used in teaching and learning Business Education in Colleges of Education in Anambra State?
- ii. To what extent are these ICT software packages applied in Business Education instruction and assessment?
- iii. What influence does the application of ICT software have on the development of students' business-related skills?
- iv. What influence does the application of ICT software have on the academic intelligence of Business Education students?

Methodology

This study adopted a descriptive survey research design, appropriate when the goal is to obtain information about the characteristics, opinions, or behaviors of a population without manipulating variables (Nworgu, 2015). The population comprised all Business Education

students and lecturers in Colleges of Education in Anambra State, specifically Federal College of Education (Technical), Umunze, and Nwafor Oziru College of Education, Nsugbe, totaling 120 lecturers and 800 students.

A sample of 200 respondents (10 lecturers and 190 students) was drawn using stratified random sampling to ensure proportional representation from each college (Kothari, 2021). The primary instrument was a structured questionnaire with four sections: demographic information; extent of ICT software utilization in skill development; role of ICT software in enhancing academic intelligence; and challenges to ICT integration. Items used a four-point scale type: Strongly Agree (4), Agree (3), Disagree (2), Strongly Disagree (1). The questionnaire was validated by two experts in Business Education and ICT integration and one expert from Measurement and Evaluation Department. Reliability was established using Cronbach's Alpha, yielding a coefficient of 0.82. Data were analyzed using mean and standard deviation, with a decision cut-off point of 2.50.

Results

Research Question 1: ICT Software Packages Commonly Used in Business Education

Table 1: ICT Software Packages Commonly Used in Teaching and Learning Business Education in Colleges of Education in Anambra State (N = 200)

Item Statements	Sfx	X	Remark
1 Microsoft Office Suite (Excel, Word, PowerPoint, Access)	513	3.42	Agreed
2 Tally (TallyPrime / Tally ERP)	572	3.81	Agreed
3 QuickBooks	570	3.80	Agreed
4 Sage (Pastel / Sage 50)	552	3.68	Agreed
5 Moodle	588	3.92	Agreed
Average Mean		3.73	Agreed

Source: Researcher's Field Survey, October 2025

Table 1 shows that all mean scores exceed the cut-off point of 2.50 on the four-point Likert scale, with an average mean of 3.73. This indicates that respondents agreed that Microsoft Office Suite, Tally, QuickBooks, Sage, and Moodle are the ICT software packages commonly used in teaching and learning Business Education in Colleges of Education in Anambra State.

Research Question 2: Extent of Application of ICT Software Packages in Instruction and Assessment

Table 2: Extent to Which ICT Software Packages Are Applied in Business Education Instruction and Assessment (N = 200)

Item Statements	Sfx	X	Remark
6 ICT software packages are extensively applied in instruction, with tools like PowerPoint and Word used regularly for lecture notes and presentations.	546	3.64	Agreed
7 Spreadsheet and accounting packages (e.g. Excel, Tally, Quick Books) are moderately applied in practical courses to simulate real-life business operations.	539	3.59	Agreed
8 Application in student assessment is growing, as some lecturers use ICT tools to set, administer, and grade assignments and tests.	496	3.30	Agreed
9 Use of LMS and online platforms for assessment and feedback is still limited despite available ICT resources.	594	3.96	Agreed
10 Overall application of ICT software is partial, with higher usage in instructional delivery than in assessment.	570	3.80	Agreed
Average Mean		3.66	Agreed

Table 2 shows that all mean scores for items 6 through 10 exceed the cut-off point of 2.50, with an average mean of 3.66. This demonstrates that ICT software packages are applied to a moderate but significant extent in Business Education instruction and assessment, with higher utilization in instructional delivery than in formal assessment activities.

Research Question 3: Influence of ICT Software on Business-Related Skills

Table 3: Influence of ICT Software Application on the Development of Students' Business-Related Skills (N = 200)

Item Statements	Sfx	X	Remark
11 Improved Accounting and Financial Skills	519	3.46	Agreed
12 Enhanced Communication and Presentation Skills	519	3.46	Agreed
13 Development of Analytical and Problem-Solving Skills	530	3.53	Agreed
14 Acquisition of Digital Literacy and ICT Competence	519	3.46	Agreed
15 Preparation for Employability and Entrepreneurship	570	3.80	Agreed
Average Mean		3.54	Agreed

Source: Researcher's Field Survey, October 2025

Table 3 reveals that all mean scores for items 11 through 15 exceed the 2.50 cut-off, with an average mean of 3.54. Respondents agreed that ICT software application positively influences the development of accounting skills, communication and presentation abilities, analytical and problem-solving competencies, digital literacy, and employability and entrepreneurial readiness among Business Education students.

Research Question 4: Influence of ICT Software

Table 4: Influence of ICT Software Application on the Academic Intelligence of Business Education Students (N = 200)

Item Statements	Sfx	X	Remark
16 Enhancement of Cognitive Development	576	3.84	Agreed
17 Improved Knowledge Retention and Understanding	522	3.48	Agreed
18 Promotion of Independent and Self-Directed Learning	500	3.33	Agreed
19 Development of Logical and Analytical Thinking	519	3.46	Agreed
20 Increased Motivation and Academic Engagement	570	3.80	Agreed
Average Mean		3.58	Agreed

Source: Researcher's Field Survey, October 2025

Table 4 shows that the mean responses for items 16 through 20 are all above the cut-off point of 2.50, with an average mean of 3.58. Respondents agreed that ICT software application enhances cognitive development, improves knowledge retention, promotes self-directed learning, develops logical and analytical thinking, and increases students' motivation and academic engagement.

Discussion of Findings

The findings of this study reveal that Microsoft Office Suite (Word, Excel, PowerPoint), QuickBooks, Peachtree, SPSS, and Moodle are the most commonly used ICT tools in Business Education in Colleges of Education in Anambra State. This finding agrees with Odimmune and Okonkwo (2021), who reported that Microsoft Office applications are indispensable in teaching Business Education because they promote learner engagement and skill-based instruction. The finding is also consistent with IIARD (2025),

who established that accounting software packages significantly improved students' employability, and with Ojo (2024), who reported that LMS adoption improves students' academic performance and supports continuous learning beyond the classroom.

Regarding the extent of ICT application, while Microsoft Word and PowerPoint are frequently used in instructional delivery, specialized tools such as QuickBooks, Peachtree, and LMS platforms are utilized to a relatively low extent due to infrastructural limitations and inadequate lecturer training. This corroborates Bupo and Ndinechi (2015) and Okoro and Nwafor (2023), who observed that full ICT integration in Nigerian tertiary institutions has been hampered by poor internet access, inadequate digital infrastructure, and low lecturer competence in assessment-based technologies.

On skills development, the finding that ICT software significantly influences business-related skills is supported by multiple studies. Okonkwo and Eze (2022) asserted that ICT tools like Word and Excel help students master technical and administrative competencies required in the workplace. Ogbu and Ezenwafor (2023) found that Business Education students trained with accounting software demonstrate superior accuracy and speed in financial analysis, while Inuwa and Sheriff (2021) reported that ICT-assisted instruction encourages student participation, critical thinking, and confidence building during business communication activities.

On academic intelligence, the findings confirm that ICT software application positively impacts students' cognitive development, analytical reasoning, and independent learning. Odimmune and Okonkwo (2021) observed that ICT-integrated learning motivates students to

think critically and engage more actively with course materials. Ojo (2024) found that LMS use enhances learners' self-efficacy and cognitive development, while Okoro and Nwafor (2023) established that ICT-based research tools foster logical thinking and problem-solving abilities among Business Education students.

Conclusion

The study established that ICT software packages such as Microsoft Office Suite, QuickBooks, Peachtree, SPSS, and Learning Management Systems are essential tools that enhance effective teaching, learning, and assessment processes in Business Education. However, their utilization remains moderate due to challenges such as inadequate ICT facilities, limited technical competence, and insufficient institutional support. The use of ICT software significantly influences the development of students' business-related skills, including data management, communication, accounting, and analytical problem-solving abilities, while also promoting academic intelligence through improved creativity, research competence, and adaptability to technological change. Therefore, the integration of ICT software in Business Education should be viewed as a necessary component for achieving 21st-century educational goals, bridging the gap between theoretical knowledge and practical skill acquisition to produce graduates who are digitally competent, innovative, and globally

competitive.

Recommendations

Based on the findings and conclusions, the following recommendations were made:

1. Colleges of Education should provide adequate ICT infrastructure and access to modern computer laboratories equipped with licensed software to support full utilization of ICT in Business Education.
2. Regular training and retraining programmes should be organized for Business Education lecturers to enhance their competence in using ICT software for both instruction and assessment.
3. The curriculum of Business Education should be reviewed to include practical ICT-based courses that develop both business and technological skills, reflecting current industry demands.
4. Government and educational agencies, including the Ministry of Education and NCCE, should allocate special funding to support ICT integration in Colleges of Education and develop policies mandating the use of ICT software in all Business Education programmes.
5. Students should be encouraged to engage in self-directed learning using ICT tools to improve their academic intelligence and professional skills beyond formal classroom settings.

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Influence of Ensuring Environmental Sustainability Through Biology Education

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Abstract
The study was examined to ensuring environmental sustainability using biology education in Anambra East Local Government Area of Anambra State. The purpose was to redefine and solidify the inculcated environmental sustainable values by finding out the influence of ensuring environmental sustainability through biology education. Four research questions were formulated to guide the study. A sample size of one hundred and thirty-two (132) respondents were sampled using simple random sampling techniques. A validated structured questionnaire whose reliability was established at 0.85 through a test retest method was used as an instrument for data collection, and was reliable. Data collected were answered using mean and standard deviation. The results of the findings showed that conservation of natural resources, protecting global ecosystems to support health are what environmental sustainability entails. Deforestation as a result of human activities, overgrazing from nomadic practice, poaching, carbon dioxide emission from faulty vehicles and industries were among the various biological factors that can harm the environment. Enacting laws against deforestation, and educating farmers on best farming practices are among the possible solutions to the biological factors that affect the environment, and also that inculcating the knowledge of environmental sustainability into biology education lowers human harmful environmental impacts and promote the conservation of natural habitat and biodiversity. Base on the findings, the following recommendations were made; creation of more awareness to prevent the environmental mistake of the past, Government should take proper action against the backdrop of serious inequities, and their impact on the environment, minimize unnecessary purchases and consider the environmental impact of products before buying, choose reusable items over disposable ones, follow recycling guidelines in your area, and recycle materials such as paper, glass, plastic, and metal, repair any water leaks and minimize water wastage, and finally remember, that small individual actions can collectively make a significant impact on the environment and thus one should incorporate these practices into one's daily life and encourage others to do the same.

Keywords: Environmental, Sustainability, Education, and Biology

Introduction

Environment is the totality of the places and surroundings in which we live, work and

interact with other people in our cultural, religious, political and socio-economic activities for self fulfillment and advancement of our

communities, societies or nations. It refers to as all surrounding conditions that have direct impact on all human beings and animals (Olatunde, 2022). It is within this environment that both natural and man-made things are found. It is the combination of external conditions that affects the growth and development of an organism. It controls the life of organisms including human beings and basically consists of three components - physicals, biological and cultural aspects, (Luo, 2020). The environment of man is the most significant factor in determining his fate on the planet earth, affecting lives, nature behavior and the growth, development and maturity of living organisms' (Holland, 2017), causing direct or indirect adverse effects on living beings and human activities and as such needs to be guided and sustained.

Sustainability is the ability to maintain or support a process continuously over time. In business and policy contexts, sustainability seeks to prevent the depletion of natural or physical resources, so that they will remain available for the long term (Daniel, 2023). According to Biermann et al., (2022), In everyday use, sustainability often focuses on countering major environmental problems, including climate change, loss of biodiversity, loss of ecosystem services, land degradation, air and water pollution. The principle of sustainability refer to the three core concepts of environmental, social, and economic sustainability- sometimes broken down as people, planet, and profits'. This means that in order to be considered sustainable, there must be conservation of natural resources, supporting a healthy community and workforce, and earning enough revenue to remain financially viable for the long-term (Daniel, 2023).

Environmental sustainability involves making

decisions and taking actions that are in the interests of protecting the natural world, with particular emphasis on preserving the capability of the environment to support human life. It adds greater emphasis on the life support stems such as the atmosphere or soil that must be maintained for economic production or human life to even occur (Daniel, 2023). It is important because of how much energy, food, and human-made resources we use every day. Rapid population growth has resulted in increased farming and manufacturing, leading to more greenhouse gas emissions, unsustainable energy use, and deforestation. Bradshaw et al., (2021), Ripple et al., (2017) and Trisost et al., (2020), in their work stated that due to these unsustainable human activities, the earth is increasingly moving towards environmental collapse, which may cause the extinction of the natural biodiversity and cause loss of human life.

There are many approaches people can take to ensuring environmental sustainability, these include maintaining ecosystem services, reducing food waste, and promoting dietary shifts towards plant-based foods. Another is reducing population growth by cutting fertility rates. Others are promoting new green technologies, and adopting renewable energy sources while phasing out subsidies to fossil fuels (Ripple et al., 2017).

Statement of the Problems

The daily increase in human population and the quest to meet the need of the increasing human population had led to adverse increase in man's exploitation of its immediate environment. Notable among these, are the need for shelter and industrialization which as a result led to high demand in timber production and thus increase in the rate of deforestation and destruction of wide life. Many wastes from modern industries are not properly channeled and thus cause environmental pollution.

Though the Federal Government of Nigeria had established law guiding the environment as that of Environment protection Act of 1999, and also had inculcated in her education curriculum some topics to enlighten her people on the need to keep the environment safe, there still exist sanitary conditions or environmental pollution in the society and the attendant human and animal hazards mostly in Anambra East Local Government Area of Anambra State. Thus this work sought to redefine and solidify the inculcated environmental sustainable values by finding out the influence of ensuring environmental sustainability through biology education.

Purpose of the study

This study generally sought to investigate the influence of ensuring environment sustainability through biology education. Specifically, it seeks to find out

- 1. What environmental sustainability entails.
- 2. The various biological factors that can harm the environment?
- 3. Possible solutions to the biological factors that affect the environment.
- 4. The benefits of inculcating the knowledge of environmental sustainability into biology education.

Research Questions

The following research questions guided the study:-

- 1. What does environmental sustainability entail?
- 2. What are the various biological factors that can harm the environment?
- 3. What are the possible solutions to the biological factors that affect the environment?
- 4. What are the benefits of inculcating the knowledge of environmental sustainability into biology education.

Methods

The study adopted a descriptive survey design. The design is considered appropriate for this study because the work is intended to collect data from small growth with view to describing the entire population. The study was carried out in the Anambra East Local Government Area of Anambra State, and comprised of eleven (11) towns which are Aguleri, Enugwu-Aguleri, Eziagulu Otu Aguleri, Enugwu Otu Aguleri, Mkpunando-otu Aguleri, Ikem-Ivite, Igbariam, Umuoba Anam, Nando, Umueri, and Nsugbe. The population of this study comprised of one thousand, three hundred and nine (1,309) senior secondary school one (SS1) biology students in government owned secondary schools in Anambra East Local Government Area of Anambra State. Random sampling technique was used to select twelve (12) SS1 biology students in eleven (11) schools making a sample size of 132 students. The instrument was a standardized instrument which consists of two sections, viz- section A and B. Section A consist of demographic data of the respondents, while section B, was the questionnaire titled 'the Influence of Ensuring Environmental Sustainability through Biology Education'. The reliability of the instrument was determined using test, re-test method. The test was administered on 14 students from Onitsha South Local Government Area of Anambra State and was repeated after two weeks. Chronbach alpha was used to analyze the data collected and the result yielded a high reliability score of 0.90. The questionnaire items were distributed to the respondents by two research assistants employed for this purpose. The respondents were required to fill the questionnaires immediately under the guidance of the research assistants and returned on the spot. The data collected were analyzed using mean and standard deviation. The acceptable mean score is 2.50 and above and any mean score that is below was rejected.

Research Question One: What does environmental sustainability entail?

Table 1: Mean rating and standard deviation on what environmental sustainability entails.

Item Statements	p	SD	Remark
1 Ability to maintain an ecological balance	2.79	1.10	Accepted
2 Conservation of natural resources to support the wellbeing of current and future generation	2.91	0.97	Accepted
3 Making money for the present generations only	1.10	0.13	Rejected
4 Protecting global ecosystems to support health and wellbeing now and in future	2.98	0.99	Accepted
5 Meeting the needs of the present generation without compromising the needs of future generations	3.05	0.99	Accepted

Table 1 above, revealed that items 1, 2, 4 and 5 were accepted while item 3 was rejected. However, item 5, has the highest mean score of 3.05. This means that environmental sustainability is meeting the needs of the present generation without compromising the needs of future generations.

Research Question Two: What are the various biological factors that can harm the environment?

Table 2: Mean rating and standard deviation on the various biological factors that can harm the environment.

Item Statements	p	SD	Remark
1 Deforestation as a result of human activities	3.22	0.77	Accepted
2 Overgrazing from nomadic practices	3.11	0.95	Accepted

Item Statements	p	SD	Remark
3 Poaching	3.29	0.76	Accepted
4 Excessive burning of bushes	3.28	0.62	Accepted
5 Carbon dioxide emission from faulty vehicles and industries	3.70	0.63	Accepted

From the table 2 above, it was discovered that the research items 1-5 have their respective mean above the acceptance mean of 2.5. This indicated that the respondents are of the positive view that all are various biological factors that can harm the environment.

Research Question Three: What are the possible solutions to the biological factors that affect the environment?

Table 3: Mean rating and standard deviation on the possible solutions to the biological factors that affect the environment.

Item Statements	p	SD	Remark
1 Enacting laws against deforestation and guiding game resources also promoting afforestation	3.05	0.99	Accepted
2 Recycling of materials to avoid burning	2.98	0.99	Accepted
3 Encouraging education for sustainability development by including key sustainable development like climate change, biodiversity e.t.c	3.29	0.76	Accepted
4 Embarking on agricultural practices to reduce excessive burning of bushes	3.11	0.95	Accepted
5 Educating farmers on best farming practices	3.29	0.76	Accepted

From the table 3 above, it was discovered that the research items 1-5 all have their respective mean above the acceptance mean of 2.5. This indicated that the respondents are of

the positive view that all are possible solutions to the biological factors that affect the environment.

Research Question Four: What are the benefits of inculcating the knowledge of environmental sustainability into biology education?

Table 4: Mean rating and standard deviation on the benefits of inculcating the knowledge of environmental sustainability into biology education.

Item Statements	p	SD	Remark
1 Creates consciousness on the effective management of water resources and avoiding stressing of water bodies thus reducing loss of life and property damage by natural disasters like droughts	3.11	0.95	Accepted
2 Aids in proper management of trees, forest and woodlands thus halting deforestation, increase afforestation, reforestation and safeguarding wildlife	3.70	0.63	Accepted
3 Lower human harmful environmental impacts and promote the conservation of natural habitats and biodiversity.	2.66	1.14	Accepted
4 Discourages poor utilization of environmental resources	3.05	0.99	Accepted
5 Aids in protecting the land from desertification and restores degraded land and soil.	3.29	0.76	Accepted

From the table 4 above, it was also discovered that the research items 1-5 all have their respective mean above the acceptance mean of 2.5. This indicated that the respondents are of the positive view that all are benefits of inculcating the

knowledge of environmental sustainability into biology education

Discussion of Findings

The findings of the study reviewed environmental sustainability as the responsible use of natural resources to ensure they will be around in future. This was in line with the work of Gillaspy, (2023) who stated that environmental sustainability entails responsible interaction in the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality.

It also revealed that deforestation, excess burning of fossils, carbon(IV) oxide emission, overgrazing are among the factors that can harm the environment. This was supported by the research of Islam and Wang, 2023 who stated that the world, particularly the developing countries, now encounter several environmental problems which include: carbon dioxide emission, hazardous pollution, climate change, global warming, flood, droughts, deforestation, excessive and less rainfall crises, over-consumption of natural resources and loss of biodiversity. They concluded by saying that these factors lenders sustainable development.

Further, it was revealed that enacting laws against deforestation, promoting afforestation and embarking on agricultural practices to reduce excessive burning of bushes, educating farmers on best farming practices and possible solution to the biological factors that affect the environment. This finding agreed with the UN resolution 1987 of environmental perspective to the year 2000 and beyond as cited by Islam and Wang(2023), who stated that the UN resolution chalked out some perceptions to mitigate the problems of the environment and notable among these perceptions include internalizing and co-ordinating the environmental considerations

into sectoral policies and programs to achieve sustainable development, safeguarding the species and adopting flexible environmental coping strategies with mass level awareness creation.

Finally the research question four which sought to find out the benefits of inculcating the knowledge of environmental sustainability into biology Education, revealed that the respondents were of the view that when the knowledge is inculcated, it lowers human harmful environmental impacts and promote the conservation of natural habitat and biodiversity. This was in line with the findings of Opoku et al, (2022) who stated that integrating environmental sustainability as a prerequisite for sustainable development reduces the potential adverse environmental externalities related to climate change.

Conclusion

The existence of man will continue to register its effects and impact on the environment. This development will continue to trigger off questions which must be answered. It is there sponsibility for all of us to pay particular attention to protect the environment by ensuring thatwe avoid anything that might destroy the environment and at the same time obey rules and regulations that will help sustain the environment. Added to this, there should be adequate service training, workshops, seminars for both the people of Anambra East, the teachers and the students.

Recommendations

On the basis of the research work done, and considering promoting a sustainable

environment, the following recommendations for creating a more sustainable environment were made:

- Educational action: support institutions and initiatives that transmit knowledge, raise public awareness, and involve local actors in a sustainable manner.. We need to spread social awareness to bring a change in social attitude.
- Legislative and legal action: encourage governments and international organizations to mandate issues related to environmental sustainability, and legislate concrete measures to guarantee inclusivity.
- Media and the arts: channel the role of media and the arts in educating the public, changing the narrative on environmental breakdown, and focusing global attention on local issues.
- Minimize unnecessary purchases and consider the environmental impact of products before buying. Reuse Items: Whenever possible, choose reusable items over disposable ones.
- Water Conservation: Fix Leaks: Repair any water leaks in your home promptly.
- Use Water Wisely: Be mindful of water usage, and consider installing water-saving fixtures.
- Waste Reduction: Composting: Compost kitchen waste to reduce the amount of organic waste sent to landfills .Avoid Single - Use Plastics :Choose alternatives to single - useplastics , such as reusable bags and containers .

Remember , small individual actions can collectively make a significant impact on the environment .By incorporating these practices into your daily life and encouraging others to do the same ,you contribute to the creation of a more sustainable and eco friendly world .

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Effects of Facilities and Funding on Effective Teaching of Physical and Health Education in Junior Secondary Schools in Anambra State

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Abstract

This study analyzed the effects of physical and health education facilities and funding on effective teaching of physical education in Junior secondary schools with emphasis on facilities and funding in Anambra East local government area of Anambra State, Nigeria. The study employed the descriptive survey research design in addressing the research problem from the study location. The research used purposive sampling technique to sampled a total of 25 PHE teachers across 25 (20 public and 5 private) Junior Secondary Schools that cut across the study location. The research adopted questionnaire to elicit information from the respondents. A set of statistical tools such as chi-square and descriptive statistics were used to test the validity of the hypotheses at 0.05 level of significance. The results from findings revealed that inadequate, inadequate sports facilities are significant problem affecting the teaching of physical and health education in junior secondary schools in Anambra East local government area of Anambra State. The research concluded that inadequate funding significantly affects the teaching of physical and health education in junior secondary schools in the study location. Base on the results of the study findings, the research recommends that governments at all levels should provide more sports facilities and adequate funding-should be provided to all junior secondary schools for the effective teaching of physical and health education.

Keywords: Strategic Investment, Sports Facilities, School-Funding, effective teaching, physical and health education.

Introduction

Teaching of physical and health education is majorly done in junior secondary schools and it is an important aspect of junior secondary school curriculum and is thought directly and indirectly.

Physical and health education is thought directly through class instructions and practical and

indirectly through engagement of students in school's annual inter-house sport activities, quiz and sport debates, cultural dances and other sporting activities. Idehen (2021) noted that before the coming of the Whiteman, Nigerians practiced several indigenous games such as wrestling, hunting, traditional dance, other cultural and religious functions and many more

which has served as recreational activities during their leisure period. Similarly, Owueve (2018) observed that participation in sports involve greater effort, resists fatigue and guide against sedentary lifestyles. He emphasized that through sports participation, the youths acquire and develop sports knowledge and observe the rules and regulations as applied to sports men and women in amateur and professional sports. Physical and health education is an instruction in the development and care of the body ranging from simple callisthenic exercise in a course of study to providing training in hygiene, gymnastics and the performance and management of athletic games.

Physical education as a term is broad in scope, meaning and content so much that the different definitions have been given to it by different authors. Balogun (2019) submitted that physical education is the process of education that concerns activities which the human body requires for maintenance and development. Ogonor (2021) also noted that physical education is the study of tip, characteristics of human movements and the effects of the risk activities on the physiological and psychological characteristics of individuals in the social environment. It is understandable therefore the need for the provision of adequate facilities for teachers and proper funding for effective teaching to be achieved in public secondary schools.

According to Amuchie (2018) facilities are material resources that enhance teaching and learning thereby making the process meaningful and purposeful. Also, school facilities can be defined as the entire school plant which school administrators, teachers and students' harness, allocate and utilize for the smooth and efficient management of any educational institution for the purpose of bringing about effective and purposeful teaching and learning experience. In

addition, Emetarorn (2021) submitted that school facilities are the physical and spatial enabler of teaching and learning which will increase the production of results. He observed that School facilities serve as pillars of support for effective teaching and learning. School facilities have been observed as a potent factor in qualitative teaching of physical education. Owuamanam (2019) noted that the inadequacy of equipment and facilities were major problems facing Nigerian educational system. He maintained that the school facilities are grossly inadequate to match the student's population while the available facilities were poorly maintained. Ogonor (2020) also reported that large amount of money invested in the school system is wasted when school buildings, equipment and facilities are left to deteriorate without giving proper attention. Similarly, Balogun (2019) submitted that no effective education programme can exist without equipment for teaching. This is because facilities enable teachers to teach well. Puffa (2018) asserted that school equipment and facilities when provided will aid teaching/learning programme and consequently improve academic achievement. While Pangrazi and Dauer (2019) proffered some reasons why physical and health education teachers often preferred teaching other subjects, among which are lack of equipment in the schools for practical lessons and the exposure of physical education teachers to hardships often caused by this. In the views of Emetarorn (2021) facilities are an indispensable weapon for the teaching and organization of physical education at any level and as such, the government and institutions concerned should place much premium on this issue. In addition, Amuchie (2018) noted that adequate equipment and facilities are essential for modern programme of physical education. He emphasized that Bails, bats, ropes, the football field, volleyball and basketball courts among others are educational tools just as much as

books, amps, pen, ink and ruler. They must, therefore, be supplied in sufficient quantities to ensure that each child has opportunity for action and developing skills if physical education is to produce satisfactory results.

Public finance of secondary schools has been described as the collection and disbursement of funds for public school use (Jaiyeoba & Atanda, 2019). It has also been regarded as the financial activities of public authorities in terms of taxing, spending, borrowing and lending and it involves the means of providing for the expenditure involved in the staffing, equipment and maintenance of educational institutions (Eke, 2018). The funding of education as an aspect of public finance embraces all aspects of funding of education including the sources of funding and how the money earmarked for education is spent especially for the purchase of goods and services of men and materials Emetarorn (2021). Thus, the financing of education is a vital area of ensuring that physical education is well taught (Asiyai. 2022). The importance of adequate landing of education cannot be underestimated. (Eke 2018) argued that no organization could carry out its functions effectively without adequate financial resources at its disposal. He submitted that money is needed to pay staff, provide the needed facilities, maintain the plant and keep the services going. Consequently, inadequate funding is one of the obstacles to the effective management of secondary education in the country. According to Aghenta (2021), the success of any secondary school depends upon the resources available to it. Money is very important in this respect because, by it all other vital elements in the school can be achieved, such as school building, purchase of equipment, payment of teachers' salaries and allowances and running expenses. Atandaand Lameed (2021) emphasized that the rapid expansion of students' enrolment in Nigeria since the attainment of independence followed by the enrolment

explosion in recent years has made education a thorny responsibility for government to shoulder. Hence, inadequate funding has resulted in poor teaching and dilapidated buildings (Omoregie, 2021). There is no doubt whatsoever, that the inadequate funding of the secondary school system in the country has hindered the accomplishment of some of the aims and objectives of this level of education as contained in the National Policy on Education. Thus physical education requires huge spending in many areas like provision of equipment, building a sporting arena, paying workers, providing first aid care to people, giving health talks and so on. These areas have been neglected and it poses a mayor problem for the effective teaching of physical education. According to Ajayi (2018) most of the Nigerian secondary schools are dilapidated due to inadequate funding while most tertiary institutions are living in their past glories. Such a situation he opined, hinders effective teaching and learning, making the process rigorous and uninteresting to students and teachers. Therefore, there can be no overestimation on what adequate funding can do to improve the status of facilities and equipment for physical education theory and practical lessons (Atanda & Lameed, 2021).

In recent lime, leaching of physical and health education by teachers in junior secondary schools is at the lowest ebb especially the public secondary schools in Anambra East locai government area of Anambra State; this may not be unconnected with the attitude of school authorities and government who have shown little or no interest in sports and physical activities by failing to provide facilities and funds. This has affected the interest and enthusiasm of physical and health education teachers with the resultant effect being that of low interest in ihe teaching of the subject in public secondary schools. Therefore, the purpose of this study is to examine facilities and funding

as indices for effective teaching of physical and health education in junior secondary schools in Anambra Fast local government area of Anambra State.

Hence, in view of the aforementioned problems, this study seeks to provide answers to the following research questions:

Research Questions

- i. Are there adequate facilities for effective teaching of physical and health education in the junior secondary schools in Anambra East local government area of Anambra State?
- ii. What is the level of funding of physical and health education in the junior secondary schools in Anambra Fast local government area of Anambra. State?

Methodology

The study employed descriptive survey research design in addressing the research problem from

S/N	Item	Always	Occasionally	Hardly	Never	X ² cal	X ² crit	Df	P
	We have all the facilities for physical and health education practical	1,541.7%	1,850.0%	38.3%	-				
	Practical rooms are substituted for other purposes in my school	12.8%	25.6%	13	20				
	All participating students have access to all required equipment, particularly sporting activities			36.1%	55.6%				
	Students are allowed to use some of the equipment to practice	-		19	17				
				52.8%	47.2%	29.667	12.592	6	0.000
		16	719.4%	7	6				
		44.4%		19.4%	16.7%				

Source: Author's Computation (2023) (x²cal=29.667, x² crit=12.592. df- 6. p>0.05)

The table above shows that facilities play significant role for effective teaching of physical and health education in junior secondary schools in Anambra East, local government area of Anambra State. Therefore, the null hypothesis that facilities does not have a significant effect on the teaching of physical and health education in junior secondary school is hereby rejected.

S/N	Item	Always	Occasionally	Hardly	Never	X ² cal	X ² crit	Df	P
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the study location. The research used purposive sampling technique to sample a total of 25 PHF location. The research adopted questionnaire to elicit information from the respondents. A set of statistical tools such as chi-square and descriptive statistics were used to test the validity of the hypotheses at 0.05 level of significance.

Data Presentation and Discussions

Research Question 1: Are there adequate facilities for effective teaching of physical and health education in (he junior secondary schools in Anambra East local government area of Anambra State.

Table 1: Chi-square table showing facilities as indices for effective teaching of physical education in public secondary schools in Anambra East local government area of Anambra State.

Research Question 2: What is the level of funding of physical and health education in the junior secondary schools in Anambra East local government area of Anambra State?

Table 2: Chi-square table showing funding as index for effective teaching of physical education in junior secondary schools in Anambra East local government area, Anambra

Government usually renovate our sporting complex	55.6%	38.9%	5.6%						
Government has no time for PHE in schools	-	5.6%	50.0%	44.4%	19.222	16.919	9	0.024	
Government supplied new sporting equipment to my school	72.2%	25.0%	2.8%						
PHE is considered less valued subject, so government usually do not fund it.	27.8%	36.1%	22.2%	13.9%					

Source: Author's Computation (2023) (x²cal=19.222, x² crit=16.919. df- 9. p>0.024)

The table above shows that funding is an index for effective teaching of physical education in junior secondary schools in Anamhra East, local government area of Anambra State. Hence, the null hypothesis is hereby rejected.

Discussion

Facilities will not be an index for effective teaching of physical education in junior secondary schools in Anambra East local government area of Anambra State. The result in Table 1 revealed that facilities is an index for effective teaching of physical education in junior secondary schools in Anambra East local government area of Anambra State. The result corroborated the findings of Omoregie (2021) who posited that lack of adequate facilities and equipment is one of the problems facing the teaching of physical education in secondary schools in Nigeria. He further posited that sports facilities and equipment in secondary schools are grossly inadequate. He therefore concluded that in order to achieve attainment in physical education in public secondary schools, there is need to improve on the facilities and equipment. Obiyemi and Abayomi (2021) have warned that for sports and physical education programmes to be successful, the desired facilities, equipment and supplies must be made available.

Funding will not be an index for effective teaching of physical education in junior secondary schools in Anambra Hast local government area of Anambra State. The result on table 2 showed that funding is an index for

effective teaching of physical education junior secondary schools in Anambra East local government area of Anambra Suite. This finding is in agreement with Ahenta (2021) who submitted that the success of any secondary school depends upon the resources available to it. Similarly, Omoregie (2021) opined that inadequate funding has resulted in poor teaching and dilapidated buildings while, Emetarorn (2021) posited that there can be no overestimation on what adequate funding can do to improve the status of facilities and equipment for physical education theory and practical lessons.

Conclusion

Base on the findings of this study, it has been established that facilities and funding are not only critical but fundamental to the effective teaching of physical education in public secondary schools in Anambra East local government area of Anambra State.

Recommendations

In view of the results of the survey findings, the following recommendations are hereby made:

- Adequate facilities should be provided in order to achieve effective teaching of physical and health education in junior secondary schools in Anambra Cast local government area of Anambra State, Nigeria.
- Funds should be made readily available to facilitate effective teaching of physical and health education especially in public junior secondary schools in Anambra East government area of Anambra State. Nigeria.

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Impact of Nursery Education on Children with Special Needs in Awka South Education Zone of Anambra State

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Abstract

This study investigated “Impact of nursery education on children with special needs in Awka South Education Zone, of Anambra State.” Four research questions were formulated to guide the study. The target population is six hundred and seventy (670) teachers from the sixty-seven (67) nursery/primary schools in Awka South Local Government Area of Anambra State. The total sample of two hundred (200) teachers was randomly selected; ten (10) teachers each from the twenty (20) selected nursery/primary schools in Awka South Local Government Area of Anambra State. This study adopted a descriptive survey design. A structured questionnaire which had the reliability of 0.87 after the pilot study was used as instrument for collection of data. Data collected were analysed using mean and standard deviation. The findings among others were that nursery schools help identify developmental delays or disabilities early, and also provides opportunities children with special needs to interact with peers and develop friendships among others. Children with special needs are faced with several problems which includes shortage of funds, dearth of special education teacher, shortage of instructional materials, negative attitude of the public towards children with special needs and inequality educational opportunity for children with special education. To solve these problems, the government should provide funds for children with special needs in nursery schools, and also public should have positive attitude towards them among others. It was concluded that the prospects of children with special needs in nursery schools were bright and better in the future. Finally, it was recommended that the general public should be sensitized to have a positive thought towards children with special needs. Also, special nursery schools should be built for the children with special needs.

Keywords: Education, Nursery School Education and Children with Special Needs.

Introduction

Education is an instrument for change and development. Any change that is needed to be made, should be inculcated to the members of the society through education. The Federal Republic of Nigeria in her National Policy on Education (2013) described education as an instrument par excellence for effecting natural development. Onyeanu (2011) pointed that

education is an excellent tool for national development. Similarly, Hornby (2016) defined education as a process of learning, training and teaching especially in schools or colleges to improve knowledge and skill. Anyaogu (2010) saw education as the instrument that transforms people’s culture, norms, accepted values and custom which are transformed from one generation to another. Education goes beyond

literacy alone. It includes the acquisition of functional skills, moral identity, ambition to succeed in life and improve the science and technology in the society. Offorma (2012) stressed that education is the process of providing information to an inexperienced person to help him or her develop physically, mentally, socially, emotionally, spiritually and economically.

In Nigeria, there are different categories of education system such as pre-primary, primary education, secondary education, teacher education and higher education (National Policy on Education, 2013). Pre-primary/Nursery education is the education given in an educational institution to children prior to their entering the primary school. It includes the crèche and the kindergarten (Nnadozie, 2013). Nursery education in Nigeria can be traced back to the colonial days when it was meant for children of colonial officials. According to Nwuzor, et al (2010), in the 1960s, the number of such institutions was created as a result of the influence of the children of various European and American citizens working in different parts of the country. With various economic changes, following rapid independent development in Nigeria, and increase in the rate at which married women pick up jobs here and there in order to help the husband makes both financial ends meet, parents began to see the need to send their children to nursery schools where these children would be taken care of before the mother returns from work and where they would also learn in preparation for entering the primary schools (Oraegbunam, 2013). The need for Nursery education was highly felt in the recent years when the federal government launched the universal primary education scheme, which liberalized education, and it was possible for every child to go school without bothering about the school fees (Okorie, 2014).

The purpose of nursery education, according to National Policy on Education (2013) was to: effect a smooth transition from the home to the school, prepare the child for primary level of education, provide adequate care and supervision for the children while their parents are at work, inculcate social norms, inculcate in the child the spirit of enquiry and creativity through the exploration of nature, the environment, art, music, playing with toys and the likes, develop a sense of co-operation and team-spirit, learn good habits, especially good health habits, teach the rudiments of numbers, letters, colours, shapes, and informs through play. The Nursery education is meant for children who are either physically challenged or healthy. Children with special needs are those children who have learning difficulties because of different kind of handicaps such as blindness, partial-sightedness, deafness of hearing, mental retardation, social maladjustment, limb deformity or social position later life (Ezejiegwu, 2018). Special education was defined by Mba (2019) as ideal general education in which individual differences are considered and provided for. These differences may manifest in children’s abilities, aptitudes, learning styles and motivation to learn. These variable factors make it necessary that appropriate instructional techniques should be designed to meet the ascertained need of each learner. Denga (2017) posited that special education is education of exceptional children or children with special needs. The exceptional children who benefit from special education practical includes the deaf, blind, mentally retarded, gifted, among others. Special education is an education within general education designed not only to prevent, reduce or eliminate all the conceptions that produce significant defects in all round functioning of exceptional persons, but also designed to render specialized services directed

towards meeting the individual needs of exceptional persons (Okeke, 2010). In a nutshell, special need education is a unique form of education for the physically challenged persons of all sorts. The goal is to have each person become self actualizedas he achieve his objectives and contributes his quote to the development of the country (Mba, 2019).

Nursery education plays a crucial role in the development of children with special needs. It provides early intervention, structured learning, and social interaction during the most important stage of brain development. Nursery schools help identify developmental delays or disabilities early. Teachers trained in early childhood education can observe challenges in speech, motor skills, behavior, or learning patterns. Early intervention programmes supported by organizations like UNESCO emphasize that addressing difficulties at a young age significantly improves long-term outcomes (Flores-Buils, et al., 2022). Nursery education improves language and communication skills, betters cognitive development, and reduces severity of learning difficulties over time. Children with special needs often face challenges in social interaction. Nursery education provides opportunities to: interact with peers, develop friendships, learn sharing and cooperation, and build confidence and self-esteem. Inclusive nursery settings promote acceptance and reduce stigma (Nanyunja, 2022). For children with speech or language delays, nursery environments encourage their verbal expression, listening skills, and use of use of gestures or assistive communication tools. Interaction with teachers and peers supports faster communication development (Beighton, & Wills, 2017). A nursery provides routine and structure, which is especially beneficial for children with autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder

(ADHD), and intellectual disabilities. Structured activities improve focus, independence, and adaptive behaviour. Many nursery programmes create individualized education plans (IEPs) tailored to each child's needs. These plans set realistic goals, adapt teaching methods, and provide specialized therapies (speech, occupational, behavioral). This personalized approach ensures better academic and developmental progress.

Despite the goals of special needs education, children with special needs in nursery school are grapple with some educational problems. Some of the factor that militating against the children with special needs in nursery schools include lack of personal teachers. Okeke (2010) opined that there is shortage ofadequate trained teacher to teach special needs. Those teachers available are not experts in the field of special education. To that end, quacks and individuals who red general education are employed to do the job of special education. Lack of finance is another factor. According to Mmaduakonam (2018), children with special need in nursery school require special educators and other infrastructural facilities to forge ahead. Nevertheless, funds are not made available for this. The much made available by the government is hardly utilized. There are also inadequate teaching materials for teaching the children with special needs. Most of nursery schools lack the instructional materials meant for the teaching of children with special needs. Some nursery school use the instructional materials meant for teaching the other children in the nursery school to teach the children with special needs. Also, there is negative attitude of healthy children towards the children with special needs. According to Umezulike and Eneasator(2012), many learners associate handicap with evil. The negative attitude of people toward children with special needs in

nursery school affects the psychological makeup of the children with special needs. In some nursery schools, they are regarded as parasite that cannot fend for themselves. There is factor of inequality of educational opportunities in nursery schools between normal children and those with special needs. According to Ezejiegwu (2018), in some nursery schools, children with special needs are often asked to join the educational institutions established for the so called normal persons without considering their peculiarities and conditions. When the normal children and children with special needs are blended together, it will not give room for the children with special needs to follow their lesson properly.

Furthermore, the study examinedthe impact of nursery education on children with special needs in Awka South Education Zone, of Anambra State. No similar study has been carried out in this Local Government. Hence the researcher seeks to bridge this existing gap.

Statement of the Problem

Education is the bedrock of any nation. The Universal Basic Education made it compulsory for all the children to have equal and basic education. But in nursery schools, children with special needs were not given equal right to quality education. They are being deprived the equal opportunity to quality education. In some nursery schools, children with special needs lack access to instructional materials specially meant for handicapped children.Some children with special needs in nursery schools lack special education teachers. These make such children in nursery school to lack basic education. Also, children with special needs were discriminated by the normal children in nursery schools due to their health challenges. This issue makes most of nursery schools to use teaching gadgets meant for teaching normal children. In nutshell, children

with special needs in nursery school are faced with social and academic problems. And these problems make them perform poorly in those schools. These existing problems triggered the research to embark on this study.

Purpose of the Study

The general purpose of this study is to examine the impact of nursery education on children with special needs in Awka South Education Zone, of Anambra State. Specifically, the study sought to: 1.find out the impact of nursery education on children with special needs in Awka South Local Government Educational Zone, of Anambra State. 2.discover the problems affecting the children with special needs nursery school education in Awka South Local Government Educational Zone, of Anambra State.

3.ascertain the solutions to the problems affecting the children with special needs nursery school education in Awka South Local Government Education Zone, of Anambra State.

4.determine the prospects of children with special needs in nursery schools in Awka South Local Government Education Zone, of Anambra State.

Significance of the Study

The findings of the study will be beneficial to the following: parents, teachers, government, ministry of education, pupils and future researchers. The findings of the study will make the parents to know that children with special needs are grappled with some problems at their nursery education. It will make the parents to avoid any activity that will lead them to have handicapped children in their family.

The findings of the study will make the teachers,

especially special education teachers to handle children with special needs very well in their classroom. It will make them to adopt appropriate teaching methods while teaching the children with special needs.

The findings of the study will make the government to provide adequate funds for equipping the nursery schools where the children with special needs are studying. It will make the government to build many nursery schools for children with special needs.

The findings of the study will make the ministry of education to train more teachers of special education who will teach in nursery schools.

The findings of the study will make the children not to discriminate against those with special needs. Instead, they will assist them in the school.

Finally, the findings of the study will be valuable to future researcher. It will serve as a springboard for their research work, because it will provide them with material to build up the foundation of their research work.

Scope of the Study

The scope of the study covers the impact of nursery education on children with special needs in Awka South Education Zone, of Anambra State. The content scope of the study include to find out the problems effecting the children with special needs nursery education; to find out the solutions to the problems effecting the children with special needs nursery education and to determine the prospects of children with special needs in nursery schools in Awka South Local Education Zone, of Anambra State.

Research Questions

The following research questions were

formulated to guide the study:

- 1. What are the impact of nursery education on children with special needs in Awka South Local Government Educational Zone, of Anambra State?
- 2. What are the problems affecting the children with special needs nursery school education in Awka South Local Education Zone, of Anambra State.
- 3. What are the solutions to the problems affecting the children with special needs nursery school education in Awka South Local Government Education Zone, of Anambra State?
- 4. What are the prospects of children with special needs in nursery schools in Awka South Local Government Education Zone, of Anambra State?

Methodology

The research design adopted for this study was survey research design. According to Nworgu (2006) survey design is one in which a group of people or items are studied by collecting and analyzing data from only a few people or item considered to be representative of the entire group. This design is considered appropriate because it was used to elicit responses from nursery school teachers on impact of nursery education on children with special needs in Awka South Education Zone, of Anambra State, as the study area. The target population was six hundred and seventy (670) teachers from the sixty-seven (67) nursery/primary schools in Awka South Local Government Area of Anambra State.

The total sample of two hundred (200) teachers was randomly selected; ten (10) teachers each from the twenty (20) selected nursery/primary schools in Awka South Local Government Area of Anambra State. The data collection instrument used was a questionnaire designed by

the researcher. It was divided into two sections (A and B). Section A was for collection of information on personal data of respondents while Section B consisted of questions drawn from the research questions that elicited responses from the respondents with response options: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly disagree (SD).

To ensure the face validity and content validation of the study, the research instrument was scrutinized by an expert in measurement and evaluation department and two experts in early childhood care and education department, both in NwaforOrizu College of Education, Nsugbe. Their comments and criticisms were effected to ensure that the instrument measure what it purposed to be measured.To determine the reliability of the instrument, the correlation coefficient between the data obtained from the tests was ascertained using Pearson Product Movement Correlation Coefficient and the value of 0.87 was obtained which was considered high enough for reliability of a survey research instrument.

The researcher distributed 200 copies of the questionnaires to the respondents with the aid of a staff assistant in each school. The respondents were given time to fill the questionnaires and were collected at the spot. The data collected were used for data analysis. The response to the questionnaire items was analyzed using mean and standard deviation. The mean less than 2.50 was disagreed. While the mean of 2.50 and above was agreed.

Results

Research Question 1: What are the impact of nursery education on children with special needs in Awka South Local Government Educational Zone, of Anambra State?

Table 1: Mean and Standard Deviation Rating the teachers on impact of nursery education on children with special needs

N = 200					
S/N	Item	? fx	$\bar{X}$	SD	Decision
1	Nursery schools help identify developmental delays or disabilities early	681	3.44	0.73	Accepted
2	Nursery education provides opportunities children with special needs to interact with peers and develop friendships	684	3.41	0.70	Accepted
3	For children with speech or language delays, nursery environments encourage their verbal expression	685	3.42	0.72	Accepted
4	Nursery provides routine and structure, which is especially beneficial for children with dis abilities	682	3.43	0.77	Accepted
5	Nursery programmes create individualized education plans which ensures better academic and developmental progress.	684	3.41	0.66	Accepted

Source: (Researcher’s Field Survey, 2023).

Table 1 shows that items 1-5 with their mean and corresponding standard deviation of 3.44(0.73), 3.41(0.70), 3.42(0.72), 3.43(0.77), and 3.41(0.66) were all accepted. This was because, they were up to and above the accepted mean level of 2.50 respectively. Thus, the result shows that nursery schools help identify developmental delays or disabilities early, and also provides opportunities children with special needs to interact with peers and develop friendships. For children with

speech or language delays, nursery environments encourage their verbal expression and provides routine and structure, which is especially beneficial for children with disabilities. It individualizes education plans which ensures better academic and developmental progress.

Research Question 2: What are the problems affecting the children with special needs nursery school education in Awka South Local Government Educational Zone, of Anambra State?

Table II: Mean and standard deviation rating the problems affecting the children with special needs nursery school education

N = 200					
S/N	Item	? fx	$\bar{X}$	SD	Decision
6	Inequality educational opportunities	687	3.44	0.69	Agreed
7	Death of special education teachers	683	3.41	0.75	Agreed
8	Shortage of fund for their educational support	692	3.46	0.66	Agreed
9	Negative attitudes of the public towards children with special needs	695	3.47	0.67	Agreed
10	Shortage of their instructional materials	700	3.50	0.64	Agreed

Source: (Researcher’s Field Survey, 2023).

Table 2 shows that items 6-10 with their mean and corresponding standard deviation of 3.43(0.69), 3.41(0.75), 3.46(0.66), 3.47(0.67), and 3.50(0.64) were all accepted. This was because, they were up to and above the accepted mean level of 2.50 respectively. Therefore, the result implies that inequality educational opportunities and death of special education teachers among others are the problems affecting the children with special needs nursery school education in Awka South Local Government Education Zone,

of Anambra State.

Research Question 3: What are the solutions to the problems affecting the children with special needs nursery school education in Awka South Local Government Education Zone, of Anambra State?

Table III: Mean and standard deviation rating the solutions to the problems affecting the children with special needs nursery school education

N = 200					
S/N	Item	? fx	$\bar{X}$	SD	Decision
11	For effective inclusive education, normal children should be taught not to discriminate against the children with special needs	683	3.41	0.74	Agreed
12	Government should provide necessary instructional materials for the education of children with special needs	681	3.40	0.70	Agreed
13	Government should provide funds for the education of children with special needs in nursery schools	685	3.42	0.75	Agreed
14	Public should have positive attitude towards children with special needs in nursery schools	685	3.42	0.77	Agreed
15	Government should train and recruit special education teachers in all nursery schools	684	3.42	0.68	Agreed

Source: (Researcher’s Field Survey, 2023).

Table 3 shows that items 11-15 with their mean and corresponding standard deviation of 3.41(0.74), 3.40(0.70), 3.42(0.75), 3.42(0.77), and 3.42(0.68) were all accepted. This was because, they were up to and above the accepted mean level of 2.50 respectively. Hence, the result indicates that for effective inclusive education, normal children should be taught not to discriminate against the children with special needs. Also, Government should provide necessary instructional materials for the education of children with special needs among others.

Research Question 4: What are the prospects of children with special needs in nursery schools in Awka South Local Government Area of State?

Table IV: Mean and standard deviation rating the prospects of children with special needs in nursery schools

N = 200					
S/N	Item	? fx	$\bar{X}$	SD	Decision
16	Children with special needs have talents that needed to be natured.	682	3.41	0.72	Agreed
17	They have brighter future.	685	3.42	0.73	Agreed
18	They are part of our existing society	691	3.45	0.71	Agreed
19	Children with special needs should be groomed to acquire life sustenance skills	688	3.44	0.66	Agreed
20	Children with special needs have a promising future	691	3.45	0.72	Agreed

Source: (Researcher’s Field Survey, 2023).

Table 4 shows that items 16-20 with their mean and corresponding standard deviation of 3.41(0.72), 3.42(0.73), 3.45(0.71), 3.44(0.66), and 3.45(0.72) were all accepted. This was because, they were up to and above the accepted mean level of 2.50 respectively. As such, the result connotes that the

prospects of children with special needs in nursery schools include that they have talents that needed to be natured, brighter future and are part of our existing society.

Discussion of the Findings

In research question one, it was ascertained that nursery schools help identify developmental delays or disabilities early, and also provides opportunities children with special needs to interact with peers and develop friendships among others. These findings were in line with Flores-Buils, et al., (2022) who posited that nursery schools help identify developmental delays or disabilities early which addresses difficulties at a young age that significantly improves long-term outcomes. Again, inclusive nursery education promotes acceptance and reduce stigma (Nanyunja, 2022).

In research question two, it was ascertained that problems affecting the children with special needs includes; shortage of funds, death of special education teacher, shortage of instructional materials, negative attitude of the public towards children with special needs and inequality educational opportunity for children with special education. These findings were in line with Ezejiegwu (2013) who asserted that many nursery schools that educated children with special needs lack funds to buy instructional materials needed for teaching and learning. Similarly, Umezuluike and Eneasator (2012) posited that attitude of general public towards children with special needs affect their psychological makeup.

In research question three, it was found that the problems affecting the children with special needs in nursery schools should be solved when the government provide funds for children with special needs in nursery schools, and also public should have positive attitude towards them

among others. These findings were in line with Okafor (2001) who posited that the problem of finance should be solved when the government includes children with special needs in annual budgets.

In research question four it was reviewed that children with special needs have brighter future. They are part of our existing society who can groom to acquire life sustenance skill. These findings were in line with Obikeze and Ofojebe (2010) opined that the prospects of children with special needs in nursery schools are very bright in view of the government’s renewed vigor and efforts to better the deplorable condition of children with special needs.

Conclusion

It was concluded that nursery schools help identify developmental delays or disabilities early, and also provides opportunities children with special needs to interact with peers and develop friendships. Again, children with special needs are faced with several problems which includes hortage of funds, death of special education teacher, shortage of instructional materials, negative attitude of the public towards children with special needs and inequality educational opportunity for children with special education. To solve these problems, the government should provide funds for children with special needs in nursery schools, and also public should have positive attitude towards them among others. However, it was concluded that the prospects of children with special needs in nursery schools will be bright and better in the future.

Recommendations

The following recommendations were made:
1. The general public should be sensitized to

have a positive thought towards children with special needs.

- 2. Government should train and recruit more special education teachers in the nursery schools in the country.
- 3. Parents of children with special needs should be supportive in terms of materials needed for their children’s education.
- 4. The Ministry of education should provide all the needed instructional materials to schools of the children with special needs.
- 5. Special nursery schools should be built for the children with special needs.

Contribution to Knowledge

The study contributes to knowledge in the following ways:

- 1. The research provides empirical data on how nursery education supports cognitive, social, emotional, language, and motor development among children with special needs.
- 2. The study contributes practical insights into inclusive teaching strategies used at the nursery level and also identifies effective classroom adaptations, teacher preparedness, and learning supports that enhance engagement of children with special needs.
- 3. Findings from this study can inform policymakers and educational stakeholders in improving early childhood education frameworks.
- 4. The study contributes to understanding the role of nursery education in supporting families of children with special needs.
- 5. This study contributes to existing knowledge on early childhood education by expanding understanding of how nursery education influences the developmental outcomes of children with special needs.

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Effectiveness of Virtual Reality (VR) Technologies for Disaster Preparedness and Response Mechanism

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Abstract

Disasters, both natural and anthropogenic, continue to increase globally, resulting in significant human, economic, and environmental losses. Traditional disaster preparedness and response training methods such as lectures, tabletop exercises, and field simulations often face limitations including high costs, safety risks, and logistical complexity. Virtual Reality (VR) has emerged as a transformative technology capable of addressing these limitations by creating immersive, interactive, and controlled training environments. VR allows users to experience simulated disasters in real time while practicing decision-making, situational awareness, and emergency procedures without physical risk. This paper examines the role of virtual reality in disaster preparedness and response, focusing on its applications in training emergency responders, community preparedness, disaster education, and operational decision support. The study reviews recent developments, highlighting the effectiveness, benefits, challenges, and future directions of VR-based disaster management systems. Evidence from recent studies demonstrates that VR improves learning retention, skill acquisition, and situational awareness among trainees compared to traditional training methods. However, barriers such as technological costs, usability issues, and limited infrastructure remain challenges in developing regions. The integration of VR with emerging technologies such as artificial intelligence, augmented reality, and digital twins is expected to further enhance disaster management systems. The study concludes that VR represents a promising tool for strengthening disaster preparedness and response globally.

Keywords: Virtual reality, disaster preparedness, emergency response, disaster simulation, immersive

Introduction

Disasters, both natural and human-induced, pose significant threats to life, infrastructure, and societal resilience worldwide. Effective disaster preparedness and response require comprehensive training that can simulate rare yet high-stakes scenarios without endangering participants. The increasing frequency and intensity of environmental disasters necessitate

innovative approaches to resilience and preparedness training. Virtual reality (VR) has emerged as a transformative technology for immersive simulation, enabling realistic, repeatable, and scalable training environments that can enhance readiness among professionals and communities alike (Leong, 2026). Disasters are catastrophic events that disrupt communities and cause significant human, economic, and

environmental losses. These events may occur due to natural phenomena such as earthquakes, floods, hurricanes, wildfires, and pandemics or due to human-induced incidents including industrial accidents, terrorism, and infrastructure failure (UNDRR, 2022). In recent years, the frequency and severity of disasters have increased significantly due to climate change, rapid urbanization, environmental degradation, and population growth (IPCC, 2023).

Effective disaster management relies heavily on preparedness and response mechanisms that enable individuals, organizations, and governments to react quickly and efficiently during emergencies. Disaster preparedness involves planning, training, resource allocation, and simulation exercises designed to ensure readiness before disasters occur (Alexander, 2020). Disaster response, on the other hand, refers to the immediate actions taken after a disaster to protect life, property, and the environment.

Traditional disaster preparedness training methods include classroom lectures, tabletop exercises, and large-scale physical simulations. While these approaches remain valuable, they present several challenges. Physical drills are expensive, time-consuming, and often limited in realism because they cannot fully replicate the chaotic conditions of real disasters (Smith & Jones, 2021). Additionally, real-world simulations may expose participants to safety risks and logistical constraints.

Emerging digital technologies are transforming disaster management practices. Among these technologies, Virtual Reality (VR) has gained considerable attention for its ability to create immersive simulated environments that replicate real-world disasters in a safe and

controlled manner (Radianti et al., 2020). VR enables users to interact with digital environments using specialized hardware such as head-mounted displays (HMDs), motion sensors, and haptic devices.

VR technology provides immersive experiences that enhance learning and training effectiveness by simulating real disaster scenarios. Trainees can experience earthquakes, fires, floods, or mass casualty incidents while practicing response strategies and decision-making skills. Studies have shown that immersive simulations significantly improve knowledge retention, situational awareness, and practical skills compared to conventional training methods (Makransky & Petersen, 2021).

The adoption of VR in disaster preparedness has grown rapidly over the past decade. Governments, emergency agencies, healthcare institutions, and educational organizations increasingly use VR to train emergency responders, firefighters, medical professionals, and volunteers. For instance, VR simulations have been used to train healthcare workers in managing mass casualty incidents and pandemics (Rizzo & Koenig, 2021). Similarly, firefighters use VR to practice navigating hazardous environments such as burning buildings without exposure to real danger.

Another significant application of VR is community disaster education. Public awareness and preparedness play a crucial role in reducing disaster risk. VR allows communities to experience realistic disaster scenarios, helping individuals understand risks and learn appropriate safety behaviors (Lovreglio et al., 2021).

Despite its benefits, VR implementation faces several challenges. These include high

development costs, technical limitations, user acceptance issues, and lack of standardized training protocols. Furthermore, many developing countries lack the infrastructure required for VR deployment in disaster management systems.

The aim of this study is to examine the role and effectiveness of Virtual Reality (VR) technologies in enhancing disaster preparedness and response training, with a focus on improving emergency management, decision-making skills, and disaster risk awareness, benefits and limitations, and future research directions.

Specific Objectives

1. To examine the concept and technological components of virtual reality in disaster management systems.
2. To evaluate the applications of virtual reality in disaster preparedness training for emergency responders, healthcare professionals, and communities.
3. To assess the effectiveness of VR-based simulations in improving disaster response skills and situational awareness.
4. To compare virtual reality disaster training with traditional disaster training methods.
5. To identify the benefits and limitations of implementing VR technology in disaster preparedness and response programs.
6. To explore the integration of virtual reality with emerging technologies such as artificial intelligence and augmented reality in disaster management.
7. To propose recommendations for improving the adoption of VR technologies in disaster preparedness and response training.

Research Questions

This study seeks to answer the following research questions:

1. What is the role of virtual reality technology

in disaster preparedness and response training?

2. How is virtual reality currently being applied in disaster management and emergency response training?
3. To what extent does VR-based disaster simulation improve knowledge, situational awareness, and decision-making skills among trainees?
4. How does virtual reality disaster training compare with traditional disaster preparedness training methods in terms of effectiveness and efficiency?
5. What are the major benefits and challenges associated with the implementation of virtual reality in disaster preparedness programs?
6. How can emerging technologies such as artificial intelligence, augmented reality, and digital twins enhance VR-based disaster training systems?
7. What strategies can be adopted to improve the implementation and accessibility of VR technologies in disaster preparedness and response, particularly in developing countries?

VR technologies and their role in disaster training

VR integrates high-fidelity graphical environments with interactive scenarios, allowing users to experience complex disaster contexts safely. Unlike traditional drills or tabletop exercises, VR offers situational realism and interactive decision-making tasks that better approximate real-world stress and operational complexity (Alshowair et al., 2024). Moreover, VR simulations can incorporate real-time data, environmental modeling, and adaptive feedback loops to tailor training to specific regional hazards such as floods, earthquakes, and wildfires (Leong, 2026).

Concept of Virtual Reality

Virtual Reality is a computer-generated environment that allows users to interact with simulated worlds in real time. VR systems typically consist of three main components:

1. Hardware devices (head-mounted displays, sensors, controllers)
2. Software simulation environments
3. Interaction systems enabling user engagement.

Types of Virtual Reality

Non-Immersive VR: Uses desktop screens or monitors where users interact with the virtual environment using keyboards or controllers.

Semi-Immersive VR: Uses projection systems or large screens to enhance immersion.

Fully Immersive VR: Uses head-mounted displays and motion tracking systems to create a fully interactive experience. Fully immersive VR systems are most commonly used for disaster training because they simulate realistic emergency environments.

Disaster Preparedness and Response

Disaster management consists of four key phases:

1. Mitigation
2. Preparedness
3. Response
4. Recovery

Preparedness focuses on training, planning, and risk awareness to ensure effective disaster response (Alexander, 2020).

Effective preparedness requires realistic training environments where participants can practice decision-making and coordination under stress. VR provides such environments without the logistical challenges of real-world simulations.

Applications in Professional Preparedness
Emergency Health Personnel

Recent experimental studies demonstrate that immersive VR training significantly enhances disaster preparedness knowledge, self-efficacy, and competencies among healthcare workers. For example, a quasi-experimental study involving 90 emergency nurses showed significant improvements in disaster core competencies and self-efficacy after VR-based disaster simulations (Alsager & Alhmoud, 2025). Similarly, mixed-method research on mass-casualty incident training indicates high acceptability of VR use in training simulations, suggesting improved readiness among first responders (Heldring et al., 2025).

Healthcare workers must respond effectively during disasters such as pandemics, mass casualty incidents, and chemical spills. VR allows medical personnel to simulate:

- Emergency room overload
- Triage decision making
- Pandemic outbreak response

Healthcare VR simulations enhance clinical decision-making and teamwork skills (Makransky & Petersen, 2021).

Community Volunteers and Rural Preparedness
VR training is not limited to professionals; recent work highlights its scalability and impact in low-resource settings. A large quasi-experimental trial in rural Indonesia found that volunteers exposed to VR earthquake preparedness training showed statistically significant gains in both knowledge and practical response skills compared with conventional training, with sustained effects at 3-month follow-up (Calisanie et al., 2025).

Community Disaster Education

Public education is essential for reducing disaster risks. VR allows communities to experience

simulated disasters such as earthquakes or floods. Research shows that individuals who participate in VR disaster training demonstrate higher preparedness levels compared to traditional learning methods (Lovreglio et al., 2021).

Specialized Disaster Scenarios
VR simulations have been developed for a range of disaster types. For example, immersive environments have been used to model evacuation planning and crowd behavior in complex built environments, offering insights into decision-making and egress efficiency that can inform policy and infrastructure design (Review on building evacuation research, 2024). Additionally, bespoke VR applications simulating real landslides provide educational tools that deepen spatial understanding of rarely seen hazards (Asgary et al., 2024)

Emergency Responder Training
VR is widely used to train firefighters, paramedics, police officers, and search-and-rescue teams.

Immersive simulations enable responders to practice critical tasks such as:

- **Evacuation procedures**
- **Hazard identification**
- **Victim rescue**
- **Medical triage**

Studies show that VR-based training improves response time and situational awareness among emergency responders (Rizzo & Koenig, 2021).

Advantages and Limitations
VR-based disaster preparedness exhibits several key advantages:
Realistic Simulation and immersion: VR replicates real disaster conditions such as fire, smoke, earthquakes, and floods. Users experience

dynamic environments that closely mimic real disaster contexts.

Safe Learning Environment: Participants can experience hazardous situations without physical danger.

Cost Effectiveness: VR reduces the need for expensive physical drills.

Repeatable Training and safety: Simulations can be repeated multiple times for skill improvement. Scenarios can be repeated without physical risk, benefitting novice and expert trainees alike.

Improved Learning Outcomes/ Knowledge retention: Immersive experiences enhance knowledge retention and engagement. Studies show measurable improvements in knowledge and skill retention over time compared with traditional training methods.

Table 1: Comparison of Traditional Training and VR Training

Training Feature	Traditional Training	VR Training
Cost	High	Moderate
Safety	Potential risks	Completely safe
Realism	Limited	Highly immersive
Repeatability	Limited	Unlimited
Engagement	Moderate	High

However, limitations remain. Technology access may be constrained in low-resource areas, and VR scenarios must be carefully designed to avoid oversimplification of complex real-world dynamics. Furthermore, high fidelity can require significant computational resources, and poorly designed interactions may limit behavioral transfer to real emergencies.

VR challenges
High Development Costs: Developing realistic simulations requires significant investment.

Hardware Limitations: VR equipment can be expensive and requires maintenance.

Motion Sickness: Some users experience discomfort during immersive simulations.

Limited Accessibility: Developing countries may lack the technological infrastructure required for VR training.

Integration of VR with Emerging Technologies
Future disaster training systems may combine VR

Study	Population / Scenario	Outcomes Measured	Key Findings
Alsaqer and Alhmoud. (2025)	Emergency nurses	Preparedness & self-efficacy	Significant improvements in disaster competencies and confidence post-VR training.
Nyayu et al., (2025)	Rural volunteers	Earthquake knowledge & skills	VR group showed higher preparedness / skills vs control, sustaining at 3-month follow-up.
Panel Ke Xionget al (2025)	Nurses & midwives	Acceptance & skill confidence	High acceptance and improved skill confidence with immersive VR.
Kimura et al. (2024)	Scoping review	VR disaster education	VR effective for disaster mitigation and training across settings.

Future Directions
Emerging research suggests that integrating VR with situated digital twins real-time virtual representations of environments could further enhance first-responder training by enabling adaptable and context-specific scenarios (Partarakis et al., 2025).

Continued advances in VR hardware, haptics, and multi-user networking are likely to expand collaborative disaster response training.

with:
Artificial Intelligence: AI can adapt simulations based on user behavior.

Augmented Reality: AR can overlay real-world data during training.
Digital Twins: Digital replicas of cities can simulate disaster impacts.

Integration of these technologies will improve disaster planning and response effectiveness.

Case Studies - Evidence of Effectiveness
Several empirical studies provide data on VR’s impact:

Table 2. Key VR Studies in Disaster Preparedness.

Study	Population / Scenario	Outcomes Measured	Key Findings
Alsaqer and Alhmoud. (2025)	Emergency nurses	Preparedness & self-efficacy	Significant improvements in disaster competencies and confidence post-VR training.
Nyayu et al., (2025)	Rural volunteers	Earthquake knowledge & skills	VR group showed higher preparedness / skills vs control, sustaining at 3-month follow-up.
Panel Ke Xionget al (2025)	Nurses & midwives	Acceptance & skill confidence	High acceptance and improved skill confidence with immersive VR.
Kimura et al. (2024)	Scoping review	VR disaster education	VR effective for disaster mitigation and training across settings.

Moreover, tailored applications for community engagement and public education remain promising areas for future study.

Future research should focus on:

- **Standardizing VR disaster training programs**
- **Reducing technology costs**
- **Improving accessibility in developing countries**
- **Integrating VR with real-time disaster monitoring systems**

Conclusion

Virtual reality represents a powerful tool for disaster preparedness and response across professional and community settings. Recent evidences indicate that VR enhances training effectiveness, supports improved decision-making, and fosters long-term retention of critical disaster response skills. As VR technologies continue to mature, their integration into training curricula, emergency planning frameworks, and resilience programs offers considerable potential to strengthen global disaster readiness.

Despite challenges such as technological costs and accessibility barriers, VR adoption is expected to grow as technology becomes more affordable and accessible. The integration of VR with artificial intelligence and digital twin technologies will further enhance disaster management systems.

Ultimately, VR represents a transformative innovation that can strengthen global disaster preparedness and response efforts.

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Impact of Communal Areas Management Programmes on Indigenous Resources Management in South Eastern States, Nigeria

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Abstract

The study examined the impact of communal areas management programmes on indigenous resources management in South Eastern States. Four research questions guided the study. The study adopted descriptive survey design with the population and sample size of 4000 and 2000 respondents respectively. The instrument used to obtain data was a structured questionnaire which had a reliability index of 0.75. Mean analysis was used to answer the research questions while Pearson Product Moment Correlation coefficient (r) statistics was used to test the hypothesis at 0.05 level of significance. Findings of the study among others revealed that; communal areas management programmes impact resources management in South Eastern States, communal practices promote resources management in South Eastern States, centralization of resources management and lack of trust between government and local community serves as barriers to resources management in South Eastern States, and acquisition of relevant environmental knowledge promote communal areas management programmes on resources management in South Eastern States. The paper therefore, recommended that government should seek practical involvement of the indigenous people in resources management, communal practices and knowledge systems should be encouraged in resources management, and environmental adult education should be promoted in the society.

Keywords: Communal areas management programmes, resources management, adult education and

Introduction

Over the years, debates on natural resources conservation, preservation, restoration and management strategies has been of an international concern as these has recently become a divide between nature and people oriented affairs. As a result, calls to include the concept of indigenous people participation in natural resources conservation and management have been supported by organizations like the World Bank and grassroot human right organization offering suggestion on approaches

and strategies to be used to promote indigenous people participation in natural resources management (Neuman in Ipara, Kimanzi and Odwori, 2022). The underlying theory of this indigenous people participation in natural resource management is the belief that indigenous people living in a particular area are in constant interactions with the environment and its natural resources; knowing that their livelihood depend on the environment and its resources.

In Africa, the foregoing paradigm shift has been evident in the communal areas management programme for indigenous resource (CAMPFIRE) in Zimbabwe (Metcalf, 2024). Communal areas management programmes for indigenous resources is a major global strategy of natural resources conservation and management designed to get the indigenous people involved and committed towards the management of the natural resources. According to Ipara (2023) communal area management programmes are programmes mounted to help rural communities in the management of natural resource with in their area for their local development. Implicit in this, is that indigenous people who are direct owner or beneficiary of natural resources manage it better, effectively and efficiently with the help of indigenous knowledge and resources. Hence, integration of indigenous people in natural resources management not only minimizes the cost of law enforcement and policing, and minimizes negative impact associated with the "fence and fine's" approach as well as other management members but also enhances community access to benefits accruing from the management. Burgess (2023) observed that devolving control of natural resources to indigenous people improves livelihood access to and management of the natural resources thereby improving the resource base and benefits of indigenous people. Similarly, Clarabute (2023) observed that communal areas management programmes give the indigenous people sense of belonging and enables them share relatedness and support perpetual growth of themselves and their environment. This maintains that communal area management programmes must be radically reconceived so as to be more fundamental to the resident or occupants of communities from all social classes to participate in the management of the natural resources.

According to Kipkeu, Nwangi, and Njogu (2024) communal area management programmes are based on the premises that if indigenous people participate in resources management, then the 'win-win' scenarios will arise where by resources is conserved and managed at the same time as community welfare improved. This shows that indigenous people conservation and management activities have the ultimate goal of maintaining resources management while simultaneously aim at improving the socio-economic status of human communities.

Communal area management programme for indigenous resources is an approach to natural resources management that involves the full participation of indigenous people and local communities and resources users in decision-making activities and the incorporation of local institution, customary practices and knowledge systems in management, regulatory and enforcement processes (Ipara, 2023). Under this approach, community-based monitoring and information system are initiative of indigenous people and local community organizations to monitor their communities well-being and the state of their territories knowledge and innovative tools and approaches.

Since 1990s, communal area management programmes has been implemented across the developing world. This has continued to be an important and expanding conservation strategy and provides potential platforms that other conservation and management strategies are built upon. Despite the plausible nature of the communal area management programmes as a fundamental factor in ensuring that indigenous people are guaranteed benefits. Communal area management programmes have constraints in various areas. Tosun (2020) identified limitations to communal area management programmes in decision making process and benefit sharing. He classified these limitations into three categories

namely; operational, structural and cultural.

Operational level: At the operational level, the government centralized the natural resource management at the national level. All decision regarding, implementation and monitoring of natural resources are made at a national level with minimal or no input from the indigenous people. Only a few areas, whose decision maker at the national level may have interest, may experience while other regions are neglected. Akama, Maingi and Camarco (2021) observed that despite what communal area management programmes hold in potential for natural resource management, it is geographically advantages to few areas with special interest. Oketch (2023) attributed this to the absence of appropriate land use policy and procedures governing the location and distribution of natural resources. This shows that even areas considered to be developed in terms of exposure, natural resource management are hindered by the nature of the government. Kibicho (2023) observed that lack of trust between the government and the indigenous people weak participation in the communal areas management programmes thereby not achieving the desired results.

Structural limitations: At this level, the appropriate legal system especially on the matters regarding land ownership where initiatives are registered as Community Based Organization (CBOS) associations trust or limited companies with various land ownership tenures and without a definite land use policy (Manyara and Jones, 2022). This make it easy to convert land for agriculture and conservation for building etc. lack of trained human resources and expertise (i.e. appropriate knowledge or education) among the indigenous people limits participation in the communal area management programmes for natural resources management.

Cultural limitations: At this level, lack of awareness and information hinder most indigenous people from participating in the communal area management programmes put forward for participation in natural resources management. Lack of inspiration and low level of awareness among the indigenous people has been attributed to a history of ignoring the grassroot in decision making (Tosun, 2020; Mensah, 2022). Also, Blackstock (2005) observed that heterogeneous nature of community is a constraint to the participation of the indigenous people in communal area management programmes in their management of the natural resources within their area.

Statement of the Problem

Natural resources management is the management of natural resources such as land, water, soil, plant and animals with a particular focus on how management affects the quality of life for both presence and future generations. It deals with managing the way in which people and natural landscape interact. It bring together natural heritage management, land use planning, water management, biodiversity conservation and the future sustainability of industries like agriculture, mining, tourism, fisheries and forestry. It recognizes that people and the livelihood rely on the health and productivity of landscape, and their actions as stewards of the land, play a critical role in maintaining this health and productivity. This is therefore, the reason for this study which examines the impact of communal area management programme for indigenous resources management in South Eastern States, Nigeria.

Aim/ Objectives of the Study

The aim of the study is to investigate the impact of communal area management programmes on indigenous resources management in South Eastern States, Nigeria. Specifically, the objectives are to:

1. ascertain how communal area management programmes impacts resources management in South Eastern State.
2. find out how communal practice promotes resource management in South Eastern States.
3. find out constraints to communal area management programmes for resource management in South Eastern States.
4. ascertain how acquisition of relevant environmental knowledge promotes communal area management programmes for resource management in South Eastern State.

Research Questions

The study was guided by the following research questions:

1. In what ways can communal area management programmes impact resources management in South Eastern States?
2. How does communal practice promote resources management in South Eastern States?
3. What are constraints to communal area management programmes on resources management in South Eastern States?
4. How does acquisition of relevant environmental knowledge promotes communal area management programmes on resources management in South Eastern State?

Research Hypothesis

The study was guided by one null hypothesis:

Ho₁: There is no significant relationship between the communal area management programmes and natural resources management in South Eastern States.

Methodology

The study adopted descriptive survey design. The study was carried out in two states in South

Eastern states (Anambra and Imo States) with the population of 2592 and 1408 farmers consisting of members of Igwebuike Cooperative farmer society and Nneoma Cooperative Farmers Society from the two states respectively, totaling 4000 farmers. The study covered only fifty percent (50%) of the total population. Nkpa in Nnamuma 2022 emphasized that if population is fairly large, that percentage sample size will be enough. Therefore, the sample size is 2000 farmers.

The instrument for data collection was the questionnaire titled: Impact of Communal Area Management Programmes on Indigenous Resources Management (ICAMPIRM) in South Eastern States developed by the researcher. The instrument ICAMPIRM consisted of section A and B. Section A contains demographic characteristics of the respondent, while section B consists of 16 items in four clusters from which the research questions were answered. The questionnaire seek the opinions of the farmers on the impact of communal areas management programmes for indigenous resources management in south eastern states. The items were structured on a 4-point likert-type scale of Strongly Agreed (SA)--4points, Agree (A)--3points, Disagree (D)--2points, and Strongly Disagree (SD)--1point.

The instrument was validated by two experts in measurements and evaluations from Nwafor Orizu College of Education Nsugbe, Anambra State. The reliability was established through test-retest technique of which the reliability coefficient was 0.75 of Pearson Product Moment Correlation Coefficient. The questionnaire was analyzed using frequency counts and mean. The pooled mean where used to answer the research questions while the null hypothesis was tested at 0.05 levels of significance using x2 statistics.

Example: $x = \frac{\sum fx}{\sum f} = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.50$

Cut off point = $2.50 + 0.05 = 2.55$: accepted
Rejected: $2.50 - 0.05 = 2.45$

$$X^2 = \frac{(O-E)^2}{E}$$

Research Question1: In what ways do communal areas management programme impact resources management in south eastern states?

Table1: Distributions of respondents according to their responses on impact of communal areas management programmes.

S/N	The impact of communal areas management programmes.	SA	A	D	SD	Total	$\bar{X}$	Decision
1	Communal areas management programmes get indigenous people involve in resources management.	4476	2328	126	42	6972	3.5	Agree
2	Communal areas management programmes get indigenous people committed to resources management.	4348	2037	356	56	6799	3.4	Agree
3	Communal areas management programmes gives the indigenous people sense of belonging in the management of their resources.	3992	2619	158	50	6819	3.4	Agree
4	Communal areas managements improve resources base and benefits of indigenous people.	3116	1623	648	356	5743	2.9	Agree
Pooled mean							3.3	Accepted

Table1, shows the calculated mean values generated from the respondent which reflected their weighted responses on the impact of communal areas management programmes on resources management. Items number 1, 2, 3 and 4 with weighted mean scores of 3.5, 3.4, 3.4 and 2.9 respectively which are above the cut off mean of 2.5 revealed that communal areas management programmes impacts resources management with a pooled mean of 3.3, it

established that communal areas management programme impacts resources management in South eastern states.

Research Question 2: How do communal practices promote resources management in south eastern states?

Table 2 : Distributions of respondents according to their responses on Communal practices and resources management.

S/N	Communal practice and resources management	SA	A	D	SD	Total	$\bar{X}$	Decision
5	Communal practices regulate resources usage.	3848	2349	182	16	6543	3.3	Agree
6	Local institutions like age grade practices enforces land use system.	3876	2703	106	77	6762	3.4	Agree
7	Customary practices like sanctuary promote conservation of natural resources.	3060	1551	600	368	5779	2.9	Agree
8	Community organizations like farmers cooperative promote monitoring of natural resources management.	1376	1758	940	600	4674	2.3	Disagree
Pooledmean							3.0	Accepted

Table 2, presents the communal practices for resources management. Items 5 with weighted

means 3.3, which is above 2.5 cut off mean indicated that communal practices regulate

resources management. Similarly, item number 6 and 7 revealed weighted mean 3.4 and 2.9 respectively. The result implies that local institutions and customary practices promote resource management. Conversely item 8 which recorded weighted mean scores of 2.3 were rejected as the score is below 2.5 cut off mean. This shows that organizations like farmers cooperatives do not promote monitoring of resources management in south eastern state. With the pooled mean of 3.0 recorded in research question 2. It is accepted that communal

practices promotes resources management in south eastern state.

Research Question 3 : What are the constraints to communal areas management programmes on resources management in south eastern states?

Table 3: Distributions of respondents according to their responses on constraintsto communal areas management programmes on resources management.

S/N	Constraints to Communal areas Management on resources management	SA	A	D	SD	Total	$\bar{X}$	Decision
9	Centralization of natural resources management is a constraints in communal areas management programmes on resources management	4664	1722	286	117	6789	3.4	Agree
10	Lack of trust between the government and community is a barrier to communal area management programmes on resources management.	3916	2193	252	164	6665	3.3	Agree
11	Land ownership system without definite land use policy is a constraints to communal area management programme on resources management.	3848	2703	114	80	6745	3.4	Agree
12	Culture is a barrier to communal area management programmes on resource management.	3204	2313	446	205	6168	3.1	Agree
Pooledmean							3.3	Accepted

Table 3 , revealed that items 9, 10, 11 and 12 generated weighted mean scores of 3.4, 3.3, 3.4 and 3.1 respectively. This implies that centralization of natural resources management constraints resources management. Also, lack of trust between government and the local communities is a barrier to communal areas management programme on resources management. Furthermore, land ownership system and culture are also problems to communal areas management programmes on resources management.

of resources management, lack of trust between government and indigenous people, land ownership system and culture are constraints to communal areas management programmes on resource management in south eastern states.

Research Question 4: How does acquisition of relevant environmental knowledge promote communal areas management programmes on resources management in south eastern states?

Table 4 : Distributions of respondents according to their responses on acquisition of relevant environmental knowledge on resources management.

With pooled mean of 3.3 recorded in research question three. It is accepted that centralization

S/N	acquisition of relevant environmental knowledge on resources management	SA	A	D	SD	Total	$\bar{X}$	Decision
13.	Environmental literacy is a requisite in communal areas management programmes in resources management.	2564	1761	847	347	5522	2.8	Agree
14	Environmental adult education empowers one with the right skills to tap from the environment sustainably	2460	2415	668	246	5789	2.9	Agree
15	Tree planting is a practice in resources management	1847	2160	1118	259	5385	2.7	Agree
16	Conservative tillage is an environmental knowledge for resources management	2928	1932	700	277	5828	2.8	Agree
Pooledmean							2.8	Accepted

Table 4, shows how acquisition of relevant environmental knowledge promote communal areas management programmes on resources management in south eastern states. From the table, items nos 13, 14, 15, and 16 recorded weighted mean scores of 2.8, 2.9, 2.7 and 2.9 respectively. These mean scores are all above the cut off mean of 2.5 and were all agree. The analysis shows that acquisition of relevant environmental knowledge promotes communal areas management programmes on resources management through environmental literacy, environmental adult education, tree planting and conservative tillage. A pooled mean of 2.8 recorded on the research question suggests that acquisition of relevant environmental knowledge promote communal areas management programme on resources management in south eastern states.

Test of Research Hypothesis
Hypothesis: There is no significant relationship between the communal areas management programmes and natural resources management.

Table 5: Communal areas management programme and natural resource management.

	N	DF	Level %	r-cal	r-crit	Decision
Communal areas management programmes (x)	5	3	0.5	0.95	0.805	Reject
Natural Resources management (Y)						

From the result obtained in Table 5 computed value of 0.9528 is greater than the critical table value of (0.805) at 0.05 level of significance. Therefore, the null hypothesis is rejected while the alternative hypothesis accepted. This implies that there is significant relationship between communal areas management programmes and natural resources management.

Discussion of findings
The discussion of findings of the study will be addressed with the research questions posed. Research question one, revealed that communal areas management programmes impact resources management. Clarabute (2023) agreed with this by saying that communal areas management programmes gives the local community sense of belonging and enable them share relatedness and support perpetual growth of themselves and their environment. The research question two also revealed that

communal practices promotes resources management. Ipara (2023) agrees that incorporation of local institutions, customary practices and knowledge system promotes and regulates resources management and law enforcement processes.

The research question three, indicates that centralization of resources management, lack of trust between government and local communities, land ownership system and culture serves as impediments to communal areas management programmes on resources management. Tosun (2020), kibicho (2023) and Oketch (2022) agree to the above by observing that centralization of resources management, lack of trust, land ownership system and culture serves as limitation to communal areas management programmes on resources management.

Research question four, revealed that acquisition of relevant environmental knowledge promote communal area management programmes on resources management. Manyara and Jones (2022) agree to this by observing that lack of trained human resources and expertise (appropriate) knowledge or education among the indigenous people limit participation in the communal area management programmes on resources management.

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Conclusion
The study which examined the impact of communal area management programmes on indigenous resources management concluded that communal area management programmes influence resources management by giving the indigenous people sense of belongings in resources within their area. Communal practices and knowledge systems also promotes resources management as the indigenous people are in steady interactions with the environment and it's resources. Also, appropriate environmental knowledge is needed for the indigenous people to make significant improvements in the management of natural resources.

- Recommendations**
From the findings of the study, it was recommended that:
1. The government should devolve management of natural resources to accommodate the indigenous people that inhabits it for effective management,
 2. Communal practices should be encouraged in resources management,
 3. Communal areas management programmes should be made more practical and real in its practice, and
 4. Requisite environmental knowledge is needed for the indigenous people to participate effectively.

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Influence of Information and Communication Technology (ICT) on Job Performance of Secondary School Heads in Anambra State, Nigeria.

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Abstract

Information and communication technology has become the basic building block in the administrative effectiveness of the school heads at all levels in the educational system most especially at the secondary school level. These help in the collection, processing, storage, retrieval, and dissemination of administrative information. This study examined influence of information and communication technology (ICT) on secondary school heads job performance in Anambra State. Four research questions guided the study with sample size of 81 secondary school heads drawn from fifteen (15) public secondary schools. The instrument used to obtain data was a structured questionnaire which had reliability index of 0.78. Mean and standard deviation statistical analysis was used to answer the research questions while Z-test was used to test the hypotheses. Findings of the study among others revealed that the use of whatsapp enhances the job performance of school heads as it makes dissemination of information and feedback very easy and fast among the school stakeholders and also, the use of database management system enhances the job performance of the school heads as it makes school data available in real time and facilitates their decision making process and monitoring of staff and students performance. It is therefore recommended that government should provide internet-compliant smart devices such as laptops and ipad as well as 4G network to enable them access the internet regularly, while good maintenance culture and the purchase of more information and communication gadgets should be done in schools.

Keywords: Information, communication, technology and Job Performance

Introduction

Information and Communication Technology, generally refers to all kinds of technology used to

create, store, process and use information in its various forms of computerized systems and devices that enhances human communication

(Olayanju and Asogwa, 2020). As we live and operate in a technological age where data processing and transmission are superfast, information technologies are being incorporated into every field of endeavour including education. Apart from using information and communication technology for pedagogical purposes, school heads rely on it in performing some of their basic functions.

The secondary school heads are the senior administrative staff of a secondary school. This personnel include Principals, Vice Principals (academic/administration), bursars, etc., who perform a lot of functions such as planning, organizing, decision making, supervision of academic/non-academic staff and students, maintenance of school facilities, including collection, processing, storage, retrieval and dissemination of administrative information (Asiabaka, 2020). The objectives of public secondary school education is to provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development; provide trained manpower in the applied science, technology and commerce at sub-professional grades; offer diversified curriculum to cater for the difference in talents, opportunities and future roles; develop Nigerian languages, art and culture in the context of world’s cultural heritage and to foster national unity with an emphasis on the common ties that unite us in our diversity (FGN, 2014). All public secondary schools in Nigeria including those in Anambra State in particular are established to accomplish the objectives outlined above. Achievement of these goals requires adequate funding and effective administrative functions. Unfortunately, most of the public secondary schools in Anambra State are not fully equipped in terms of information and communication technology gadgets. The teaching and learning process is basically manual and traditional and the administrative activities

run with pen and paper rather than computer systems or where there are ICT facilities, they are not functional.

In the past, principal’s administrative functions were basically paper based but the advent of information and communication technology has transformed the way school data is collected, processed, transmitted and stored.

The advent of Information and Communication Technology (ICT) has tremendously transformed and facilitated administrative processes in the school system which makes the job of the school heads easier and more efficient. ICT facilities such as computer systems, internet facilities and database management systems seem to be grossly inadequate in most public secondary schools in Anambra State irrespective of the fact that most of the schools are situated in urban areas (Ibrahim, Suleiman & Mustapha, 2024). Most of the school administrative functions such as records keeping and computation of results are still done manually which slows down administrative processes and makes the job of school heads cumbersome (Jeff, 2024). Most often the use of the few available ICT facilities for school administration is marred by bad network and epileptic power supply. ICT facilities are under-utilized by school principals (Oboegulem & Ugwu, 2023). Previous educational research literature dwelt on ICT in secondary school administration in Southern Kenya (Makewa & Role, 2023); access and use of ICT for administrative purposes in Nigeria (Asiabaka, 2020); and the place of ICT in the administration of secondary schools in South Eastern States (Oboegulem & Ugwu, 2023).

The research conducted by Eric (2020) in Anambra State to examine the impact of ICT on local government administration revealed that the use of e-mail which has been democratized by mobile communication (the use of phones and

iPads) enhances information circulation, promotes employee participation and speeds up administrative decision making. In the same vein, Obim (2023) studying 20 selected private secondary schools in Kogi State found that the use of computer system and social media platforms such as WhatsApp and e-mail boosts job performance of school heads and makes it easy for sensitive issues to be communicated. In contrast to these studies, Kofi (2021) who investigated the influence of office automation on principals’ effectiveness in Ghana, using a sample of 60 school heads in both private and public primary and secondary schools, revealed that excessive e-mail alerts and the need for prompt reply to numerous mails constitute a major source of negative work stress to school administrative heads.

A study conducted by Zelikovich (2021) using 500 employees selected from airline, health, banks, cellular companies, municipal and government ministry service organizations found a positive correlation between quantity perception of e-mail (QPM) and personal time ineffectiveness (PI) among workers. Bassey (2023) showed that the use of computer systems in processing, storing, retrieving and publishing students’ results is significantly related to increased accuracy and high levels of efficiency in coordination of school activities in private schools in Kwara State. Similarly, a study conducted by Visshe and Wild (2024) in Madiha found that information systems make all necessary information pertaining to academic staff, non-academic staff, students’ bio-data and performance grades and other relevant school data readily available for the school administrator which increases his level of efficiency and effectiveness in decision making. Stephen (2020) found that the use of computer resources in the educational system improves the quality of instruction and facilitates

administrative activities in public secondary schools in Bosso Local Government Area of Niger State.

A study conducted by Uche (2023) using 80 form teachers and 15 school heads found that viruses and system crash have resulted in loss of organizational memories which slowed down administrative processes. Some have examined accessibility and influence of ICT facilities on school administrators’ job performance. Koko & Nlem (2022) and Koko & Okogun (2020) also studied the influence of modern office automation on administrative performance as well as mobile learning and multimedia on students’ performance. Yet, none of these studies examined how the use of ICT affects the job performance of school heads in Anambra State. This study therefore steps in to fill this gap.

Research Purpose and Objectives

The purpose of the study was to examine the influence of Information and Communication Technology (ICT) on school heads’ job performance in Anambra State. Specifically, the objective of the study are to:

- 1. find out how the use of Whatsapp affect the job performance of school heads in Anambra State.
- 2. determine how the use of database management system affect the job performance of school heads in Anambra State.
- 3. find out how the use of Internet affect school heads job performance in Anambra State.
- 4. determine how the use of words processing software affect school heads job performance in Anambra State.

Research Questions

The following research questions were answered in this study:

- 1. How does the use of whatsapp affect the job performance of school heads in Anambra

- State?
2. How does the use of database management system affect the job performance of school heads in Anambra State?
3. How does the use of the internet affect school heads' job performance in Anambra State?
4. How does words processing software affect school heads job performance in Anambra State?

Methodology

The research design adopted for this study was the descriptive survey design. The motivation derives from the fact that the study involves a large number of school heads (administratives and assistants) in secondary schools in Anambra State. The sample size of the study consisted of eighty-one (81) school heads drawn from fifteen (15) public secondary schools in Anambra State, Nigeria, comprising of 27 Principals and 54 Vice Principals. Primary data was used for this study and obtained using a structured questionnaire

Questionnaire Item	Mean	St.D	Decision	Mean	St.D	Decision
1 Through Whatsapp school heads are able to reach out to teachers and student heads on time on any issue.	3.57	0.741	Strongly Agree	3.69	0.741	Strongly Agree
2 principals get update from the Ministry of Education through whatsapp	3.73	0.678	Strongly Agree	3.60	0.678	Strongly Agree
3 The use of whatsapp makes for real time dissemination of information amongst academic and non-academic staff.	3.53	0.706	Strongly Agree	3.87	0.76	Strongly Agree
4 Whatsapp eliminates the stress of writing and posting letters and circulars by hand.	3.81	0.68	Strongly Agree	3.75	0.684	Strongly Agree

Research Question 2

The use of database management system affect the job performance of school heads.

entitled “Information and Communication Technology and School Heads’ Job Performance Index (ICTASHJPI)” structured to reflect the Likert four point scale of strongly agree, agree, strongly disagree and disagree. The face and content validity of the instrument was established by experts in the field and reliability determined using the test retest method. A reliability coefficient of 0.78 was obtained using the Pearson’s Product Moment Correlation Coefficient. The mean and standard deviation statistical tool was employed in analyzing the research questions, whilst the Z-test was used for hypotheses testing.

Results

Research Question 1

The use of whatsapp affect the job performance of school heads.

Table 4.1: Mean and Standard Deviation of Response on the Use of whatsapp and Job Performance

Table 4.2: Mean and Standard Deviation of Response on the Use of Database Management System and Job Performance

Research Question 2

The use of database management system affect the job performance of school heads.

Questionnaire Item	Mean	St.D	Decision	Mean	St.D	Decision
6 School information system provides relative guarantee for the safety of school records.	3.30	0.655	Agree	3.25	0.655	Agree
7 School information system if properly managed makes it easy for school heads to access records.	3.72	0.612	Strongly Agree	3.57	0.612	Strongly Agree
8 With a computerized school information system, school heads can easily retrieve school data and this facilitates the decision making process.	3.56	0.645	Strongly Agree	3.74	0.645	Strongly Agree
9 School database makes it possible for school managers to provide quick feedback to the system because information is readily available.	3.70	0.648	Strongly Agree	3.66	0.648	Strongly Agree
10School database simplifies routine clerical activities and saves school heads a lot of stress.	3.60	0.622	Strongly Agree	3.87	0.622	Strongly Agree
11School database makes it easy for school heads to monitor trends in staff and students performance and know the right step to take on time.	3.50	0.651	Strongly Agree	3.77	0.651	Strongly Agree
N=21.38		3.66		N=21.86	3.6	
Grand M				Grand M		

Column two of Table 4.2 above reveals mean scores above 2.5 across all the items with a grand mean score of 3.56. This indicates that principals affirmed that the use of database management system enhances their job performance as it makes school data available in real time and facilitates their decision making process and monitoring staff and students’ performance.

Column three of Table 4.2 above reveals mean scores above 2.5 across all the items with a grand mean score of 3.64. This indicates that other administrators (vice principals) affirmed that the use of database management system enhances their job performance as it makes school data

Table 4.2: Mean and Standard Deviation of Response on the Use of Database Management System and Job Performance

available in real time and facilitates the decision making process. The closeness across the standard deviations (0.655, 0.612, 0.645, 0.648, 0.622 and 0.651) indicates homogeneity in the views of the respondents. Our finding is in consonance with that of Bassey (2023), Vissshed and Wild (2024) and Nnamdi (2024).

Research Question 3

The use of internet affect school heads’ job performance.

Table 4.3: Mean and Standard Deviation of Response on the Use of Internet and Job Performance

Questionnaire Item	Mean	St.D	Decision	Mean	St.D	Decision
12The internet provides school heads with current information on modern school management practices.	3.35	0.648	Agree	3.60	0.648	Strongly Agree
13Information obtained online can help to improve the administrative process of the school.	3.20	0.664	Agree	3.50	0.664	Strongly Agree
14Internet chats makes the coordinating function of the school easier.	3.57	0.758	Strongly Agree	3.41	0.758	Agree
15The internet provides social platforms where school heads can post information and relate at a personal level with students and the community.	3.70	0.648	Strongly	3.66	0.648	Strongly Agree

Questionnaire Item	Mean	St.D	Decision	Mean		
16School heads who take advantage of the internet are able to improve their job performance.	3.60	0.682	Strongly Agree	3.70	0.682	Strongly Agree
17School database makes it easy for school heads to monitor trends in staff and students performance and know the right step to take on time.	3.50	0.651	Strongly Agree	3.77	0.651	Strongly Agree

Column two of Table 4.3 above reveals mean scores above 2.5 with a grand mean score of 3.50 which indicates that experienced school heads accepted the fact that the use of internet is of immense benefit to their job performance since it provides them with timely and relevant update concerning administrative policies and practices. The standard deviation (0.648, 0.664, 0.758, 0.714 and 0.682) implies that experienced school heads were homogenous in their responses.

Column three of Table 4.3 above reveals mean scores above 2.5 with a grand mean score of 3.61 which indicates that new school heads strongly agreed that the use of internet is of immense

benefit to the job performance of school heads as it provides them with timely and relevant update concerning administrative policies and practices. The internet enables school heads to stay in touch with the school community via social media platforms which aids decision making and coordination.

Research Question 4
The use of word processing software affect school heads job performance.

Table 4.4: Mean and Standard Deviation of Response on the Use of Word Processing Software and Job Performance

Questionnaire Item	Mean	St.D	Decision	Mean		
18The use of Microsoft Word helps school heads to type and print documents in their office.	3.30	0.642	Agree	3.60	0.642	Strongly Agree
19The use of word processing software within the administrative office ensures the confidentiality of school records.	3.25	0.761	Agree	3.31	0.761	
20Word processing software makes processing of school data easier thereby bringing about administrative efficiency.	3.14	0.749	Agree	3.30	0.749	Agree
21Microsoft Excel makes the compilation and computation of results easier.	3.40	0.660	Strongly Agree	3.50	0.660	Agree
	N= 16.34 Grand M	3.2		N=17.01 Grand M	3.4	

Column two of Table 4.4 above reveals mean scores above 2.5. This indicates that the male respondents agreed that the use of word processing software such as Microsoft Word and Microsoft Excel enhances the job performance of school heads particularly in the areas of document preparation and computation of results. The closeness between the standard

deviations (0.642, 0.632, 0.761, 0.749 and 0.660) indicates that the male respondents were homogenous in their responses.

Column three of Table 4.4 above reveals mean scores above 2.5 with a grand mean of 3.40. This indicates that the female respondents were of the agreement that the use of word processing

software such as Microsoft Word and Microsoft Excel enhances the job performance of school heads particularly in the areas of document preparation and computation of results. The closeness between the standard deviations indicates that the female respondents were homogenous in their responses. Our result is in consonance with the findings of Ibrahim, Suleiman and Mustapha (2023), Uzoho (2020), Adebowale and Osuji (2022), and Kingsley (2023) which showed that word processing software enhances administrative effectiveness of school heads.

Conclusion
The study, which empirically examined the relationship between information and communication technology and job performance of school heads in Secondary Schools in Anambra State, made significant revelations. The use of whatsapp enhances the job performance of school heads in public secondary schools in Anambra State. Database management system enhances school heads job performance in public secondary schools in Anambra State. In similar vein, the internet provides practices and enables school heads to share information with ease. The use of word processing software does enhance school heads job performance in terms of records management and computation of result. Conclusively, it was resolved that

information and communication technology significantly enhance the job performance of school heads in public secondary schools in Anambra State.

Recommendation
Based on the foregoing, the outlined recommendations were proffered:

- Good maintenance culture and the purchase of more information and communication gadgets should be done in schools.
- Principals, Vice Principals, and other school heads should imbibe the habit of using email and other internet-enabled social networks regularly communicating with educational stakeholders. This will save time, cost, and energy thereby enhancing the performance of school heads.
- Government and non-governmental organization should provide state of the art cloud-based database management system across all the secondary schools to enhance easy and accurate capture, storage, and processing of school data. This will also enhance decision making and information security.
- School heads should be provided with internet-compliant smart devices such as laptops and iPad as well as 4G networks to enable them access the internet regularly.

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Exploring the Effectiveness of Virtual Reality (VR) in Enhancing Students' Understanding of Complex STEM Concepts

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Abstract

The study investigated the effectiveness of Virtual Reality (VR) in enhancing student understanding of complex Science, Engineering, Technology and Mathematics (STEM) concepts in Nigerian Universities. A mixed-methods approach was employed, involving an experimental design with 60 undergraduate students randomly assigned to a VR-based learning group and a traditional teaching method group. Results showed that VR-based learning significantly improved students' understanding of complex STEM concepts, with the experimental group scoring higher on post-tests (80.56 ± 12.15) compared to the control group (60.23 ± 10.56). Students perceived VR as an engaging and effective way to learn STEM concepts, citing benefits such as increased interactivity and hands-on experience. Technical issues and lack of infrastructure were identified as major challenges to VR adoption. The study recommends integrating VR into STEM curriculum, providing infrastructure and technical support, and training teachers to effectively use VR in teaching and learning. The findings suggest that VR has the potential to improve students' outcome in STEM education, particularly in resource-constrained contexts like Nigeria.

Keywords: Virtual Reality (VR), STEM Concepts, Student Understanding

Introduction

The integration of Virtual Reality (VR) in education has gained significant attention in recent years, with researchers exploring its potential to enhance student understanding of complex concepts (Huang et al., 2020). In the context of STEM education, VR offers immersive and interactive experiences that can simulate real-world environments, making abstract concepts more tangible and accessible (Radianti et al., 2020). In Nigeria, studies have shown that VR-based learning environments can improve student engagement and motivation in STEM subjects (Adeoye et al., 2019). Similarly, in South Africa, researchers have found that VR can

enhance student understanding of complex scientific concepts, such as quantum mechanics (Kriek & Stols, 2018). STEM education is crucial for economic development, particularly in Africa, where there is a growing demand for skilled professionals in these fields (World Bank, 2020). However, many students struggle with complex STEM concepts, leading to high dropout rates and poor academic performance (Akinyemi & Adeyemo, 2017). In Nigeria, for instance, students often find subjects like physics and mathematics challenging due to the abstract nature of the concepts (Ogunleye, 2018). VR offers a potential solution to this challenge by providing interactive and immersive learning

experiences that can enhance students' understanding.

Research has shown that VR can improve student learning outcomes in STEM subjects by increasing engagement, motivation, and retention (Parong & Mayer, 2020). VR can simulate real-world environments, allowing students to explore and interact with complex concepts in a safe and controlled setting (Huang et al., 2020). In Ghana, a study on VR-based learning found significant improvements in students' understanding of complex scientific concepts (Agyei & Wray, 2019). These findings suggest that VR can be a valuable tool for enhancing STEM education in African countries. While VR has shown promise in enhancing STEM education, its adoption in African countries is still in its infancy (Adeoye et al., 2019). There is a need for research on the effectiveness of VR in African educational contexts, taking into account factors such as infrastructure, teacher training, and cultural relevance (Kriek & Stols, 2018). This study aims to contribute to this gap by exploring the effectiveness of VR in enhancing student understanding of complex STEM concepts in Nigerian universities.

Virtual Reality (VR)

Virtual Reality (VR) is a computer-generated simulation of a three-dimensional environment that can be experienced through a headset or other devices (Radianti et al., 2020). This technology has been increasingly used in various fields, including education, to provide immersive and interactive learning experiences. According to Huang et al. (2020), VR can simulate real-world experiences, making abstract concepts more tangible and accessible. In the context of education, VR has been shown to enhance student engagement, motivation, and learning outcomes (Parong & Mayer, 2020). The use of VR

in education offers several benefits, including the ability to simulate real-world environments, provide hands-on experiences, and cater to different learning styles (Kriek & Stols, 2018). For instance, a study by Adewole et al. (2018) found that VR-based learning environments improved student understanding of complex scientific concepts in Nigerian universities. Similarly, in South Africa, researchers have found that VR can enhance student understanding of complex STEM concepts, such as quantum mechanics (Kriek & Stols, 2018).

VR also has the potential to address some of the challenges facing education in Africa, such as limited access to resources and infrastructure (Adewole et al., 2018). With the increasing availability of affordable VR devices, such as mobile VR headsets, VR can be used to provide immersive learning experiences to students in remote and underserved areas (Radianti et al., 2020). VR can be used to provide virtual field trips, virtual labs, and other interactive learning experiences that can enhance student engagement and understanding (Parong & Mayer, 2020). VR is a transformative technology that has the potential to revolutionize education in Africa and beyond. By providing immersive and interactive learning experiences, VR can enhance student engagement, motivation, and learning outcomes. As the technology continues to evolve, we can expect to see more innovative applications of VR in education, including the use of VR to simulate real-world environments, provide virtual labs, and cater to different learning styles.

STEM Concepts

STEM Concepts refer to the abstract and complex ideas in science, technology, engineering, and mathematics (Kriek & Stols, 2018). These concepts are the foundation of innovation and progress in various fields,

including medicine, energy, transportation, and communication. According to Adeyemi and Adeyemo (2017), STEM concepts are essential for addressing global challenges, such as climate change, poverty, and inequality. In Nigeria, the government has emphasized the importance of STEM education, launching initiatives to promote STEM subjects in schools and universities (Ogunleye, 2018). STEM concepts are often challenging for students to grasp, leading to poor academic performance and high dropout rates (Akinyemi & Adeyemo, 2017). Researchers have found that interactive and immersive learning experiences, such as hands-on activities and simulations, can enhance student understanding of STEM concepts (Parong & Mayer, 2020). In South Africa, Kriek and Stols (2018) found that using virtual reality to teach complex STEM concepts, such as quantum mechanics, improved student engagement and understanding. Similarly, in the United States, Parong and Mayer (2020) found that immersive virtual reality experiences enhanced student learning outcomes in science education.

The importance of STEM concepts is not limited to academic achievement; it also has significant implications for the workforce and economy. According to the World Bank (2020), the demand for STEM skills is increasing globally, and countries that invest in STEM education are likely to reap economic benefits. In Nigeria, the government has identified STEM education as a key driver of economic growth and development (Ogunleye, 2018). There is a shortage of skilled STEM professionals in Nigeria, highlighting the need for effective STEM education and training programs (Adeyemi & Adeyemo, 2017). STEM concepts are essential for innovation, progress, and economic growth. These concepts are often challenging for students to grasp, leading to poor academic performance and high dropout rates. To address this challenge, educators and

polymakers must develop effective strategies to promote STEM education, including the use of interactive and immersive learning experiences. By investing in STEM education, countries can reap economic benefits and address global challenges.

Students’ Understanding

Student understanding refers to the cognitive process of comprehending and applying knowledge (Bloom, 1956). It is the ultimate goal of education, as it enables students to make sense of the world around them, and apply their knowledge to real-world problems (Hattie, 2012). According to Parong and Mayer (2020), students’ understanding is a critical component of learning, as it involves the construction of meaning and the development of conceptual understanding. In the context of STEM education, students’ understanding is particularly important, as it enables students to apply scientific and mathematical concepts to solve complex problems (Kriek & Stols, 2018). Research has shown that students’ understanding can be enhanced through the use of interactive and immersive learning experiences, such as hands-on activities, simulations, and virtual reality (Parong & Mayer, 2020; Kriek & Stols, 2018). These experiences enable students to engage with complex concepts in a more meaningful way, promoting deeper understanding and retention of knowledge. In Nigeria, studies have found that student-centered approaches to teaching and learning, such as problem-based learning and inquiry-based learning, can improve student understanding of STEM concepts (Adeyemi & Adeyemo, 2017).

Assessing students’ understanding can be a challenge for educators. Traditional assessment methods, such as multiple-choice questions, may not accurately capture students’ understanding,

as they often focus on rote memorization rather than deeper understanding (Hattie, 2012). Alternative assessment methods, such as performance tasks and project-based assessments, can provide a more comprehensive picture of students’ understanding (Parong & Mayer, 2020). In South Africa, researchers have found that using virtual reality to assess student understanding of complex STEM concepts can provide valuable insights into students’ learning (Kriek & Stols, 2018). Students’ understanding is a critical component of learning, and it can be enhanced through the use of interactive and immersive learning experiences. Educators must prioritize students’ understanding in their teaching practices, using a range of assessment methods to capture student learning. By doing so, we can promote deeper understanding and prepare students for success in an increasingly complex and rapidly changing world. The theoretical framework for this study was grounded in the Constructivist Learning Theory (Piaget, 1950) and Cognitive Load Theory (Sweller, 1988). These two theories provide a comprehensive understanding of how students learn and process information, and how Virtual Reality (VR) can be used to enhance student understanding of complex STEM concepts.

Constructivist Learning Theory (Jean Piaget 1920s - 1970s)

Constructivist Learning Theory, first proposed by Jean Piaget (1920s - 1970s), posits that learners construct knowledge through active engagement with their environment. According to this theory, students are not passive recipients of information, but rather active participants in the learning process. They construct their own understanding of the world by interacting with it, and this interaction leads to the development of new knowledge and understanding (Piaget, 1950). As von Glasersfeld (2016) notes, constructivism is a theory of knowing, not a theory of teaching, emphasizing the importance

of students' active construction of knowledge. In the context of education, Constructivist Learning Theory suggests that students should be encouraged to explore, experiment, and discover concepts on their own, rather than simply being told what to learn (Huang et al., 2020). This approach to learning has been shown to promote deeper understanding, better retention of knowledge, and improved transfer of learning to new contexts (Kriek & Stols, 2018). For example, a study by Adeyemi and Adeyemo (2017) found that students who engaged in problem-based learning is more effective than traditional lecture-based instruction in promoting student understanding of complex scientific concepts.

Constructivist Learning Theory also emphasizes the importance of social interaction in the learning process (Vygotsky, 1978). According to this perspective, students learn best when they are able to engage with others, share ideas, and negotiate meaning (Kriek & Stols, 2018). This social aspect of learning is critical, as it allows students to develop their critical thinking skills, challenge their own assumptions, and learn from others. Constructivist Learning Theory provides a powerful framework for understanding how students learn and how educators can support this process. By emphasizing the active construction of knowledge, social interaction, and contextualized learning, educators can create learning environments that promote deeper understanding and better retention of knowledge.

Cognitive Load Theory (John Sweller 1988)

Cognitive Load Theory (CLT), first proposed by John Sweller (1988), suggests that learners have limited working memory capacity, and that instructional design should aim to reduce extraneous cognitive load (Sweller, 2016). According to CLT, cognitive load refers to the amount of mental effort required to process

information, and it is composed of three types: intrinsic, extraneous, and germane load (Kawachi, 2018). Intrinsic load refers to the inherent difficulty of the material, extraneous load refers to the unnecessary cognitive processing required by the instructional design, and germane load refers to the cognitive effort required to construct knowledge and understanding (Sweller, 2016). In the context of education, CLT suggests that instructional design should aim to reduce extraneous cognitive load, increase germane cognitive load, and manage intrinsic cognitive load (Kawachi, 2018). This can be achieved through the use of multimedia learning principles, such as the multimedia principle, the contiguity principle, and the coherence principle (Mayer, 2020). For example, a study by Adeyemi and Adeyemo (2017) found that, using multimedia learning materials reduced cognitive load and improved students' understanding of complex scientific concepts.

CLT has been widely applied in various educational contexts, including multimedia learning, problem-solving, and virtual reality (VR) learning environments (Kriek & Stols, 2018; Parong & Mayer, 2020). In VR learning environments, CLT suggests that instructional design should aim to reduce extraneous cognitive load by providing an immersive and interactive environment that simulates real-world experiences (Parong & Mayer, 2020). This can help to increase germane cognitive load, promote deeper understanding, and improve retention of knowledge (Kriek & Stols, 2018). Cognitive Load Theory provides a useful framework for understanding how students learn and how instructional design can support this process. By reducing extraneous cognitive load, increasing germane cognitive load, and managing intrinsic cognitive load, educators can create learning environments that promote deeper understanding and better retention of knowledge.

Statement of the Problem
Despite the growing importance of STEM education, many students struggle to understand complex STEM concepts, leading to poor academic performance and high dropout rates (Adeyemi & Adeyemo, 2017). This is particularly concerning in Nigeria, where the demand for STEM professionals is high, but the supply of skilled graduates is limited (Ogunleye, 2018). The traditional lecture-based approach to teaching STEM subjects has been criticized for being ineffective in promoting deep understanding and retention of knowledge (Kriek & Stols, 2018). Therefore, there is a need for innovative and effective approaches to teaching STEM subjects that can enhance students' understanding and engagement. One potential solution is the use of Virtual Reality (VR) technology, which has been shown to promote immersive and interactive learning experiences (Parong & Mayer, 2020). VR has the potential to address the limitations of traditional teaching approaches by providing students with hands-on and experiential learning opportunities that can enhance their understanding of complex STEM concepts. There is need for research on the effectiveness of VR in enhancing student understanding of complex STEM concepts, particularly in the Nigerian context. The study addressed this gap by exploring the effectiveness of VR in enhancing students' understanding of complex STEM concepts in Nigerian universities. The study provided insights into the potential benefits and challenges of using VR in STEM education and inform the development of effective VR-based learning environments that can improve student outcomes.

Research Questions
Four research questions guided the study.

1. What is the effect of Virtual Reality (VR) on student understanding of complex

- STEM concepts?
2. How do students perceive the use of VR in enhancing their understanding of complex STEM concepts?
 3. What are the challenges faced by students and teachers in using VR to enhance student understanding of complex STEM concepts?
 4. How does VR compare to traditional teaching methods in enhancing student understanding of complex STEM concepts?

- Specific Objectives**
1. To investigate the effect of VR on student understanding of complex STEM concepts.
 2. To explore students' perceptions of the use of VR in enhancing their understanding of complex STEM concepts.
 3. To identify the challenges faced by students and teachers in using VR to enhance student understanding of complex STEM concepts.
 4. To compare the effectiveness of VR with traditional teaching methods in enhancing student understanding of complex STEM concepts.

Methodology
This study employed a quasi-experimental research design to investigate the effectiveness of Virtual Reality (VR) in enhancing student understanding of complex STEM concepts. The population for this study was undergraduate students in a Nigerian university enrolled in a STEM course. A sample size of 60 students were randomly selected and assigned to an experimental group (VR-based learning, n=30) and a control group (traditional teaching method, n=30). The experimental group used VR to learn complex STEM concepts, while the control group used traditional teaching methods. The study used a pre-test-post-test design to assess the effectiveness of VR in enhancing

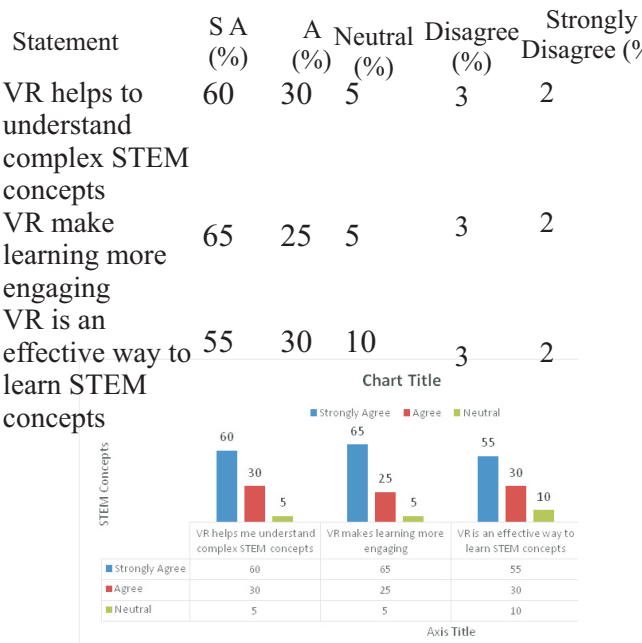
students' understanding of complex STEM concepts. Data was collected using a combination of quantitative and qualitative methods, including surveys, interviews, and achievement tests. The data was analyzed using statistical software, and the results presented in tables, figures, and text. The study provided insights into the effectiveness of VR in enhancing student understanding of complex STEM concepts and inform the development of effective VR-based learning environments.

Results
Research Question: What is the effect of Virtual Reality (VR) on student understanding of complex STEM concepts?

Group	Pre-test Score (Mean±SD)	Post-test Score (Mean±SD)	T-value	P-value
Experimental (n=30)	40.23±10.12	80.56±12.15	12.56	0.001
Control (n=30)	41.15±11.25	60.23±10.56	6.23	0.01

The results show that the experimental group (VR-based learning) had a significant increase in post-test scores compared to the control group (traditional teaching method).

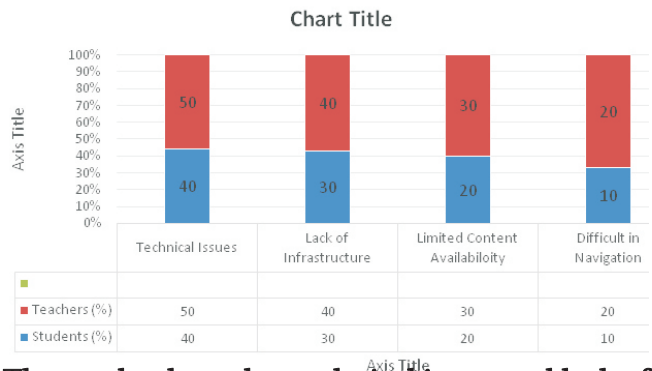
Research Question 2: How do students perceive the use of VR in enhancing their understanding of complex STEM concepts?



The results show that students had a positive perception of VR in enhancing their understanding of complex STEM concepts.

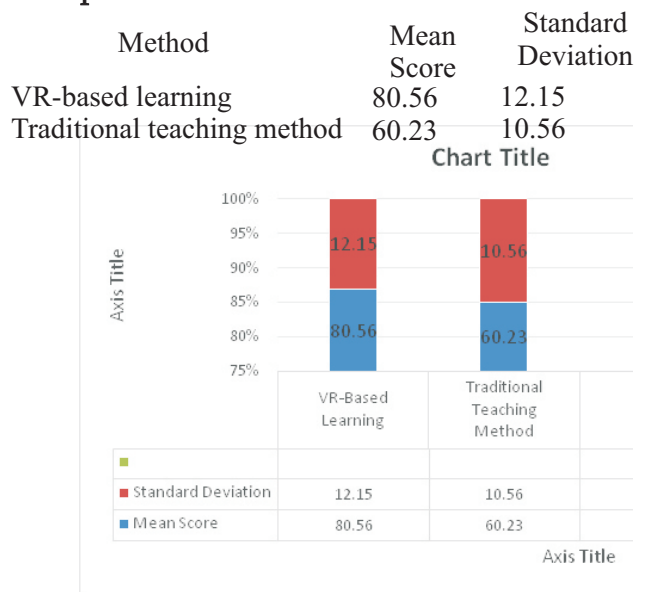
Research Question 3: What are the challenges faced by students and teachers in using VR to enhance student understanding of complex STEM concepts?

Challenges	Students (%)	Teachers (%)
Technical issues	40	50
Lack of infrastructure	30	40
Limited content availability	20	30
Difficulty in navigation	10	20



The results show that technical issues and lack of infrastructure were the major challenges faced by students and teachers in using VR.

Research Question 4: How does VR compare to traditional teaching methods in enhancing student understanding of complex STEM concepts?



The results show that VR-based learning was more effective than traditional teaching methods in enhancing student understanding of complex STEM concepts.

Discussion of Findings

The study found that VR is an effective tool in enhancing students’ understanding of complex STEM concepts. The experimental group (VR-based learning) showed a significant increase in post-test scores compared to the control group (traditional teaching method). Students had a positive perception of VR in enhancing their understanding of complex STEM concepts. The challenges faced by students and teachers in using VR included technical issues and lack of infrastructure. VR was found to be more effective than traditional teaching methods in enhancing student understanding of complex STEM concepts.

Conclusion

The study provides evidence that VR is an effective tool in enhancing student understanding of complex STEM concepts. The results suggest that VR can be used to improve student outcomes in STEM education, particularly in the Nigerian context. However, there is a need to address the challenges faced by students and teachers in using VR, such as technical issues and lack of infrastructure.

Recommendations

Based on the findings, the following recommendations were made:

- 1. VR should be integrated into STEM curriculum to enhance student understanding of complex concepts.
- 2. Universities should provide the necessary infrastructure and technical support to facilitate the use of VR in teaching and learning.
- 3. Teachers should be trained on how to effectively use VR in teaching and learning.
- 4. VR-based learning materials should be developed to support STEM education.

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The Role of Literature in Building a Positive Youth Image for Sustainable Development, Peace and Security in the 21st Century Nigeria

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Abstract

The youth constitutes the major workforce, the developmental strength and the future of any given society. The void filled by this age bracket cannot be qualified nor quantified by any standard. Hence, no Nation of the world can survive without her youth. However, the image of the youth portrays a two- edged sword, which could make or mare the future of any state. A cursory look at the world today and especially Africa and Nigeria in particular, reveals an overflow of myriads of youthful exuberances which manifests in forms like terrorism, kidnapping, banditry, insurgency, trafficking, armed- robbery, prostitution, fraud, cultism, hooliganism, toutism, ritualism, militancy and all manner of unimaginable misconducts and malpractices. It is therefore too disheartening that this supposed age group, which in essence should be reflective of a good and positive life style, has degenerated shamelessly into a sorry and pitiful state, where the Nigerian nation has become a parade ground for evil. Consequently, everyone lives in a state of constant fear, while the level and the degree of lawlessness, insecurity and total disorder in Nigeria today holds sway and cannot be described. In this state of so much quagmire, literature comes as an aid, an apt remedy to salvaging the nation from relapsing totally into eternal doom and apparent damnation. Literary artists live by example, by way of putting up works that are committed toward building the image of the youth for a sustainable development, peace and security in the 21st century. The study uses as it reference points literary works drawn from the three genres of prose, drama and poetry. Literature does not stop at this, but strives to redeem and restore to normal the already deformed youth image(s) through a corrective and therapeutic strategy. This it does through a number of techniques which it incorporates into its art. These include being satirical - exposing and condemning societal ills, thereby dethroning evil and enthroning good. Being didactic in teaching good morals capable of impacting positive influences on man. Ensuring that one reaps the fruit of one's seed through poetic justice and in sighting man by sharpening his mind through educative measures.

Keywords: - Literature, Positive image, Youth, Nation building, Commitment

Introduction

There are no universally accepted definitions of the concept of youth. Different countries, organizations and professionals often define youth along a peculiar line. There are no hard and fast rules as to the age bracket of youth.

Iorngurum (2020) defines youth as a person between the age where he/ she may leave compulsory education, and the age where he / she find his / her first job. It often means the time between childhood and adulthood. It is a period of transition from the dependence of childhood to adulthood, between the ages of 18- 35years. They occupy the middle age and the aged.

Ngrumekwe and Ada (2020) are of the view that they occupy a prominent place in any society, Besides numerical superiority, youth have energy and ideas that are society's great potentials .As the most active segment of any society, they are the major determiners of peace and stability of a nation. The degree of disorderliness and instability in societies is also determined in part by youths. The youth represents tremendous potentials development of human capital which the society cannot afford to neglect. They are also referred to as 'college graduates, university graduates or young school leavers of all categories (Osas, 2020).

David (2020), defines youth as the ready tools for violence and young people are a vital and important segment of the society in which they live, while Fabisiyi (2019) and Ogeyi (2020), assert that youth represent the vibrant segment of the Nigerian population and on whose shoulders the leadership and all facets of the nation's economy lies. They are not only regarded as the future leaders but future of tomorrow and occupy a central place in the society. They are potentially and actually the greatest investment for the country's'

development. They own the key to security, creativity and resourcefulness.

The United Nation best defined youth as a period of transition from the dependence of childhood to adulthood's independence and awareness of our interdependence as members of a community. For statistical reasons, the Common Wealth defines youth as those persons between the ages of 15 and 25 years, without prejudice to other definitions by member states.

The Nigerian National Youth Policy (2009) defines youth as persons between the ages of 18- 35. However, the 2019 National Youth Policy has changed the above class. By the new policy, a youth in Nigeria is a person between 18 – 29 yrs. This explains why NYSC is limited to graduates under the age of 30 years.

Ndu and Yusuf (2000) and (2001) respectively, saw youth as neither adolescent nor children characterized by excessive energy that needs to be exerted, which if not guarded, is channeled into negative tendencies, The United Nation General Assembly and World Bank in Obiora and Chijioke (2021), defined youth as people between the ages of fifteen to twenty – four years. In Nigeria, people within the age limit of thirty years are considered as youths; hence they are allowed to participate in National Youth Service Corp Programme.

The youth are seen as young people who are still in the most active period of their lives. They are cognitively capable of hypothetical deductions, analysis and synthesis of situations by which they find themselves. Youths are filled with energy and when this energy is positively channeled, they are highly productive, hence they are likely to contribute to the overall development of the society. On the other hand, when this same energy is negatively channeled,

restiveness and its resultant effects are likely to happen. Youths are restive – impatient, obstinate and agitate especially when they are not satisfied with the state of things around them.

The Need for a Positive Youthful Image
Positive youthful image development focuses on protective factors or the assets of the youth (Learner et. al. 2005). It embraces the concept of the youth as having the capacity to thrive, defined as “fulfilling one’s potential and contributing positively to one’s community” (Edberg 2008). It emphasizes the potential of each youth. This approach represents a fundamental shift away from earlier conceptualizations of youth as broken, dangerous and problems to be managed, as well as a shift away from a (deficit model” that understood positive development as the absence of negative or risk behaviors such as drug abuse, truancy, delinquency (Learner e. al. 2013). Many models of intervention or prevention prior to the early 1910’s focused almost exclusively on reducing risk exposure. One issue that as hampered the development of positive youth image as a field has been the lack of measures and indicators. However, that gap has been addressed more recently. For instance, positive youth image has been commonly operationalized by Learner et. al. to include elements of competence, confidence, connection, character and caring or compassion as well as contribution.

Programmes grounded in positive youth development constructs concentrate on developing these competencies and assets in the youth they serve, emphasizing the youth positive connections to their community and their ability to be productive and effective at task and activities that others value. This broad – bases strategy includes any intervention that steers the youth away from anti- social norms and toward conventional adulthood. It

emphasizes interventions that concentrate on improvements in education, social competencies, employability, civic and other life skills to change the capacity of a youth from a liability to an asset. (Learner et.al 2013). Efforts in recent years have been made to integrate risk and protection models with positive youth image, since they have a common goal of supporting healthy youth development through the cultivation of individuals and social competences (Catalano et. al. 2004). These models recognize the critical impact of individual, social and community resources and strengthen on healthy development and support interventions that address the “whole person” and that address contextual factors beyond the individual (DGS 2013).

In summary, the positive youth image approach seeks to prepare young people to meet the challenges of the youth through a series of structured, progressive activities and experiences that help them to obtain social, emotional, ethical, physical and cognitive competencies. This “asset based” broad approach views youths as resources and builds on their strengths and capacities for development within their own community. It emphasizes the acquisition of adequate attitudes, behaviours and skills. It centers less on the prevention of delinquent behaviours although that has been suggested in the empirical research to be an important result of positive youth development programmes.

The Role of Literature in Building a Positive Youth Image
Apart from serving an entertainment, informative and educational purposes, which are the primary roles of literature, it goes further to build a positive youth image through its satiric and didactic roles. Thus, every literary work is written for a purpose, which the writer has in

mind to achieve in its target – audience. No literature work is written for writing sake. Literature helps people to know who they are and who they ought to be, and to know the good and the bad aspects of their lives. And for literature to achieve this aim, the writer must be committed and must try as much as possible to open the eyes of the people in order to re – direct them. This is exactly what Achebe meant when he succinctly says in “The Novelist as a Teacher” that all good literature is caused – based and that it is the duty of the writer to tell the people where the rain began to beat them. Nwahunanya (2010) collaborated Achebe’s submission concerning this function of literature when he says that,

Contemporary society poses a lot of challenges that provide a variety of working materials for the creative writer. Most of our creative writers, because of this surfeit of socially relevant topical issues, they believe they have a message worth listening to, once they dip their hands into the available pool of ideas and experiences which may not be new to their presumed audience. Indeed, the writer has not yet started to write who does not believe he has a socially relevant message Nwahunanya (2010).

With regard to commitment, Nwoga in Nwahunanya, posits that: commitment should be seen in its dual possibilities of external call to action or internal orientation of awareness.

Iriele in Nwahunanya, again locates the African writer’s vocation in the area of identification with the heartbeat of his milieu thus:

It is perhaps not too much to say that if modern African writing has any value at the present moment, any significance, it is essentially a function of the comprehensive testimony it offers of the turns and patterns of

unfolding drama of existence in which we have been and continue to be involved in..... Nwahunanya, (2010)

The above views succeed in putting certain co – ordinate to the committedness of African literature especially the works studied in this paper. These literary works attract academic attention, establish socio- cultural relevance and do so with a high sense of technical discipline.

The paper examines elements of youthful exuberances evident in the three genres of Nigerian literature under study by finding out how African writers react to the situation with a view to building and rebuilding the already damaged youth image through satiric and therapeutic measures.

In the area of poetry, poets have contributed their quota towards capturing the world of the youth and bearing in mind the negative impacts their ignorance and naivety may have on them, and thus provide / recommend possible avenues through which they could eschew evil in any means possible, thereby contributing positively to their societies.

Akachi Adimora Ezeigbo, one of the leading 21st century poets and who has written extensively on the 21st century contemporary ills, has lamented the “get rich quick syndrome” that has almost engulfed the Nigerian youth, with its resultant consequences, which manifests in diverse forms like untimely deaths of the perpetrators of these ills and their victims as well as a negative revolution that has overwhelmed the youth all over the world. She condemned in its entirety all forms of idleness and misdemeanor that could lure one to such a bad act and suggests the acquisition of skills in various fields of human endeavour like, music, computer, carpentry, plumbing, tiling, welding

and fabrication, agricultural practices, tailoring and so on. For instance, in one of her poems, “Music Evergreen”, Ezeigbo advocated for creative impulses and masterpieces like music of various forms and types ranging from pop, hip up, reggae, gospel, high life and so on. She enjoins the Nigerian youth to explore their musical potentials and turn them into fascinating careers rather than experimenting with cocaine and other hard drugs. She asks them to export and make a show of their talent instead of exporting fraudulent tendencies and engaging in illicit drugs as cocaine and the like. She again heralded the esthetic and enduring epitomes of timeless music and songs like calypso, reggae/ rock, high-life and so on. as well as give credit to their creators like Bob Marley, Majek Fashek and others unmentioned.

In a similar poem by the same poet, “Cultism”, the poet demonstrated so much worry for the youth and especially Nigerian youths, who deliberately plunge themselves into cultism and occultism. In the process, they kill and slaughter innocent people without remorse believing that their high placed benefactors will always protect them. The poet captured the insecurity inherent in youth cultism in the image of a “butcher“, and the people they kill in those of “Fulani cattle” and “Bamenda goat”. Aside the killings, these misguided youth deliberately put themselves in the mood of these evil by injecting and sniffing hard and intoxicating substances like “Igbo”, “wee wee” and “kai kai”,. Toward the end, she proffered as solution: death to anyone engaged in the act, which kills someone and imprisonment to anyone who almost kills. The poet communicated her feelings about this menace in pidgin, a language of the rustic- which she believes that everyone will understand.

It is worthy to note that Ezeigbo’s cultism has so much relevance to the Nigerian situation today,

where so much insecurity lurks in the face and threatened boldly the nascent democracy of the state. It has gotten to an alarming and disturbing rate that the masses have lost hope because it is evident that the government can no longer provide security for her citizens and thus has made several pronouncements for people to protect and defend themselves. In Nigeria today, unknown and uncountable militant groups battle against each other. In most cases, innocent citizens bear the brunt of these ills. Many people have been killed, kidnapped, raped, burnt, waylaid and assaulted in unimaginable forms and degrees, and in all these, the Nigerian government stands completely handicapped as its citizens are slaughtered and butchered in broad day light. The perpetrators of these evil being the youth who have refused to become useful to themselves and to the nation. And literature rather than fold its arms and feel unconcerned, urges its writers to commit their writings to the salvation and repatriation of these erring and revolutionary youths.

In the area of drama, Emeka Nwabueze champions the cause of re - directing and re building the image of the youth. In one of his celebrated plays, A Dance of the Dead, he sees the Nigerian youth as people who should be hardworking and focused unto a good cause. He sampled the Nigerian students in higher institutions of learning as those that should adequately make use of every opportunity to become someone in life. He however, frowns at such acts as laziness, emptiness, truancy, prostitution, waywardness, gullibility among others, prevalent in such institutions. The play centers on the major character and the heroine, who defiled all measures and advice of her parents. Deceived by her youthful exuberance and believing that she knows it all, and therefore does not need to be advised nor directed by anyone. She was broken at last and did not even

have the opportunity to learn her lesson the hard way. Through the writer’s use of satire and poetic justice, the act of prostitution was seriously condemned and as the popular saying goes, “if the ear refuses to listen, when the head is cut off, the ear goes with it.” The tragic heroine paid dearly for her heedlessness and the message of the play becomes clear as he tells the youth to eschew all manner of prostitution, because if they fail, what happened to the heroine will certainly happen to them. That way, literature directs the paths of the youth and seems to tell them that he who listens to the words of the elderly is rewarded with long life.

Again, most Nigerian novelists have also done their best toward building and re – building the image of the Nigerian youth. This they did by redeeming the already damaged youth image and redirecting it toward a safe and progressive path. Some Nigerian novelists deal with the issues of youths who believe that engaging in a short cut to make it in life is the ideal way of life. Thus in Akamelu’s The Brilliant Fool and Dungeons of Agony respectively, the writer made her heroines, who fully know the outcome of their negative acts and went ahead to do them pay for their acts. In the Brilliant Fool, she made Ada the bad seed of her bad deeds. When she decided to help her truant friend, Nneka out during the exam even when she has not written her own. She has finished writing for her friend and was about to write her own, when the invigilating officer smartly noticed that she is in possession of two answer booklets. She could not offer any reasonable explanation for her action and that earned her a demotion from second year to first year, her cries and pleas notwithstanding.

Again in Dungeons of Agony (2026), she warns sternly and frowns at the practice of pre – marital sex. She uses Blanche, a youth corper serving at her place of primary assignment in the Eastern

Nigeria, to teach other youths that pre marital sex is evil and could jeopardize the future and destiny of anyone who deems it as nothing. In the text, Blanche met and gave herself to Collins, even when she knew that he does not love her. Collins on his part was already married but wanted to use Blanche as a side chick. When she noticed that she was pregnant and confided in Collins, He blamed her and further beat her up for trying to hook him up with pregnancy. He later abandoned Blanche who became broken. However, Blanche picked up her broken pieces and decided never to allow any man take advantage of her ignorance again. Even when she got a job as secretary to her new boss, who tries all he could to seduce her. She stood her ground and did not bulge. She promised herself never to fall into her past mistake again. Years after, Collins realizing his mistakes and meanness to Blanche, came back not to marry her for he was already married but to apologize and ask for forgiveness from Blanche stating that he too had not had it easy in life and was being pricked by his conscience. Blanche after due considerations accepted his apology and forgave him.

In earnest, literature delves into the world of the youth, exploring their nature and pre – dispositions, allowing them to make mistakes as humans and making them learn from the same mistakes. By making the characters to suffer pain, betrayal and disappointments, points to the satiric role literature plays in exposing and condemning in its entirety such negative acts as exam malpractice, prostitution, cultism, and others like pre-marital sex. Through poetic justice, the writer allows them to reap the ugly consequences of the negative choices they made in life and when broken and learning in every hard way, they become repentant and come to self realization. Even when it is too late but then comes with it a decision not / never to indulge in evil again. What more! the image is built,

directed and saved from relapsing further into doom. For experience they say is the best teacher and the truth one tells oneself is the best truth.

Challenges that Militate Against Building a Positive Image of the Youth in Nigerian Society
One factor that seriously works against the building of the positive image of the youth is corruption, which has been the bane of the Nigerian society. Many are corrupt in high and low places. Among the Nigerian leaders and political shots, corruption clings tenaciously to their body like a second skin. Hence they make and enforce selfish policies that benefit them to the greater detriment of the majority. They appropriate the public funds to their own gains and enrich themselves adversely through this game. Again, the masses are deceived through their dubious and untransparent attitudes. They are morally debased, as a result of this cankerworm that has eaten deep into their bones and blood.

Impunity: This could be described as a deliberate intent and calculated effort to engage in evil / bad behavior under the background that others did it and that I will do my own. For instance, in the Nigerian society, it is judicially noticed, for it is an open secret that everyone that is going for any political post does that with the sole intent of enriching himself from the purse of the masses, and this affects the life style of the contemporary youth, who rather than cling on the side of the positive, takes after the way of life of the so called leaders. They thus engage in negative and dangerous acts as long as they will make money from such, its negative consequences notwithstanding. This explains the puzzle surrounding the “get rich quick” syndrome that has overwhelmed our youth today. Culminating in the nefarious and heinous incidences of the “yahoo and yahoo plus boys’ ” activities, that is

fast becoming an epidemic in Nigeria.

The Nigerian politicians and leaders are epitomes and embodiments of selfishness. Thus they parade themselves as insensitive leaders who are equally very insensitive to the needs and plights of the majority who elected them into power. The masses are adversely neglected by these highly placed people who deliberately forgot about the promises they made during their campaigns and manifesto nights, while they amass and enjoy the wealth of the nation alone, leaving the masses to wallow in abject poverty, hunger, starvation and severe wants. An average Nigerian leader and politician makes an indiscriminate show of affluence and luxury. They live misguided lives where their consciences have been traded on the altar of corruption, foolishness and stupidity. The wealth of the nation are stolen and plundered by these leaders, who hide same in secret accounts both here in Nigeria and abroad. They again invest in foreign countries, thereby helping to develop those nations, and increase the rate of employment of the youths of those countries while denying these same goodies to the Nigerian state. The worst hit are the youth, who continue to remain unemployed, consequently theyengage in series of illicit and unhealthy behaviors like drug, cultism, kidnapping, terrorism, hooliganism, armed robbery and it’s like as a result of being frustrated for a very long time.

The Nigeria society is such that riches are celebrated and affluence worshipped. The society plays / makes so much emphasis on riches but keeps aside the spirituality that should keep this in check. A poor man is seen as nothing. He does not really matter in his home nor in his community and his advice and worth is not valued at all. This has led to an increase in avarice and senseless drive and pursuit for wealth. Most

Nigeria youths today can do anything to make money. The luxurious and extravagant lifestyles of our politicians being their driving force. Where a local government chairman has over 50 super expensive cars and properties worth billions of Dollars, how then do you blame the youth? Consequently, they have refused to go to school, or learn a trade. Let alone acquire any skill. All they care about is how to make it quick and fast. The incident of yahoo boys and yahoo boys plus, which has become the order of the day, was a legacy our political leaders have bequeathed and handed over to the youths.

Conclusion
The study has delved extensively on the need to build and salvage the already / damaged image of the Nigerian youths. The study sees this prospective approach through the rebuilding and redemptive roles which literature plays in our society today. Literature being concerned with the social, political and otherwise malaise in the society, offers an apt help in order to re –direct the path of the contemporary youths from damnation to salvation and as part of the measures toward rebuilding and redeeming the image of the Nigerian youth.

Recommendations
The paper recommends following:
The need to build a good legacy: The popular saying that a good name is better than riches should be revived as a life principle and way of life. Money is good but the love of money is the root of all evil (The Holy Bible). It is the love of money that made the Nigerian political leaders to amass public funds to their own personal gains, leaving the nation in utter deterioration.

Poetic justice should be preached and practiced: Good deeds should be rewarded while evil and bad deeds should be seriously discouraged, by according such deeds the measure of punishment

they deserve. The judiciary should be independent in the discharge of her duty. No one should be seen to be above the law, for this is the root cause of impunity among the polity.

The fear of God should be inculcated into children from their childhood age: The primary agencies of socialization – family, school, and the church, have a greater role of inculcating this into the child, so that when he grows, he will not depart from it. Children should be taught that it pays to obey God and that disobedience to God brings suffering and hardship.

Our political leaders should imbibe the spirit of brotherhood and being one’s brother’s keeper. They should learn to share the national cake to get to the poorest man on the street. A selfless spirit and attitude is what give the peace of mind and an all-round development of a nation.

Love for money and worship of affluence, which is the force that drives greed and avarice about among the people, should be discouraged and put to an abrupt stop. Religious groups should lead by example. The rate at which titles are given in churches today should be highly minimized. Over bearing attention on money and wealth should be de-emphasized. Again towns and communities should award titles according to merit and not on the basis of who is the richest. The need to be spiritually inclined should be preached and practiced.

The youth should be taught the principle of dignity in all honest jobs, Again young girls should be made to learn to engage in paid jobs whether on full time or on part time basis in order to take care of themselves. The believe by young girls that they should rely on men for financial buoyancy should be likened to the gift of the devil, which he does not give anyone for free

Finally, political offices should be made less attractive so as to instill into the youth the need to be hard work and self-reliant.

Contributions to Knowledge

The research contributes to both knowledge and

practice. It is an addition on works written on the concept of youth in the Nigerian society. It again contributes to the practice of inculcating poetic justice into literary works as a way of checkmating and curbing evil. It is a source of enlightenment and leisure to anyone interested in reading

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Influence of Technology on Primary School Pupil's Psychomotor Skills Development in Anambra State

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Abstract

This study focused on the influence of technology on pupil's psychomotor skills development among primary schools in Anambra state. One research question was raised to guide the study. The study adopted the descriptive survey research design. The population for this study comprises of 665 primary school teachers in 45 public primary schools in Awka South LGA. The sample for this study comprised of 249 caregivers in selected public primary schools in Awka local government education authority in Anambra state. This sample was derived using the Taro Yamane Formula. The instrument for data collection is a structured questionnaire titled "Influence of Technology on Pupils Psychomotor Skills Development Questionnaire (ITPPSDQ)". The items are structured on a 4-point Likert scale of strongly agreed – 4point, agreed – 3, disagreed – 2point, strongly disagree -1point. The instrument for data collection was face validated by two experts, one in Measurement and Evaluation from the Department of Educational Foundations, and one in the Department of Early Childhood and Primary Education all from Nnamdi Azikiwe University, Awka. The internal consistency of the instrument was established using the Cronbach alpha method and got a coefficient of 0.82. Data for this study was collected through direct delivery approach. Data collected was analyzed using descriptive statistics of mean and standard deviation. The findings of the study revealed a grand mean score of 3.18 indicating that the respondents rated moderately agreed to the influence of technology on pupils' psychomotor skills development among primary schools in Anambra state. Based on the finding conclusions was made.

Keywords: School, technology/ICT and Psychomotor skills

Introduction

A school is an educational institution designed to provide learning spaces and learning environments for the teaching of pupils/students under the direction of teachers. The great public benefits of education have historically prompted governments to assume the primary role in managing and funding schools. Recently, a growing interest in improving school quality,

learning outcomes, and a quest for greater school choice for parents and children, for more creativity and innovation in the schools, themselves, has challenged the notion of government's primacy in education (OECD, 2016). This trend, emerging in a number of countries, is based on the belief that the public interest in education can be better served by also involving private entities, including parents,

non-governmental organizations and enterprises, in addition to government agencies, in managing and funding schools.

Africa now has more children in primary school than ever before, more girls going to school and more women who are literate (Isaacs and Hollow cited in Tunmibi, Aregbesola, Adejobi and Ibrahim, 2015). The use of technology during teaching and learning is an extended form of classroom teaching where learning, either online or offline is facilitated by the use of computer, telecommunication devices, networks, and storage capacity. On top of its easy delivery of information and interactive nature, the main benefit behind using the E-Learning instead of the traditional way is that Learners develop communication as well as personal skills such as autonomy, analytical perception, abstraction and others (Dargham, Saeed and Mcheik, 2013). Over the years, Information and Communication Technology (ICT) has grown to become an important driver of e- learning and digitalization.

In the opinion of Okeke, Okereke and Okafor (2022), the child is the greatest asset to any family, community or country. Nobody is born an adult. The adult of today was a child of yesterday. It is thus important that every society tries to nurture children of their desire in order to attain the future of their dream. In the pursuit of this very important task, certain factors at opposing ends may work for and against this effort. While the family as the most important socializing agent, the school, the church as a moral barometer and other ancillaries of socialization provide proactive bases for this task, other factors within the emerging technological environment work to overturn this. The permeation of the new

technology into every nook and cranny of the society has added to the pool of traditional

socializing agents. Okeke et al (2020) further affirmed that most importantly among these is the uncensored social media technology and tools where children are exposed to certain classified contents without regards to the influence of these contents on their wellbeing.

Over the years, teachers’ perceptions of the use of technology in the classroom have been investigated, with findings suggesting it is an essential and important part in the education of children (Ventouris, Panourgia, and Hodge, 2021). Conversely, research in the several parts of the world also revealed factors hindering the use of technology in classrooms by teachers, including resources, institutional and administrative support, training and experience, and attitudinal /personality factors. Using technology outside school has been found to improve school readiness and academic achievement in children, with research evidence from most homes, it has been concluded that home computer ownership increases the likelihood of educational attainment. However, families with low socioeconomic status cannot always financially invest in technology, as they need to cover for the immediate family needs, resulting to children being raised in less technologically stimulating environments. Hence, the integration of technology in education is imperative

Other research evidence, such as studies from the different continents, demonstrates that time spent engaging in technology, may have negative effects on children learning, including difficulties with paying attention in class and problems with visual memory and imagination. Yet, students’ attitudes towards learning have been reported to become more positive, when teaching materials are enhanced by technology

In addition, data from the 2018 Programme for International Student Assessment (PISA)

reported, among other, that learners who intensely engage in technology and pupils/students, who do not engage at all in such activities, perform better than those who use digital technology moderately (OECD, 2019). According to the same report, technology in the hands of teachers is associated with higher scores than technology in the hands of children, while technology is associated with worse results in lower-performing schools (OECD, 2019).

In education, teachers are encouraged to include technology in their teaching to help children become digitally literate citizens to cope with the complexities of today’s societies (Fraillon et al., 2020). In the context of childhood education, teachers’ lack of digital literacy ultimately affects their competencies in using ICT tools (Koh et al., 2020; Sargent and Casey, 2020). Many teachers have reported having difficulty in conducting online lessons when schools were forced to shut down to prevent the spread of the Corona Virus pandemic (Varea and Gonz´alez-Calvo, 2020). Hence, it is crucial for teachers to acquire relevant ICT proficiencies to plan, deliver and intervene in the learning process, especially when their students encounter difficulties in using ICT tools (Bodsworth and Goodyear, 2017). Although studies have documented multiple benefits that can arise from using ICT in education (Fullan and Langworthy, 2013), less is understood in terms of what constitutes the desired integration and execution of ICT (Tou, et al., 2020).

Past research has shown that teachers’ attitudes towards embracing technology in their lessons are a critical factor in understanding patterns of implementation (Tou, Kee and Koh, 2020; Wyant and Baek, 2019). In efforts to explain attitudes towards ICT in education, some scholars have used the Technological Acceptance Model to frame their research. Essentially, the TAM is used to situate how

intentions to use information technology tools are governed by factors such as perceived usefulness and perceived ease of use. Moreover, attitudes towards technology are shaped by external variables, such as self-efficacy, subjective norms and facilitating technology use conditions. Other scholars have explained that PE teachers’ apprehension regarding using technology in their lessons is due to their lack of proficiency and inadequate training in employing the tools/gadgets (Tou et al., 2020). According to Tou et al. (2020), biographical factors such as gender, age and teaching experience must be considered in understanding teachers’ attitudes towards using ICT tools in their lessons. Taken together, the findings of previous studies shed some light on how attitudes and the biographical factors of teachers can influence the adoption of technology.

Psychomotor skills acquisition in Dart manipulation concept is one of the achievable educational domains which will lead to the production of self-reliant individuals that could go in to garment industry. For the teaching of psychomotor skills in dart manipulation to be effective, it requires a fair knowledge of drafting, combined with drawing and sketching. Skill is the ability of a person to perform a given task as well as a result of training and practice. In the context of this study, skill is the capability which pupils of clothing and textile must acquire to enable them perform a given task in dart manipulation. Skill acquisition is conceptualized as the ability to choose a trade, occupation or profession which best suit his/her economic gains and to work hard to succeed.

And psychomotor skill acquisition tells what the pupils have acquired during the process of manipulation. In order to achieve observable psychomotor skill acquisition in dart manipulation, there is need to measure their psychomotor skills by using well-constructed

and validated Psycho-productive skills test. In order to improve the acquisition of psychomotor skills of learners in dart manipulation, efforts should be made at investigating the interactive effect of treatment given to pupils and their gender with respect to their process and psychomotor skill acquisition in dart manipulations. From a young age, children learn to imitate and develop patterns of behaviour based on positive reinforcement, cognitive, and psychomotor development.

McLeod (2016) emphasized that sex linked characteristics are maintained as transmitted to other members of the same culture. Gender associated information is predominantly transferred to society by way of gender scheme, or complex networks of information that are then sorted by the recipient. Many factors from policies to practices affect male and female learners on psychomotor skill acquisition differently because they are located differently within our societies. Overlooking gender means being practically blind to the complete reality of children’s psychomotor skill acquisition in dart manipulation when Models of Problems based learning approach is adopted. To achieve observable psychomotor skill acquisition, there is need to measure psychomotor skills by using well- constructed and validated Psycho-productive skills test. In order to improve the acquisition of psychomotor skills of pupils in primary schools which is on a downward trend, the study will examine the influence of technology on pupil’s psychomotor skills development among primary schools in Anambra State.

Purpose of the study
The general purpose of this study is to examine the influence of technology on Primary school pupils’ psychomotor skills development in Anambra state.

Research question
This research question guided the study.
1. What is the influence of technology on primary school pupils’ psychomotor skills development in Anambra state?

Methodology
This paper adopts the descriptive survey research design. This design according to Nworgu (2015) is interested in collecting data and describing in a systematic manner the opinion of the respondents in relation with the population. In this case, this study will elicit information from teachers on the influence of technology on primary school pupils’ psychomotor skills development in Anambra state. The population for this study comprises of 665 primary school teachers in 45 public primary schools in Awka South LGA. The population for this area was curled from the study conducted by (Igwe and Ugwude, 2020). The sample for this study comprised of 249 caregivers in selected public primary schools in Awka local government education authority in Anambra state. This sample was derived using the Taro Yamane Formula. The sample for this study was selected using the simple random sampling technique of balloting with replacement. This process employs the use of slips of papers written and put in a bucket. The researcher shuffles, draw and replace the selected respondent after recording the number for inclusion in the study.

The instrument for data collection is a 10 items structured questionnaire titled “Influence of Technology on Pupils Psychomotor Skills Development Questionnaire (ITPPSDQ)”. The items were structured on a 4-point Likert scale of strongly agreed – 4point, agreed – 3, disagreed – 2point, strongly disagree -1point. The instrument for data collection was face validated by two experts, one in Measurement and Evaluation from the Department of Educational

Foundations, and one in the Department of Early Childhood and Education all from Nnamdi Azikiwe University, Awka. The internal consistency of the instrument was established using the Cronbach alpha method. According to Nworgu (2015), this procedure applies to instrument that are scored on multiple bases (Polytomously). To do this, 15 copies of the questionnaire were distributed to teachers in primary schools in Onitsha Local Government Education Area. The subjects used for the reliability are outside the area of the study, but share similar characteristics with the main subjects for this study. The overall Cronbach Alpha reliability coefficient stood at 0.82.

Data for this study was collected through direct delivery approach, in this approach, the researcher administers the instrument with the help of two research assistants due to the small geographical coverage. These research assistants were enlightened on how to administer and ensure total retrieval of the questionnaires. Data

collected was analyzed using descriptive statistics of mean and standard deviation. The following real limit of numbers was used to interpret the result Strongly agreed (SA) 3.50 – 4.00, Moderately Agreed (A) 2.50 – 3.49, Disagreed (D) 1.50 – 2.49, Strongly Disagreed (VLE) 1.00 – 1.49. The analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 27.

Results
The results and analysis for this study was presented as follows;

Research question 1: What is the influence of technology on pupils’ psychomotor skills development among primary schools in Anambra state?

Table 1: Mean and standard deviation on the influence of technology on pupils’ psychomotor skills development among primary schools in Anambra state (n=249).

Questionnaire Item	Mean	St.D	Decision
1. The use of technology for learning and socializing online can be helpful for children’s psychomotor skills development.	2.76	.71	Moderately agreed
2. Technology affects a kid’s ability to interacts with others, as they use them to promote themselves.	2.03	.68	Disagreed
3. Children desire psychomotor skill development and this can be enhanced through the use of technology.	3.35	1.03	Moderately Agreed
4. Children’sdevelopmentofpsychomotorskill is enhanced by parents use modern technological tools at home	3.44	.56	Moderately Agreed
5. The use of the talk-to-print application enhances psychomotor skill development among children	3.71	.81	Strongly agreed
6. To develop psychomotor skills, children must be used to the technological tools.	2.61	.74	Moderately agreed
7. The use of technology is seen now as the expectation of teaching, rather than it not being there.	3.53	1.06	Strongly agreed
8. Children are motivated to used technological tools within and outside the learning environment for improved psychomotor skills.	3.30	.67	Moderately agreed
9. Caregivers easily have access and make use of computers in teaching children	3.42	.81	Moderately agreed
10. Children are captivating with the effective use of overhead projectors in presenting instructions always.	3.67	.92	Strongly agreed
Grand Mean	3.18		Moderately agreed

The result presented in Table 1 shows the mean and standard deviations of the respondents on the influence of technology on pupils' psychomotor skills development among primary schools in Anambra state. Specifically, they rated strongly agreed to items 5, 7 and 10, moderately agreed to items 1, 3, 4, 6, 8 and 9, disagreed to item 2. On the whole, the grand mean score of 3.18 reveals that the respondents rated moderately agreed to the influence of technology on pupils' psychomotor skills development among primary schools in Anambra state. The standard deviation scores show homogeneity in the respondent's ratings.

Discussion

The findings of this study reveals that the respondents rated moderately agreed to the influence of technology on pupils' psychomotor skills development among primary schools in Anambra state. This aligns with Ofojebe, Olibie and Chikuma (2014) who found that strong negative reactions from the participants on the extent to which teachers' effectively use Instructional Technology (IT) facilities in teaching in the public primary schools in Anambra State. Similarly, the study of Entouris, Panourgia and Hodge (2021) is supported by the present study as it suggests that technology is an essential and important part in the education of

children. Although certain factors hindering the use of technology in classrooms by teachers and caregivers have been found to be resources, institutional and administrative support, training and experience, and attitudinal/personality factors. In view of the importance of technology to classroom learning and psychological development, it was imperative to determine the opinion of caregivers on the influence of technology on pupils' psychomotor skills development among primary schools in Anambra state.

Conclusion

The role of modern technologies in the educational development of societies today and in future cannot be sidelined. Technology has played an important role in the development and expansion of skill acquisition, education and the pace of national development. Children's constant interaction with technologies during learning will broaden their scope and understanding of concepts taught and also assists with the acquisition of psychomotor skills. Based on the findings of this study, all education stakeholders which includes policy makers, curriculum developers, school heads, teachers and educational agencies needs to facilitate the effective use of technology for transferring knowledge on learners.

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