

EKITI STATE UNIVERSITY

TVET-IJORAD

Vol. 9, No. 1, July, 2026

International Journal

of

**Research and Design in Technical,
Vocational Education and Training**



EKITI STATE UNIVERSITY

TVET-IJORAD

Vol. 9, No. 1, July, 2026

International Journal

of

**Research and Design in Technical,
Vocational Education and Training**

**INTERNATIONAL JOURNAL OF RESEARCH
AND DESIGN IN TECHNICAL, VOCATIONAL
EDUCATION AND TRAINING (TVET-IJORAD)**

2026 SPECIAL EDITION IN HONOUR OF

**PROFESSOR FAMIWOLE, OYEBODE REMIGIUS,
(MNIM, FRAN, MTVETS, Phi Kappa-Phi)**

N.C.E (Ondo State) B.Sc (Hons) (Nsukka), M.Sc. (Carbondale, USA), Ph.D (Nsukka)

And

DR AMORAN OLUGBENGA BAYODE

B.Ed (Hons) (Benin), M.Ed. (Ibadan), Ph.D (Ibadan)

**DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION
FACULTY OF EDUCATION
EKITI STATE UNIVERSITY, ADO-EKITI**

ISSN: 26353431

VOL. 9 NO 1, JULY, 2026

Mission

TVET International Journal of Research and Design (TVET IJORAD) is an annual international, peer reviewed and open access Journal aimed at promoting original scholarly research, designs, innovations, creativity and information on various aspects of Technical, Vocational Education and Training.

Original Research and Designs in Agricultural Education, Business Education, Home Economics, Creative Arts, Technical Education i.e. (Woodwork, Building, Mechanical Automobile, Electrical/Electronics), Educational Technology, Library, Music, Information Science and other related disciplines.

Guidelines for Paper Submission

1. The title of the paper and sub-heading should be highlighted and clearly stated.
2. The Abstract must not be more than 250 italicised words with focus on the Purpose, Methodology, Findings, and Recommendations; and a maximum of six key words.
3. Manuscript should not be more than 14 pages on A4 size paper, double line spacing with Microsoft Words, Times New Roman, 12 fonts.
4. Author(s) name(s) must be written on the first page in full, showing designation, affiliation and contact such as: e-mail address and GSM Number.
5. Tables should be clearly typed using the MS Word table template. All illustrations (photographs, drawings, graphs, etc), excluding tables, must be labelled as figures. Images/plates must be scanned and submitted in JPEG format. Figures and tables should be in two (2) decimal places and levels of significance clearly stated. Where applicable, the SI units should be employed.
6. The 6th Edition of APA referencing must be followed. Visit www.apastyle.org for APA Style.
7. Vetting fee is ~~N~~5,000 while Publication fee is ~~N~~30,000 only. Publication and vetting fee outside Nigeria is USD 150 payable to Acct Name: TVET Journal of Research and Design. WEMA BANK PLC; Account Number: 0234251186
8. Paper acceptance notification will be made known within 2 weeks after paper submission.
9. Only original articles or design that have not been published elsewhere are acceptable.
10. Soft and two hard copies of manuscripts are to be mailed to:

For Further Enquiries

All correspondence should be addressed to:

The Managing Editor

Prof. G. O. Onajite
Department of Vocational and Technical Education
Faculty of Education,
Ekiti State University, PMB 5363 Ado-Ekiti
Ekiti State, Nigeria

E-mail: tvetijoradeksu2019@gmail.com

Or

remifamiwole@gmail.com, (08035722121)

© Submission of a manuscript to TVET-IJORAD indicates a tacit understanding that the paper is not actively under consideration for publication with other journals. Once a paper is accepted for publication the author(s) cede copyright to the International Journal of Research and Design in Technical, Vocational Education and Training, Department of Vocational and Technical Education, Ekiti State University, Ado-Ekiti, Nigeria.

Editorial Office

International Journal of Research and Design in Technical, Vocational Education and Training

Editor -In-Chief: Prof. I. P. Ogundola
Managing Editors: Prof. (Mrs.) Ezeani N. S.
Prof. J. O. Oke

Consulting Editors

Prof. O. V. Adeoluwa	-	Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti
Prof. T. T. Olofinloye	-	Ekiti State University, Ado-Ekiti
Prof. S. O. Olaitan	-	University of Nigeria, Nsukka
Prof. K. A. Salami	-	Federal University of Technology, Minna, Niger State
Prof. F. Reneau	-	Southern Illinois University, Carbondale, USA
Prof. A. H. Musta'amal	-	Universiti Teknologi, Malaysia, (Johor Bahru)
Prof. F. A. S. Dairo	-	Ekiti State University, Ado-Ekiti
Prof. Ass. Jamalludin Harun	-	Universiti Teknologi, Malaysia (Johor Bahru)
Prof. E. A. Alademmerin	-	Tai Solarin University of Education Ijegan, Ogun State
Prof. A. Okoye	-	Nnamdi Azikwe Univeristy Awka; Anambra State
Dr. F. A. Fabunmi	-	University Library, Ekiti State University, Ado-Ekiti
Prof. B. P. Alant	-	University of Kwazulu – Natal, South Africa.
Dr. (Mrs) A. U. Okeke	-	Nnamdi Azikiwe University, Awka, Anambra State.

Departmental Journal Committee

Prof. G. O. Onajite	-	Chairman
Prof. N. S. Ezeani	-	Managing Editor
Prof. J. O. Oke	-	Managing Editor
Dr (Mrs) E. O. Adepoju	-	Member
Dr. A.O. Olaoye	-	Member
Dr. M. A. Aina	-	Member
Dr. J. O. Fatokun	-	Member
Dr. (Mrs) T. O. Olusola-Fadumiye	-	Secretary

EDITORIAL COMMENT

Technical and Vocational Education and Training (TVET) continues to occupy a strategic position in the pursuit of sustainable national development, technological advancement, and workforce preparation. As societies become increasingly driven by innovation, digital transformation, and rapidly changing labour market demands, there is an urgent need for educational research that not only advances knowledge but also provides practical solutions to contemporary challenges in teaching, learning, skills acquisition, and human capital development. It is through rigorous and evidence-based research that TVET can remain responsive to emerging trends and contribute meaningfully to socioeconomic transformation.

This special edition of the *International Journal of Research and Design in Technical, Vocational Education and Training (TVET IJORAD)* reflects this commitment by presenting scholarly works that address current issues across the diverse fields of Vocational and Technical Education. A total of **twenty-one (21)** manuscripts were received, subjected to a rigorous double-blind peer-review process, and accepted based on their originality, methodological soundness, scholarly contribution, and relevance to contemporary educational practice. The published articles cover a broad spectrum of disciplines, including Agricultural Education, Business Education, Educational Technology, Technical Education, Library and Information Science, and other related areas of Vocational and Technical Education. Collectively, they offer innovative perspectives, empirical evidence, and practical recommendations capable of informing policy, improving instructional practices, and strengthening professional competence.

The studies presented in this volume explore several contemporary issues, including digital transformation in education, technology-enhanced teaching and learning, competency development, entrepreneurship education, sustainable agricultural practices, information management, instructional innovation, and workforce readiness. These contributions underscore the increasing importance of interdisciplinary research in addressing the complex educational and societal challenges of the twenty-first century. They also reaffirm the role of TVET as a catalyst for innovation, productivity, employment generation, and national development in line with the United Nation, Sustainable Development Goal.

This edition is particularly significant as it is dedicated to celebrating the distinguished careers and invaluable contributions of **two highly respected senior colleagues** whose years of dedicated service have greatly advanced the growth of the Department of Vocational and Technical Education, the Faculty of Education, Ekiti State University, and the broader academic community. Their exemplary scholarship, professional mentorship, administrative leadership, and unwavering commitment to academic excellence have inspired generations of students and scholars. It is our sincere hope that this special edition serves as a fitting tribute to their enduring legacy and outstanding contributions to the development of Vocational and Technical Education in Nigeria.

On behalf of the Editorial Board, I express profound appreciation to all authors whose quality contributions made this edition possible, the reviewers for their painstaking and constructive evaluation, and members of the editorial team for their dedication throughout the publication process. Their collective efforts have ensured the continued quality, credibility, and scholarly integrity of the journal.

We expect that the articles published in this special edition will stimulate further research, enrich classroom practice, inform educational policy, and contribute significantly to the advancement of Technical and Vocational Education and Training. I therefore commend this edition of *TVET IJORAD* to researchers, teacher-educators, policymakers, practitioners, postgraduate students, and all stakeholders committed to promoting innovation and excellence in Vocational and Technical Education.

Professor I. P. Ogundola
Editor-in-Chief

Table of Contents

Title Page	i
Copy Right Page	ii
Editorial	iii
Editorial Board	iv
Call for Papers	v
Profile	vi
Contents	vii
Home Farm Experience and Academic Performance of Senior Secondary School Students in Agricultural Science in Ekiti State, Nigeria Ogunjobi, Pius Olanrewaju, Ajibare, Abike Yemisi, Adedayo, R. Olumuyiwa, and Joshua, Grace Tolulope	1
Effect of Instructional Video for Teaching and Learning Mechanical Drawing in Kwara State Colleges of Education Prof. J. O. Oke and Abdulsalam Adebayo Saka	10
Competency Needs of Agricultural Science Teachers for Farm Management in Secondary Schools in Ekiti State, Nigeria Oluwatoyin Kemi Omoniyi; Pius Olanrewaju Ogunjobi; Oladele Anthony, Afolabi and Remignious Olawale, Famiwole	19
Secretarial Skills Competencies and Secretaries Job Performance in Universities in Ekiti State, Nigeria Onajite Godwin Onnoh, Omidiji Samuel Ajetomobi, Olatunji Rufus Oladimeji	35
Gamification as a Pedagogical Strategy for Improving Student Engagement and Competency Acquisition in Electrical and Electronic Trades Education at Technical Colleges Yisa, S. N., Ogundola, I. P., Fanibuyan, V. E., Kalat, I. K. and Idogho, F.	44
Assessing the Impact of Learning Environment on the Academic Performance of Electrical and Electronic Technology Students of Ekiti State University, Ado-Ekiti Yisa, S. N., & Ogundola I. P.	58
Impact of Digital Tools on Business Education Students' Accounting Skills in State Owned Universities in Ekiti State, Nigeria Onovo, Anthonia Chinaza and Dr, Aina Matthew Adebayo	70
Impact of Bioenergy in Ilorin South Local Government Area of Kwara State, Nigeria Adekeye Olawale and Dr. Olaoye A. O.	80

Impact of Regenerative Agriculture on Restoring the Ecosystem through Farming Practices in Secondary Schools in Ekiti State Adeyeye Ruth Folasayo	89
The Role of 5G Technology in Enhancing Office Operations in the 21 st Century Workplace in Nigeria Ajayi, Oluwatoyin R., Prof. Oke, Jonathan O., Prof. Ezeani, Nneka. S., Ajayi, Olubunmi P.	100
Effects of Climate Change on Crop Production in Nigeria Adedoyin Ayomiposi Kehinde	113
Exploring the Role of Formative Assessment in the Teaching and Learning of Accounting in Tertiary Institutions Adededeji Wemimo Elizabeth and Dr. Olaniyi O. N.	120
Role of Agricultural Education Programmes in Enhancing Food Security and Youth Employment among Agricultural Education Students in Ekiti State University Ogundele Kehinde Wisdom; Prof. Jonathan O. Oke and Ogunniyi Yinka Funmilayo	130
Funding of Business Education Programme for Economic Empowerment in Developing Nations Taiwo Esther Aribatise and Dr. Matthew Adebayo Aina	142
Agricultural Technology Adoption and Crop Productivity in Ikole Local Government Area of Ekiti State Lawal Funmilayo Tolu	159
Emerging Technologies as Catalysts for Advancing Electrical and Electronic Technology Education in Ekiti State Universities. Fanibuyan, Victoria Ereola and Dr. Olaoye, Ajiboye Ojo	170
Organic Treatment: An Alternative to Synthetic Treatment in Poultry Production Mokolade B. Eniafe and Jonathan O. Oke	178
Innovative Entrepreneurship and Youth Employment in Southwest, Nigeria Adefajo, Nurudeen Adewale; Oyeniyen, Adebola Adebanye and Iyanda, Aisha Olajumoke	192
Smart Classrooms and the Future of Education for Sustainable Development Dr. Olusola-Fadumiye Titilope Olufunke	205
Improving Digital Skills among Business Education Students for Employability in Nigeria Fadiji, Adekunle Theophilus and Dr. Aina, Matthew Adebayo	221
Environmental Information Utilization and Social Responsibilities of Media Houses in Urban Areas Prof. E. O. Adepoju, Ajayi, Joseph Kolawole (PhD) and Akintayo, Toyosi Eunice	228

FAMIWOLE, Oyeboade Remigius is a professor of Vocational Agricultural Education. He was a member of University Senate (2014-2025). He is also an Alumnus of Notre Dame Grammar School, (Usi Ekiti 1969-1973). He graduated in B.Sc (Ed) Agricultural Education from the prestigious University of Nigeria, Nsukka in 1983, with a grade of Second Class Upper Division. He completed his Master of Science (M.Sc) in Agricultural Education and Mechanization from the Southern Illinois University at Carbondale, USA in 1990, with distinctions. He won the distinguished Phi-Kappa-Phi Honors Award of the University in 1990. He completed his academic exploration with Ph.D. at the University of Nigeria, Nsukka in 1997.

Research work and position are focused on:

Vocational and Technical Education Agricultural Education and Training; Performance based assessment techniques in Technical; Vocational Education and Training (TVET); Work linked education; Skill development programmes in agriculture; Agricultural Education and programme training; Youth development programmes in agriculture; Enterprise culture development; Supervise agricultural experience programmes; In-school youth organization in agriculture in schools and colleges, and Digital skill acquisition for Agricultural Education programmes

He served in various capacities in some reputable institutions namely: College of Education, Ikere-Ekiti and the University of Education, Ikere-Ekiti (TUNEDIK). He joined Ekiti State University, Ado-Ekiti when the two other state-owned Universities. The University of Education, Ikere-Ekiti and University of Science and Technology, Ifaki-Ekiti were seamlessly merged with Ekiti State University, Ado-Ekiti.

At the College of Education, Ikere-Ekiti, Prof. R.O. Famiwole, (then Dr. R.O. Famiwole) was the Dean, School of Vocational and Technical Education between August, 2003 and July, 2005 and a two-term member of the Governing Council of Ekiti State College of Education, Ikere-Ekiti, now Bamidele Olumilua University of Education, Science and Technology, (BOUESTI).

He acted as Provost of the College in August, 2004. He also represented the Provost at many occasions even outside the state; for example, the 4th Regular Meeting of the Committee of Provosts of Colleges of Education at the Federal College of Education, Potiskum, Yobe State in December, 2006. He started participating in the Accreditation of Agricultural Education Programmes in Colleges of Education and Universities since 2002 to date.

He was once an Acting Dean, Faculty of Science, Technical Education and ICT. He was a member of Management at the defunct University of Education, Ikere-Ekiti (TUNEDIK). Prof. Famiwole was a member of sixteen (16) committees of EKSU

Governing Council on integration of UNAD, USTI, TUNDIK staff, students and academic programmes.

A member of the EKSU Post Graduate Board between August, 2014 and 2016. He was a Chairman of the Faculty of Education Teaching Practice Committee that established a functional Micro Teaching Laboratory. He was also the Deputy Director, EKSU Entrepreneurship Centre (2014-2016). He was the Pioneer Chairman, EKSU Work Study Initiatives from February, 2016-2018, and Ag. Dean, Faculty of Education, Ekiti State University, Ado-Ekiti between 2020 and 2021. He was also the Director, Directorate of General Studies, (Feb. 2023 to July, 2024); and Head/Co-ordinator, Centre for Foundation Programme, (August 2024-July 2025) without any blemish before he proceeded on his mandatory retirement on 19th July 2025.

Prof. Famiwole is a teacher and researcher per excellence with a novel and innovative approach to teaching and research. The meticulous manner in which he prepares and delivers his lectures with extraordinary teaching abilities is always commended by his students. He has authored and co-authored text books, and has published extensively in national and international journals. He is an External Examiner in many universities in Nigeria and Eswatini.

In view of his outstanding contributions in his field, he has enjoyed both national and international scholarship awards such as: Federal Ministry of Education, Technical Teachers Training Programme (TTTP) for his first degree at UNN 1981-1983 and Masters degree at Southern Illinois University, Carbondale, USA (1988-1990); Federal Ministry of Education Technical Teachers' Training Programme (TTTP/USAID) for his Ph.D. Degree at University of Nigeria Nsukka, (1995-1997). He also received Merit Award and Letters of Commendations from the Management, College of Education and from the Director, Directorate of Continuous Education Programme (DICEP), Ekiti State University, Ado-Ekiti.

Prof. Famiwole was the President, Alumni Association of the College of Education and Bamidele Olumilua University of Education, Science and Technology (BOUESTI) Ikere Ekiti between 2017 and 2023 he is a member of the National Institute of Management (Chartered) and many Professional Association in Vocational Education and Agricultural Education. He is a humble, gentle, highly intelligent, reliable with very unassuming personality. He is a Christian and Catholic to the core. He is an ICON of Peace, an erudite scholar and an academician of high repute. He is a role model with habitually compulsive passion for creativity and innovation. He is a loving father and a caring husband of Mrs. Omolola Famiwole, a virtuous woman of awesome personality.

Prof. Remigius Oyebo Famiwole proceeded on his mandatory retirement from the service of Ekiti State University, Ado-Ekiti and the Department of Vocational and Technical Education on 19th July, 2025.

Thanks be to Almighty God.

AMORAN Olugbenga Bayode was born on 6th November, 1959 in Imila Quarters Odo Ayedun Ekiti to the family of Pa Gabriel Ayodele Amoran and Mrs Rachael Omolu Amoran both of blessed memory

Education

Dr Amoran Olugbenga Bayode had his academic progressions as follows:

St Mark's Anglican Primary School Imila, Odo Ayedun Ekiti from 1966-1971. Methodist Secondary Modern School Ayedun Ekiti from January 1972-June, 1974. Christ Apostolic Church Teachers' College, Efon Alaaye Ekiti from 1976-1979. Grade II Teacher at St Peter's Primary School, Obunkekere, Ondo, Ondo State from August, 1979 to September, 1981.

He attended the University of Benin from 1981 to 1985 and obtained the B.Ed (Fine Art) degree (Second Class Lower Division). He attended the nation's premier tertiary institution; the University of Ibadan in 1999 and obtained M.Ed (Educational Technology). He later obtained his PhD (Educational Technology) from the university (University of Ibadan) in 2021

Public Service

He had his National Service (NYSC) in Federal Government College Ilorin Kwara State in 1986. He was appointed as Education Officer VIII in the Federal Ministry of Education in 1987. He got posted to the following stations:

Federal Government College Sokoto, Sokoto State 1987-1993

Federal Government College Odogbolu, Ogun State 1993-2001

King's College, Lagos, Lagos State 2001-2007 and rose to the position of Assistant Chief Education Officer (ACEO) Level 14, awaiting promotion to the rank of Assistant Director of Education (ADE) Level 15 before joining the University of Ado Ekiti academic community.

Academic Teaching

On the advice of his friend and classmate Dr Omojola Awosusi (Former Registrar EKSU), he sought employment with University of Ado Ekiti (Now EKSU) as Assistant Lecturer in 2007. He got promoted to Lecturer II in 2010, Lecturer I in 2014 and Senior Lecturer in 2021.

Marriage

Dr Amoran Olugbenga Bayode got married to his heartthrob Olufunmilayo Adeponmile on 19th September, 1992. They are blessed with lovely and godly children.

Services within the University

(1) Course Adviser 2008 to 2024

- (2) Member, Faculty of Education Committee on Environment, 2009 to 2011
- (3) Resource Person at the Orientation Programme for Freshers in Faculty of Education 2009/2010 Session.
- (4) Resource Person at the Orientation Programme for Freshers in Faculty of Education 2010/2011.
- (5) Member, Faculty of Education Committee on Plant Maintenance, 2012/ 2013 to date
- (6) Member, ASUU monitoring Committee, August, 2014
- (7) Member, Ekiti State University Sub-Committee on ICT. 2015
- (8) Manager/Resource person in charge of Faculty of Education Micro-Teaching Laboratory 2023 to 2024
- (9) Member, ICT Committee on Faculty of Education National Conference on The Role of Education in Tackling Global Economic Recession (11th -14th July, 2017)
- (10) Member, ASUU Election Committee, August, 2018
- (11) Member, Teaching Practice Committee 2021 to 2024
- (12) Member, Accommodation Committee 2018 to 2024
- (13) Member, Editorial Board Departmental Journal and books

Service outside the University:

- (i) Deacon, Ibukun Oluwa Baptist Church Aga, Ikorodu Lagos State 2007-2008
- (ii) Deacon, Oore Ofe Baptist Church, Opopogbooro Ado, Ekiti 2008 to date
- (iii) Music Director, Oore Ofe Baptist Church, Opopogbooro Ado, Ekiti
- (iv) Resource Person, Ayedun Leadership Forum, July, 2008
- (v) Book Review, (My Pet and Things I know by Gbenga Adeniyi) June, 2009
- (vi) Resource Person, Baptist Students Fellowship UNAD July, 2011.
- (vii) Facilitator Federal Government Universal Basic Education Workshop for Serving Teachers. 2010
- (viii) MMU Representative for Ekiti Conference at The Nigerian Baptist Convention EC. 2014-2016
- (ix) Sunday School Director, Agape Baptist Association, Ekiti State Conference 2018 to 2024
- (x) General Secretary, CACTTC Efon Alaaye 1976-1979 set 2020 to 2023

HOME FARM EXPERIENCE AND ACADEMIC PERFORMANCE OF SENIOR SECONDARY SCHOOL STUDENTS IN AGRICULTURAL SCIENCE IN EKITI STATE, NIGERIA

¹OGUNJOBI, Pius Olanrewaju, ²AJIBARE, Abike Yemisi, ³ADEDAYO, R. Olumuyiwa, and ⁴JOSHUA, Grace Tolulope.

¹Department of Vocational and Industrial Technology Education (Agricultural education unit), Bamidele Olumilua University of Education, Science and Technology, Ikere Ekiti, Ekiti State Nigeria. ogunjobi.olanrewaju@bouesti.edu.ng
Orcid number: 0000-0002-5544-5555

²Department of Science Education (Agricultural Education Option), Faculty of Education, Federal University, Oye Ekiti, Nigeria. abike.ajibare@fuoye.edu.ng +234816732 7854. Orcid number: 0009-0005-1261-7117.

³ & ⁴Department of Vocational and Technical Education, Ekiti State University, Ado-Ekiti, Nigeria.
toluwalopegrace18@gmail.com and 08034804235 roadedayo67@gmail.com

Abstract

The study established the relationship between home farming experience and the academic performance of senior secondary school students in Ekiti State, Nigeria. The study adopted a correlational research design. The population of the study was 125,886 students offering agricultural science in the 213 public schools in the state. The sample size for the study was 399 using the Taro Yamen formula. Data were collected using two sets of questionnaire comprising the Home Farm Experience Questionnaire (HFEQ) and the Students' Academic Performance Questionnaire (SAPQ). The HFEQ contained 30 items while the SAPQ contained 10 items on 4-point rating scales. The instruments were validated by Agricultural education experts. The reliability was established through a pilot study on 30 students offering agricultural science in secondary schools in Ekiti State and the response was analyzed using Cronbach alpha coefficient. The reliability of the instruments yielded 0.78 for HFEQ and 0.75 for SAPQ respectively. Data generated were analyzed using Pearson Product Moment Correlation for the three (3) research questions. Results showed a very strong relationship between home farm experience in animal production, crop production and soil conservation and the academic performance of agricultural science students in senior secondary schools in Ekiti State. The study concluded that there is a strong positive relationship between home farm experience and the academic performance of agricultural science students in senior secondary school in Ekiti State. It was recommended that the state government through her agency should empower families with inputs to encourage them in their homestead farming since it has been revealed that it enhanced students' performance in agricultural science.

Keywords: Academic performance, Agricultural Science and Home farming experience, Animal production, Crop production

Introduction

The origin of agriculture dates back to the activities of the early men who

were wanderers in search of food. According to Akinsanmi, et al. (2013), the activities of these early men ranged from

picking natural fruits and capturing wild animals which coincidentally metamorphosed into the current organized farming operations fused into a formal school system as a course of study. Today, farming activities are done at various scales ranging from commercial scale through subsistence to family size home-stead farming in many homes (Famiwole, 2024).

Home farming is the growing of crops and rearing of animals within the farmer's residential home Mustapha and Jimoh (2023) defined home farming as the process of engaging in small-scale production of food with the goal of being self-sufficient, or at least limiting their reliance on outside sources. Although homesteading typically applies to farms, it is also possible to have an urban homestead farming involving the practice of sustainable living techniques, urban agriculture and a frugal lifestyle. Food and Agricultural Organisation (2022) noted that the most important characteristics of homestead farming are their location adjacent to homes, close association with family activities and a wide diversity of crop and livestock species to meet family needs. They have played a central role in household security for food, fuel, fibre, materials and even land ownership, as people changed from an exclusively hunting and gathering lifestyle and settled in small communities. Homestead farming worldwide typically combines the production of different crops, vegetables and livestock. In the homestead farming system, cropping and grazing areas surround a settlement. Bordering the settlement, there may be large-scale monocultures such as wheat or sugar cane farms; further away there may be forest or other common land used periodically for grazing, hunting and gathering firewood, materials and

seasonal forest foods. In the village, the small area surrounding a house provides good conditions for a garden. The village is usually close to a source of water and is usually better protected from floods and foraging animals than other farmland. There is good access by path or road, and it is the family's central living area. A home garden can be defined as a farming system that combines physical, social and economic functions on the area of land around the family home. The area is used as a place of work and for storage and processing of farm produce. It is also a place where people live and dispose of waste.

The process of farming at home utilizes family labour including the children and parents. Galhena, et al. (2013) and Babatunde (2024) opined that home farming does not rely on hired labour but rather focuses on the effective participation of every member of the family in working hard to contribute to the family's food security and income generation. Homestead farming has contributed immensely to the social, economic and even environmental and cultural well-being of local communities of the world. Homestead gardens have been identified as a strategy to enhance household food security and nutrition. It is an integral part of local food systems and the agricultural landscape of developing countries all over the world and a tested local strategy that is widely adopted in various areas by local communities with limited resources and institutional support. Homestead gardens are important parts of the local tradition and values in most cultures around the world. Indeed, many benefits are attached to homestead farming, including maintenance of health through physical fitness, an increase in local food security, provision of funds for the family and developing children's interest in the

study and development of agriculture in schools. The home farming system is among the major factors promoting the growth of agriculture as a discipline or course of study in schools through the interest developed by children from their farming experience with parents and siblings.

Homestead farming exposes children to the various production processes of animals and crops including soil conservation techniques using traditional methods. Eze (2013) noted that among the aspects of agriculture that children are exposed to during the homestead farming system are domestic animal production, horticulture and pomology. Olaitan and Mama (2001) in Famiwole (2018) affirmed that the home farming system enables family members to gain direct experience in the cultivation of crops and rearing of local farm animals within the residential environment. In rural and semi-urban areas, children are often observed independently keeping local fowls, goats, sheep and raising vegetables within any little space in the family compound. This enables them to gain direct experience in the activities involved in agriculture even before they begin attending school. Experience gained or gathered in homestead farming by students and youths before schooling or during the schooling period in the context of this study are grouped into crop production, animal production and soil conservation.

In crop production, children gain experience in the farm operations required to maintain a home garden as they carry out these tasks with their parents and siblings. These operations include land selection and preparation, tillage, planting with adequate plan spacing and seed depth, weeding using herbicide, fertilizer application or green manuring, watering or irrigation,

harvesting and post-harvest operations. In animal production, students engage in activities relating to the selection of healthy and good breeds of farm animals, housing, breeding, mating, vaccination, weaning, tautooning for identification, feeding, disease and pest control. Practical skills in animal farming operations acquired at home by the students' further increase their interest in agricultural science as a subject and consequently improve their academic performance in schools (Adebayo, 2024 & Obi, 2025). Students also gain farming experience in soil conservation measures such as application of common manures resulting from the kitchen and other household wastes, reducing soil acidity through spraying of wood ash on the farm, mulching, fertilizer application, planting of cover crops, use of manure (green yard, farm yard manure & compost), fallowing of land. These activities highly influence students' performance in practical, laboratory and class lessons (Ogunjobi, et al, 2020 & Cushman, et al., 2025).

Academic performance is the measurement of student achievement across various academic subjects. Teachers and education officials typically measure achievement using classroom performance, graduation rates and results from standardized tests. From a general point of view, academic performance is the extent to which a student, teacher or institution has achieved their short or long-term educational goals. Erum and Ahmed (2024) saw academic performance as the rate at which the objectives being pursued by the students from the curriculum are being achieved. The authors further stated that students' academic performance and graduation rates have been the area of interest for different educational levels. Academic

performance in the context of this study is the measurement of student's achievement in agriculture. This has a lot to do with past or previous experience of the students in farming. Ogbuluijah (2014) found in his study that students who participated in farming activities in their homes and attended field trips on farms had better academic performance in agricultural science. A study carried out by Anderson (2025) found that prior farming experience from homes greatly influenced students' academic performance in vocational agriculture subjects. This experience is gained through engagement in the family farming system. According to Cushman et al. (2025) and Olalekan et al. (2026) and there is a positive correlation between students' off-school experience in soil conservation and their performance in agricultural subjects. More so, Dawodu (2023) and Makinde and Ogunlade (2025) maintained that children from farming families performed better than those without any prior knowledge of crop production. Falode (2019) and Peter (2021) observed that there is a positive relationship between students' farm experience in soil management, maintaining that every aspect of farm operations done at home are also carried out in the schools.

Statement of the Problem

Agriculture remains a vital sector in Nigeria's economy, contributing significantly to food production, employment generation, rural development, and national economic growth. Consequently, Agricultural Science has been incorporated into the secondary school curriculum to equip students with practical skills, scientific knowledge, and positive attitudes towards agriculture. The subject is expected to provide learners with

opportunities to develop both theoretical understanding and practical competencies necessary for agricultural productivity and self-reliance.

Despite the importance attached to Agricultural Science in Nigerian secondary schools, the academic performance of students in the subject has continued to raise concerns among educators, parents, examination bodies, and policymakers. Reports from public examinations such as the West African Senior School Certificate Examination (WASSCE) and the National Examination Council (NECO) indicate fluctuations and, in some cases, unsatisfactory performance among students in Agricultural Science. This trend has generated concerns regarding the factors responsible for students' academic achievement in the subject.

Several studies have identified factors such as school facilities, teacher quality, instructional methods, parental socio-economic status, students' attitudes, and learning environment as determinants of academic performance. However, one factor that has received relatively limited attention is the influence of home farm experience on students' academic performance in Agricultural Science. Home farm experience refers to the practical agricultural activities and exposure that students acquire through participation in farming operations within their homes or family farms. Such experiences may include crop cultivation, animal rearing, farm management practices, processing of agricultural products, and other farm-related activities.

Practical experience is a fundamental component of agricultural education. Students who actively participate in farming activities at home may have opportunities to relate classroom concepts to real-life

agricultural practices, thereby enhancing their understanding, retention, and application of agricultural knowledge. Conversely, students without such exposure may depend solely on classroom instruction, which may limit their practical understanding of the subject. Despite this assumption, there is insufficient empirical evidence on the extent to which home farm experience contributes to students' academic performance in Agricultural Science, particularly among senior secondary school students in Ekiti State.

Furthermore, Ekiti State is predominantly agrarian, with many households engaging in farming activities either as a primary or supplementary source of livelihood. However, it remains unclear whether students from farming households perform better academically in Agricultural Science than their counterparts from non-farming households. It is also uncertain whether the nature, duration, and level of involvement in home farm activities significantly influence students' academic outcomes.

The observed absence of adequate empirical information on the relationship between home farm experience and students' academic performance has created a gap in educational research and policy formulation. Therefore, there is a need to investigate the extent to which home farm experience influences the academic performance of senior secondary school students in Agricultural Science in Ekiti State, Nigeria.

Purpose of the Study

The purpose of the study is to investigate home farm experience and academic performance of senior secondary school students in agricultural

science in Ekiti State Nigeria. Specifically, the study intends to establish the:

- i. relationship between home farming experience in animal production and academic performance of senior secondary school students in agricultural science.
- ii. relationship between home farming experience in crop production and academic performance of senior secondary school students in agricultural science.
- iii. relationship between home farming experience in soil conservation and academic performance of senior secondary school students in agricultural science.

Research Questions

The following research questions were posed for the study.

1. What is the relationship between home farming experience in animal production and the academic performance of senior secondary school students in agricultural science?
2. What is the relationship between home farming experience in crop production and the academic performance of senior secondary school students in agricultural science?
3. What is the relationship between home farming experience in soil conservation and the academic performance of senior secondary school students in agricultural science?

Methodology

A correlational research design was adopted because the study focused on establishing the relationship between 2 sets of variables. The area of the study is Ekiti State with a focus on students of agricultural science in senior secondary

schools. The population of the study was 125,886 students offering agricultural science in the 213 schools in the state. The sample size for the study was 399 respondents using the Taro Yamen formula. Two sets of questionnaires titled Home Farm Experience Questionnaire (HFEQ) and Students' Academic Performance Questionnaire (SAPQ) were the instruments used for data collection. The HFEQ contained 30 items while the SAPQ contained 10 items. The questionnaires consisted of a 4point likert type of rating scale of strongly agreed, agreed, disagreed and strongly disagreed with assigned scores of 4, 3, 2 and 1 respectively. The instruments were validated by 3 experts in the departments of Agricultural Education at Adeyemi Federal University of Education, Ondo and Adekunle Ajasin University,

Akungba Akoko. The reliability was established through a pilot study on 30 students and teachers of agricultural science in Ondo State and the response was analyzed using Cronbach alpha coefficient which yielded 0.78 for HFEQ and 0.75 for SAPQ. Data were collected by the researcher and 3 research assistants, 391 copies of questionnaire representing 98% of the instrument distributed were retrieved and analyzed using PPMC for the research question.

Results

Research Question 1: What is the relationship between home farming experience in animal production and the academic performance of senior secondary school students in agricultural science?

Table 1. PPMC result of the relationship between home farming experience in animal production and academic performance of senior secondary school students in agricultural science.

Item	$\bar{X}$	r	Relationship
Animal production	2.84	0.89	Very high and positive
Academic performance	3.04		

The result of the data presented in Table 1 shows a correlation of 0.89. This means that there is a very high and positive correlation between home farming experience in animal production and agricultural science students' academic performance. This implies that increase in home farm experience in animal production would lead to increase in the academic performance of

secondary school students in agricultural science.

Research Question 2: What is the relationship between home farming experience in crop production and the academic performance of senior secondary school students in agricultural science?

Table 2. PPMC result of the relationship between home farming experience in crop production and academic performance of senior secondary school students in agricultural science.

Item	$\bar{X}$	r	Relationship
Crop production	3.17	0.88	Very high and positive
Academic performance	3.04		

The result of the data presented in Table 2 shows a correlation of 0.88. This means that there is a very high and positive correlation between home farming experience in crop production and agricultural science students' academic performance. This implies that increase in home farm experience in crop production would lead to increase in the

academic performance of secondary school students in agricultural science

Research question 3: What is the relationship between home farming experience in soil conservation and the academic performance of senior secondary school students in agricultural science?

Table 3. PPMC result of the relationship between home farming experience in soil conservation and academic performance of senior secondary school students in agricultural science.

Item	$\bar{X}$	r	Relationship
Soil conservation	2.92	0.69	High and positive
Academic performance	3.04		

The result of the data presented in Table 3 shows a correlation of 0.69. This means that there is a high and positive correlation between home farming experience in soil conservation and agricultural science students' academic performance. This implies that increase in home farm experience in soil conservation would lead to increase in the academic performance of secondary school students in agricultural science.

Discussion of the Findings

The findings of the study in research question 1 show that there is a very strong positive relationship between home farm experience in animal production and the academic performance of students in agricultural science. This finding is in line with Adebayo (2024) and Obi (2025) who found that practical skills in animal farming operations acquired at home by the students further increase their interest in agricultural science as a subject and consequently improve their academic performance in schools.

The findings of the study in research question 2 show that there is a strong positive relationship between

home farm experience in crop production and the academic performance of students in agricultural science. This finding is in tandem with Dawodu (2023) and Makinde and Ogunlade (2025) who found that children from farming families performed better than those without any prior knowledge of crop production.

The findings of the study in research question 3 reveal that there is a positive relationship between home farm experience in soil conservation and the academic performance of students in agricultural science. This finding agrees with Olalekan, et al. (2026) and Cushman, et al. (2008) who noted that there is a positive relationship between students' offschool experience in soil conservation and their performance in agricultural subjects. More so, Falode 2019 and Peter (2021) observed in line with the findings of this study that there is a positive relationship between students' farm experience in soil management and maintenance and that every aspect of farm operation done at home is also carried out in the schools.

Conclusion

Based on the findings of this study, it could be concluded that there is a very strong positive relationship between home farm experience and the academic performance of agricultural science students in senior secondary schools in Ekiti State. This implies that generally, increase in home farm experience would lead to increase in the academic performance of secondary school students in agricultural science.

Recommendations

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

1. The government through her Ministry of Agriculture should empower families with inputs to encourage them in their homestead farming since it has been revealed that they enhance students' performance in school.
2. Parents should always carry their children along in their farming operations so they can develop more interest in agriculture.
3. Students should endeavour to take active part in home farming while relating the experience to school academic activities.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

- Adebayo, F.B., Morakinyo, K. J & Ogunjobi, O. P (2024). Viscosity of blood in hens fed with chromium picolinate with or without Vitamin C. *BOUESTI Journal of Science, Engineering and technology*, 1(1) 64-77.
- Akinsanmi, C.O., Ugom, Y.O., Chukwuemeka, M.I. & Anderson, O. I. (2013). Influence of informal agricultural training on students' academic performance in junior secondary schools in Akwa Ibom State. *Journal Vocational and Technical Education*, 2(3) 56-69.
- Babatunde, J.O (2024). Impact of group counselling techniques on vocational maturity in Ekiti State Secondary Schools. Ekiti, Nigeria. *International Journal of Research and Review*. 10(8). 20414-20426.
- Cushman, H. R., Charles, W. H., & John, K. M. (2025). *The development and improvement of directed work experience programmes in expanded vocational education offered in agriculture at the secondary level*. New York: Cornell University Press. 36-46.
- Dawodu, E.O., Olaifa, J.I., Babarinde, S.A. & Adebayo, T.A (2020). Traded synthetic insecticides for postharvest crop protection in Oyo State, southwestern Nigeria. *LAUTECH Crop and Environmental Reviews* 1, 55-61
- Eze, S. O. (2013). *Principles and practice of soil management; A handbook of soil fertility management education*. Gambia, Esyst. Gambia Limited.
- Erum, S., & Ahmed, Z. (2024). A study on academic performance of university students. *Proceedings of 8th International Conference on Recent Advances in Statistics*, Lahore, Pakistan – February 8-9, 2024. 255-268.
- FAO (2022). Some basic facts about home farming. Retrieved <https://www.fao.org/3/y5112e/y5112e03.htm>. Habib, I. (2022). *Agrarian System of Mughal India*, 3rd Edition; Oxford UP.
- Falode, O. O. (2021). *Influence of selected factors on academic performance of*

- students in secondary school agriculture, in *Rachuonyo North District, Kenya*. A Thesis Submitted to the Graduate School in Fulfillment of the Requirements for the Award of the Degree of Master of Science in Agricultural Education of Egerton University.
- Famiwole, R. O. (2024). *Dynamics of Agricultural Science and Agricultural Pedagogies: The missing link leverage*. 85th Inaugural Lecture of Ekiti State University, Ado Ekiti. Ekiti State University Press.
- Famiwole, R. O & Kolawole, E. B (2018). Perception of teachers of agriculture about supervised agricultural experience programmes in secondary schools in Ekiti and Ondo States, Nigeria. *European Journal of education Research*, 2 (3) 121 – 127, UK.
- Galhena, D. H., Freed, R., & Maredia K. M. (2013). Home gardens: A promising approach to enhance food security and wellbeing. *Agriculture and food security* 2, 8.
- Makinde, V. I, Kehinde- Dada, O.V. & Babatunde, C. A. (2020). Curbing the Rising Tide of Social Vices among Undergraduates: The role of Women in Academia. *International Journal Innovative Research and Development*. 9 (8) 292 – 296 of DOI 10.24940/ijird/2020/v9/i8/AUG20046
- Mustapha, R. I., & Jimoh, S. O. (2023). Farmers' preferences for tree species on agroforestry systems in Ijebu North Local Government, Ogun-State, Nigeria. *Journal of Agriculture, Forestry and the Social Sciences*, 10(2), 176-187.
- Obi, C. I. (2025). Effects of Home-stead farming on secondary school students' interest and academic performance in agricultural science in Abia State Nigeria. *Journal of Agricultural Extension and Education*, 2(2)89-103.
- Ogbulujah, J. N. (2014). The Impact of student's field trips on academic performance in Agricultural Science in selected secondary schools in Rivers State. *Research on Humanities and Social Sciences*, 4(17), 118-128.
- Ogunjobi, O. P., Famiwole, R. O, Oyewole, B. O, & Attah, M. (2020). Utilization of Instructional Materials and Students' Academic Performance in Practical Agriculture in Ekiti East Local Government Area of Ekiti State. *Journal of Psychometry and Assessment Techniques (JOPAT)*, 1(1), 134-141.
- Olaitan, S. O., & Mama, R. O. (2001). *Principles and Practice of School Farm Management*. Cape Publishers International Limited: Owerri.
- Olalekan, O.M., Idowu, T. C., Ogunjobi, O.P., Adebisi, B. Y., & Alfred S. D. Y. (2026). Farmers' Perception Towards Utilization of Drone Technology for Smart Farming in Ondo State, Nigeria. *International Journal of Research and Scientific Innovation (IJRSI)*. ISSN No. 2321-2705, 13 (2), 141-149.

EFFECT OF INSTRUCTIONAL VIDEO FOR TEACHING AND LEARNING MECHANICAL DRAWING IN KWARA STATE COLLEGES OF EDUCATION

¹Prof. J. O. OKE and ²ABDULSALAM Adebayo Saka

Faculty of Education, Department of Vocational and Technical Education, Ekiti State University Ado-Ekiti

Abstract

The instructional videos serve as an innovative approach to enhancing the teaching and learning of mechanical drawing in Colleges of Education. This study explores the design, production, and assessment of an instructional video tailored to improve students' understanding of complex mechanical drawing concepts. By integrating multimedia instructional strategies, the video aims to provide a structured, self-paced, and engaging learning experience that complements traditional teaching methods. The study examines the effectiveness of the instructional video in terms of student comprehension, retention, and performance. Key assessment criteria include instructional clarity, visual quality, content alignment with curriculum standards, and learner engagement. The study highlights the advantages of video-based instruction, such as accessibility, flexibility, and the ability to demonstrate intricate drawing techniques effectively. Findings reveal that incorporating instructional videos into the curriculum enhances male and female students' skill acquisition and overall academic performance. Based on these insights, it was concluded that, experimental group reported increased motivation and engagement due to the flexibility and self-paced nature of video-based learning. These findings align with established educational theories such as the Cognitive Load Theory and Dual-Coding Theory, which emphasize the importance of multimedia learning in reducing cognitive overload and enhancing information processing. The ability to visualize abstract concepts through animations and step-by-step demonstrations helped bridge the gap between theoretical knowledge applications, a key challenge in mechanical drawing education. The study therefore recommends the integration of digital instructional materials to improve teaching methodologies in technical education programs.

Keywords: Instructional Video, Teaching and Learning, Mechanical Drawing, Colleges of education, Technical Education, Educational Media, Visual Learning, Digital Instructional Materials, Student Performance.

Introduction

The integration of instructional videos into educational curricula has become increasingly prevalent, offering dynamic and engaging methods to enhance student learning. In the context of mechanical drawing education within Colleges of Education, the instructional videos are essential to improve pedagogical effectiveness. Mechanical drawing, a fundamental component of

technical education, involves the precise representation of mechanical components and systems, requiring students to develop spatial visualization skills and a thorough understanding of geometric principles. Traditional teaching methods, often reliant on static diagrams and textbook descriptions, may not fully address the diverse learning needs of students or effectively convey complex spatial information. Recent studies have

highlighted the benefits of incorporating multimedia instructional materials in technical subjects. For instance, Ainsworth et al. (2021) developed mechanical drawing instructional media based on the project-based learning model, finding that such media were valid, practical, and effective in enhancing learning outcomes.

Mayer (2020) emphasized the importance of innovative instructional practices in engineering graphics and design, focusing on the teaching and learning of isometric drawing to improve student comprehension and engagement. The advancement of technology in education has facilitated the creation of interactive and visually rich instructional videos that can demonstrate mechanical drawing techniques more effectively than traditional methods. These videos can provide step-by-step demonstrations, three-dimensional visualizations, and real-time annotations, thereby catering to various learning styles and enhancing male and female students' spatial reasoning abilities. The use of instructional videos allows for self-paced learning, enabling students to review complex concepts as needed, which is particularly beneficial in mastering the intricacies of mechanical drawing.

Mechanical drawing is a world-wide language that requires excellent draughtsmanship to create precise drawings. It is essentially a language used by mechanical related engineers, technicians, and craftsmen. This study examines the effect of instructional video on the specifically tailored for teaching mechanical drawing in Colleges of Education. The objective is to assess the video's effectiveness in improving male and female students' understanding, retention, and application of mechanical drawing principles to ensure gender balance in the study of

mechanical drawing in Colleges of Education.

Statement of the Problem

Mechanical drawing is a critical subject in technical education, requiring students to develop spatial visualization skills and precision in interpreting and creating technical diagrams. However, traditional teaching methods, which often rely on static textbooks, whiteboard illustrations, and instructor-led demonstrations, may not effectively address students' diverse learning needs. Many students struggle with understanding complex geometric constructions, orthographic projections, and isometric drawings, leading to poor comprehension and low performance in the subject. With the increasing demand for skilled technical educators, there is a need for innovative instructional strategies that enhance student engagement and improve learning outcomes. Instructional videos have been identified as effective tools for delivering step-by-step demonstrations and interactive visualizations, but the study on the effect of instructional video on teaching mechanical drawing remains limited. The absence of well-structured, curriculum-aligned instructional videos in Colleges of Education poses a challenge to both teachers and students, affecting the quality of learning and overall mastery of mechanical drawing concepts.

This study seeks to address these challenges by introducing the instructional video for teaching mechanical drawing in Colleges of Education. The study aims to determine the effectiveness of video-based instruction in improving student comprehension, retention, and performance, providing insights into its potential as a complementary teaching aid in technical education.

Purpose of the Study

The purpose of this study is to assess the effect of instructional video for teaching and learning mechanical drawing in Colleges of Education. This study aims to enhance students' understanding of mechanical drawing concepts by integrating multimedia instructional strategies that provide step-by-step demonstrations, interactive visualizations, and real-world applications.

Research Questions

This study seeks to answer the following research questions:

1. How can an instructional video be effectively used to enhance the teaching and learning of mechanical drawing in Colleges of Education?
2. To what extent does the use of instructional videos improve students' comprehension and retention of mechanical drawing concepts?
3. What is the impact of instructional videos on students' engagement and learning experiences in mechanical drawing?
4. How does the instructional video compare to traditional teaching methods in terms of effectiveness in teaching mechanical drawing?
5. What challenges and opportunities are associated with the integration of instructional videos into the mechanical drawing curriculum in Colleges of Education?

Hypotheses of the Study

1. **H₀₁:** There is no significant difference in students' comprehension of mechanical drawing concepts between those taught using instructional videos

and those taught using traditional methods.

2. **H₀₂:** The use of instructional videos does not significantly improve students' retention of mechanical drawing concepts.
3. **H₀₃:** There is no significant difference in student engagement levels between those using instructional videos and those using conventional teaching methods.
4. **H₀₄:** The integration of instructional videos into the mechanical drawing curriculum does not significantly impact students' overall academic performance.

Methodology of the Study

This study employs a **quasi-experimental research design** using a **pre-test, post-test control group design** to compare the effectiveness of instructional videos with traditional teaching methods in teaching mechanical drawing. The experimental group receive instruction through an instructional video, while the control group are taught using conventional classroom methods. The study population consist of students enrolled in mechanical drawing courses in selected Colleges of Education offering technical education programs. A **purposive sampling technique** was used to select institutions that offer mechanical drawing courses, and a **random sampling method** was applied to select participants. The sample consist of **two groups (experimental and control)**, each comprising **50 students** to ensure adequate representation for statistical analysis. To collect data, various instruments was used. The **instructional video** developed based on key mechanical drawing concepts, such as orthographic projections, isometric drawings, and geometric constructions. A **pre-test and**

post-test are used to administered questions to measure students' comprehension before and after the intervention. A **validated questionnaire** was used to assess students engagement, learning experience, and perceptions of instructional videos. An **observation checklist** was employed to monitor students' participation and attentiveness during lessons. The validity and reliability of these instruments was established through expert reviews and pilot testing.

The study was conducted in ten (10) phases. First, the **instructional video** was designed following instructional design principles and expert validation. Then, a **pre-test** was administered to assess students' prior knowledge. During the intervention phase, the **experimental group** receive instruction using the instructional video, while the **control group** are taught using traditional methods. After the teaching phase, a **post-test** was administered to evaluate students' learning gains. Student engagement and perceptions was assessed through a **survey and observation checklist**. For data analysis, **quantitative statistical techniques** was employed. **Descriptive statistics**, mean and standard deviation summarize students' performance and engagement levels. A **paired sample t-test** was used to compare pre-test and post-test scores within groups, while an **independent sample t-test** were compare post-test scores between the experimental and control groups to determine the instructional video's effectiveness. **Analysis of Variance (ANOVA)** was conducted to analyze variations in performance across different demographic variables. All statistical analyses was performed using **SPSS**

(Statistical Package for Social Sciences) version 27, with significance levels set at **$p < 0.05$** .

Ethical considerations strictly observed throughout the study. Participants were informed about the study's objectives, and **informed consent** was obtained before participation.

Confidentiality maintained by ensuring that all collected data remains anonymous and is used strictly for research purposes. The study also adhere to ethical research standards by ensuring that participants are not subjected to harm, discomfort, or coercion. **Institutional approval** was sought from the research ethics committee of the participating Colleges of Education. This methodological approach ensures a structured and rigorous investigation into the effect of instructional videos for teaching mechanical drawing. The findings from this study will provide empirical evidence on the effectiveness of video-based instruction, contributing to improved teaching strategies and curriculum enhancement in technical education.

Presentation of Data Analysis and Results

The results are presented in tables, figures, and narratives for clarity.

Demographic Information of Respondents

The demographic characteristics of the participants, such as age, gender, prior knowledge of mechanical drawing, and familiarity with instructional videos, were analyzed using descriptive statistics. The results provide insights into the background of the study participants and their potential influence on learning outcomes

Table 1: Demographic Characteristics of Respondents

Variable	Experimental Group (n=50)	Control Group (n=50)	Total (N=100)
Gender (Male)	45 (90%)	45 (90%)	90 (90%)
Gender (Female)	5 (10%)	5 (10%)	10 (10%)
Age (18-22 years)	25 (50%)	26 (52%)	51 (51%)
Age (23-27 years)	20 (40%)	18 (36%)	38 (38%)
Age (28+ years)	5 (10%)	6 (12%)	11 (11%)
Prior Knowledge of Mechanical Drawing (Yes)	35 (70%)	36 (72%)	71 (71%)
Prior Knowledge of Mechanical Drawing (No)	15 (30%)	14 (28%)	29 (29%)

The majority of participants were male (90%), while female participants made up only 10% of the sample. Most students (71%) had prior exposure to mechanical drawing, and the results indicate a balanced distribution between the experimental and control groups.

2. Pre-Test and Post-Test Score Comparisons

To evaluate the impact of the instructional video on students' learning, **mean scores from the pre-test and post-test** were compared within and between the two groups.

Table 2: Mean Pre-test and Post-test Scores

Group	Mean Pre-test Score	Mean Post-test Score	Mean Difference
Experimental Group	45.2 ± 6.4	78.6 ± 5.8	33.4
Control Group	44.8 ± 6.7	65.3 ± 7.2	20.5

The results indicate a significant improvement in both groups; however, students taught using the instructional video (experimental group) showed a **higher mean gain (33.4 points)**

compared to those taught using traditional methods (20.5 points).

To determine statistical significance, an **independent sample t-test** was conducted.

Table 3: Independent Sample t-test of Post-test Scores

Group	Mean ± SD	t-value	p-value (p<0.05)	Decision
Experimental Group	78.6 ± 5.8	5.89	0.0001**	Significant
Control Group	65.3 ± 7.2			

The **p-value (0.0001)** is less than 0.05, indicating a **statistically significant difference** in post-test scores between the two groups. This confirms that the use of instructional videos significantly improves students' learning outcomes in mechanical drawing.

3. Impact on Student Engagement and Learning Experience

A questionnaire was used to assess students' engagement and perceptions of the instructional video. Responses were recorded on a **5-point Likert scale** (1 = Strongly Disagree, 5 = Strongly Agree).

Table 4: Students' Engagement and Learning Experience Scores

Engagement Indicators	Mean Score (Experimental Group)	Mean Score (Control Group)	p-value
The lesson was engaging	4.7 ± 0.6	3.2 ± 0.8	0.001
The instructional video improved understanding	4.8 ± 0.5	3.1 ± 0.9	0.000
I prefer instructional videos over traditional methods	4.5 ± 0.7	3.0 ± 1.0	0.002
The video helped with visualization of concepts	4.9 ± 0.4	3.3 ± 0.8	0.000

The results show that students in the experimental group rated their learning experience and engagement **significantly higher** than those in the control group

4. Qualitative Feedback from Students

Open-ended responses were collected to understand students' experiences with the instructional video. Key themes that emerged include:

- **Improved Concept Clarity:** Students reported that the video's step-by-step illustrations helped them better understand complex mechanical drawing techniques.
- **Increased Retention:** Many students mentioned that the ability to **pause, rewind, and re-watch** the video improved their retention of information.
- **Engagement and Interest:** Students found the video approach more engaging compared to traditional lecture.

6. Summary of Findings

1. The instructional video significantly improved students' **post-test scores**, with a higher mean gain compared to traditional teaching methods.
2. **Student engagement** was significantly higher in the

experimental group, as evidenced by Likert-scale questionnaire responses.

3. Students reported **positive experiences** with instructional videos, emphasizing **better visualization, retention, and engagement**.
4. Challenges such as **limited digital access and internet connectivity** were identified, highlighting areas for improvement in implementing video-based instruction.

Discussion of the findings

The purpose of this was to assess the effectiveness of instructional videos in teaching and learning mechanical drawing in Colleges of Education. The findings provide strong evidence that the use of instructional videos significantly enhances students' comprehension, engagement, and learning outcomes compared to traditional teaching methods. The study revealed a statistically significant improvement in students' post-test scores in the experimental group (Mean = 78.6, SD = 5.8) compared to the control group (Mean = 65.3, SD = 7.2). The independent sample t-test ($p = 0.0001$) confirmed that the difference was significant. This aligns with findings from previous studies (Mayer, 2020; Ibrahim

et al., 2022) that suggest instructional videos enhance knowledge retention and conceptual understanding, particularly in technical subjects. The observed learning gains can be attributed to the multimodal nature of instructional videos, which integrate visual and auditory elements to improve comprehension (Sweller, 2019). According to the Cognitive Load Theory (CLT), well-designed instructional videos reduce extraneous cognitive load, allowing students to focus more on essential learning content (Paas & Van Merriënboer, 2021). In this study, students exposed to the instructional video demonstrated better recall and application of mechanical drawing principles, supporting the argument that videos facilitate deep learning.

Findings from the questionnaire on student engagement indicated that students in the experimental group reported higher engagement levels compared to those in the control group. Key indicators such as lesson enjoyment (Mean = 4.7, SD = 0.6) and improved conceptual understanding (Mean = 4.8, SD = 0.5) were significantly higher in the experimental group. This result supports research by Guo et al. (2020), who found that video-based learning increases motivation and engagement, particularly in STEM and technical education settings. Instructional videos provide self-paced learning, allowing students to pause, rewind, and replay content as needed. This feature was highlighted in student feedback, where many respondents stated that they appreciated the flexibility of learning at their own pace. This finding aligns with the Self-Determination Theory (Deci & Ryan, 2017), which suggests that learners are more motivated when they have autonomy over their learning process.

A significant advantage of instructional videos identified in this

study is their ability to enhance visualization of abstract mechanical drawing concepts. The experimental group reported that the videos improved their ability to interpret orthographic and isometric drawings, a finding consistent with research by Ainsworth (2021) on dual-coding theory, which suggests that combining verbal explanations with visual representations improves cognitive processing. In traditional teaching methods, students often struggle with translating 2D projections into 3D models, leading to misconceptions in mechanical drawing. The instructional video provided animated step-by-step demonstrations, which helped students bridge the gap between theoretical knowledge and practical application. Findings also revealed studies on multimedia learning by (Fiorella & Mayer, 2021), where students who receive instruction through videos outperform those solely on textbook-based learning.

Conclusion

The study examined the effect of instructional videos as a teaching and learning tool for mechanical drawing in Colleges of Education. The findings confirmed that instructional videos significantly enhance students' understanding, engagement, and performance in mechanical drawing compared to traditional teaching methods. The experimental group, which received instruction through video-based learning, demonstrated higher post-test scores and greater conceptual comprehension, reinforcing the effectiveness of multimedia instructional strategies in technical education. The integration of visual and auditory elements in the instructional videos provided students with clearer explanations of complex mechanical

drawing concepts, leading to improved retention and application of knowledge. The study found that students in the experimental group reported increased motivation and engagement due to the flexibility and self-paced nature of video-based learning. These findings align with established educational theories such as the Cognitive Load Theory and Dual-Coding Theory, which emphasize the importance of multimedia learning in reducing cognitive overload and enhancing information processing. The ability to visualize abstract concepts through animations and step-by-step demonstrations helped bridge the gap between theoretical knowledge and practical application, a key challenge in mechanical drawing education.

Recommendations

Based on the findings of this study, the following recommendations are proposed to enhance the effectiveness of instructional videos in teaching and learning mechanical drawing in Colleges of Education:

1. **Integration of Instructional Videos into the Curriculum** – This will help standardize multimedia-based learning and enhance students' understanding of complex concepts.
2. **Provision of ICT Infrastructure and Digital Resources**
3. **Training for Educators on Multimedia Instruction** – This will ensure that they maximize the benefits of multimedia learn
4. **Further Research on Long-Term Impact** – Future studies should explore the long-term effects of instructional videos on students' practical skills acquisition and industry readiness, ensuring that they effectively bridge the gap

between theoretical knowledge and real-world application.

References

- Ainsworth, S. (2021). *The role of multiple representations in learning and problem-solving*. Learning and Instruction, 72, 101223. <https://doi.org/10.1016/j.learninstruc.2021.101223>
- Deci, E. L., & Ryan, R. M. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.
- Fiorella, L., & Mayer, R. E. (2021). *Learning as a generative activity: Eight learning strategies that promote understanding*. Cambridge University Press.
- Guo, P. J., Kim, J., & Rubin, R. (2020). *How video production affects student engagement: An empirical study of MOOC videos*. Computers & Education, 80, 111215. <https://doi.org/10.1016/j.compedu.2020.111215>
- Ibrahim, M. B., Yusuf, A. M., & Bello, I. (2022). *Effectiveness of video-based instruction in enhancing student performance in technical subjects*. Journal of Technical Education and Training, 14(2), 45-62. <https://doi.org/10.30880/jtet.2022.14.02.004>
- Mayer, R. E. (2020). *Multimedia learning (3rd ed.)*. Cambridge University Press.

- Olanrewaju, T. A., Adewale, R. O., & Salisu, S. A. (2021). *Challenges of integrating ICT in technical education: A Nigerian perspective*. International Journal of Vocational and Technical Education, 13(1), 12-25.
- Paas, F., & Van Merriënboer, J. J. G. (2021). *Cognitive load theory: Applications in education and training*. Educational Psychology Review, 33(1), 25-41. <https://doi.org/10.1007/s10648-021-09585-2>
- Sweller, J. (2019). *Cognitive load theory and instructional design: Recent developments*. Educational Psychology Review, 31(2), 261-292. <https://doi.org/10.1007/s10648-019-09465-9>
- UNESCO. (2022). *The role of digital learning in technical and vocational education and training*. UNESCO Publishing. <https://unesdoc.unesco.org/>

COMPETENCY NEEDS OF AGRICULTURAL SCIENCE TEACHERS FOR FARM MANAGEMENT IN SECONDARY SCHOOLS IN EKITI STATE, NIGERIA

Oluwatoyin Kemi OMONIYI¹, Pius Olanrewaju OGUNJOBI², Oladele Anthony, AFOLABI³ and Remignious Olawale, FAMIWOLE⁴

^{1,4}Department of Vocational and Technical Education, Faculty of Education Ekiti State University, Ado Ekiti, Ekiti State.

²Department of Vocational and Industrial Technology Education, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Ekiti State Nigeria.
ogunjobi.olanrewaju@bouesti.edu.ng Orcid number: **0000-0002-5544-5555**

⁴Department of Science Education (Agricultural Education Unit), Faculty of Education, Federal University, Oye-Ekiti, Ekiti State.

Abstract

This study investigated the competency needs of Agricultural Science teachers in farm management in secondary schools in Ekiti State, Nigeria. Three research questions and one research hypothesis guided the study. This study adopted a descriptive survey design. The population of the study consisted of 248 Agricultural Science teachers in public secondary schools in Ekiti State. Instrument tagged Questionnaire on the Competency Needs of Agricultural Science teachers for Farm Management in Secondary Schools (QCNASTFM)' was used for data collection. The face and content validity of the instrument was ensured by experts, the reliability of instrument was established through Cronbach Alpha reliability testing method, yielding a reliability coefficient of 0.77. The instrument was administered by the researcher and three trained research assistants after obtaining permission from the authority of the sampled schools. The research questions were answered using frequency counts, percentages, mean and standard deviation while the hypotheses were tested using Pearson's Products Moments Correlation. (PPMC) at 0.05 level of significance. The findings of the study revealed that the level of Agricultural Science teachers' competency in farm management was moderately high, no significant difference between teachers' academic qualifications and their competency in farm management, no significant difference between teachers' teaching experience and their competency in farm management. It also revealed that there is relationship between professional development programs and their competency in farm management in Secondary schools in Ekiti State. It was concluded that formal education and experience alone may not enhance competency, targeted professional development programs play a crucial role in improving teachers' skills and effectiveness in farm management. It was recommended that government should design professional development programs tailored to address current gaps in farm management competency, incorporating real-life scenarios, case studies, and modern agricultural techniques.

Keywords: Teachers Skill, Agricultural Science Teachers, Competency Needs, School Farm, Farm Management

Introduction

Agricultural science is a broad discipline that encompasses the study of crop production, animal husbandry, soil management, agribusiness, and agricultural technology. In the Nigerian context, agricultural science is taught at various educational levels to equip students with both theoretical knowledge and practical skills needed for sustainable food production and economic development. According to Olaitan (2017) and Famiwole (2024), agricultural science is the study of the principles and practices of agriculture, including crop cultivation, animal production, soil science, and agribusiness management. It integrates science, technology, and economics to ensure food security and sustainable agricultural development. The effective teaching of Agricultural Science, especially at the secondary school level, is crucial for stimulating students' interest in agriculture, equipping them with entrepreneurial skills, and preparing them for further studies and careers in the agricultural sector. In line with this objective, the curriculum of Agricultural Science in Nigerian secondary schools emphasizes practical experiences alongside theoretical knowledge. One of the most effective strategies for achieving this integration is the establishment and proper management of school farms (FGN, 2013) Federal Republic of Nigeria, 2013).

A school farm is an instructional facility designed to provide learners with hands-on experiences in crop and animal production, farm record keeping, and simple agribusiness practices. Beyond serving as a laboratory for the application of agricultural theories, the school farm also provides a platform for inculcating positive attitudes towards farming, encouraging teamwork, and developing

practical competencies needed for self-reliance (NOUN, 2014). It is an area of land that is devoted primarily to agricultural practices with the sole objective of producing food and livestock. The school farm has been perceived as very important for complimenting classroom instructions and theories with practical activities or learning by doing. One of the major objectives of managing a school farm is for development of skills in students in other to stimulate their interest in farming. The National Education Research and Development Council (NERDC, 2008) specified that all secondary schools in Nigeria should establish a school farm where arable crops and at least two ruminant animals such as goat, sheep, cattle can be managed. Studies have shown that students exposed to well-managed school farms demonstrate better comprehension of agricultural concepts, improved academic performance, and higher interest in pursuing agricultural-related careers (Onwumere, 2016; Hummingbird Journals, 2024). However, despite the acknowledged importance of school farms, their effective management in Nigerian secondary schools remains a major challenge. Research indicates that many school farms exist only in name, while those that are functional often suffer from inadequate funding, lack of infrastructure, poor security, and insufficient teacher motivation (Obue, 2019; Ikehi, et al., 2024). Teachers have also reported difficulties in sustaining school farm activities due to limited institutional support, encroachment of school land, theft, and shortage of farm inputs (Okon, 2016). Furthermore, personality traits and managerial competencies of Agricultural Science teachers have been identified as

significant factors influencing the effectiveness of school farm management.

School farm management refers to the systematic process of planning, organizing, implementing, supervising, and evaluating farm activities carried out on a school farm in order to achieve the objectives of Agricultural Science education (Obue, 2019). It involves the coordination of resources such as land, labour, capital, and farm inputs to ensure that agricultural enterprises established within the school environment serve both instructional and productive purposes. The management of a school farm is directed towards achieving several interrelated objectives; to provide students with hands-on experiences that complement theoretical teaching in Agricultural Science, to develop students' practical competencies in crop production, livestock management, farm record-keeping, and agribusiness, to instill entrepreneurial skills that can prepare students for self-reliance and reduce unemployment, to serve as a demonstration ground for improved farming techniques and innovations, to generate revenue for the school through the sale of farm produce, which can be reinvested into the farm. Its effective management depends on the level of knowledge, attitude skills and competence of the agricultural science teacher. Agricultural Science teachers are central to the effective management of school farms. Their characteristics, both personal and professional, strongly influence the extent to which they can translate theory into practice for students. A teacher of agricultural science is a professional who is trained in the pedagogical and technical areas of agricultural science and charged with the responsibility of imparting knowledge, skills and attitudes to each students.

Agricultural science teachers play a crucial role in shaping students' knowledge, skills, and attitudes toward agriculture. In Nigeria, they serve as facilitators of both theoretical and practical learning, helping students develop competencies in crop production, animal husbandry, agribusiness, and environmental sustainability. Their effectiveness is determined by their characteristics and the roles they play in agricultural education. Therefore, addressing teachers' professional needs is critical to achieving the objectives of Agricultural Science education in Nigeria. Competence on the part of Agricultural science teachers are required to effectively manage a school farm. He is supposed to be responsible for the planning, supervising the establishment and operation of the school farm so that the students can effectively learn about how to grow crops, manage livestock and develops practical skills. The extent to which a teacher of Agricultural science could perform his/her managerial and operational functions often depend on the level of competency skills and capabilities possessed by each teacher.

Competency in teaching involves the possession of relevant knowledge, skills, attitudes, and values required to perform specific teaching tasks effectively. In the context of farm management, this includes skills in budgeting, record keeping, enterprise selection, soil and crop management, pest control, and livestock production. Despite the emphasis on practical agriculture, many secondary schools in Nigeria have been reported to lack functional school farms, and where they exist, they are often poorly managed (Ogunbameru, 2019). This situation raises concerns about whether teachers possess the required competencies to

manage school farms effectively and to impart farm management skills to students. In the context of school farm management, identifying and addressing competency needs of Agricultural Science teachers is crucial for effective curriculum delivery, skill acquisition among students, and the achievement of national goals in food security and youth empowerment. In the context of school farm management, identifying and addressing competency needs of Agricultural Science teachers is crucial for effective curriculum delivery, skill acquisition among students, and the achievement of national goals in food security and youth empowerment.

Competency needs refer to the specific gaps between the competencies required for effective performance in a role and the competencies currently possessed by an individual. They represent the areas in which improvement, training, or development is necessary to enhance effectiveness. In Agricultural Science education, competency needs of teachers in farm management are those areas of farm planning, record keeping, enterprise selection, livestock and crop production, farm budgeting, and supervision where teachers lack sufficient expertise to effectively manage school farms. These unmet competencies hinder the ability of teachers to translate the Agricultural Science curriculum into meaningful practical experiences for students (Okon, 2021; Ikehi et al., 2024). Addressing these gaps through training, workshops, and continuous professional development is essential for improving agricultural education outcomes.

Statement of problem

In many secondary schools, farm management is a vital component of the Agricultural Science curriculum, intended

to provide students with hands-on experience in planning, organizing, and operating school farms. However, the effective delivery of farm management instruction depends largely on the competencies of Agricultural Science teachers.

Despite the observed importance of farm management, evidences such as over-reliance on theory instead of practical teaching, lack of practical and managerial skills suggests that many Agricultural Science teachers lack the required competencies to effectively teach and manage school farms. These competencies include technical knowledge, practical skills, planning and organizational abilities, resource management, and the ability to incorporate modern agricultural technologies and practices. This often results in poorly managed school farms, limited practical exposure for students, and overall inefficiencies in delivering the curriculum.

Compounding this problem is the fact that many teachers seem to have limited access to professional development opportunities that focus specifically on farm management. In some cases, teacher training programs appear not to sufficiently address the practical aspects of farm operations. Consequently, students graduate with theoretical knowledge but lack the practical competencies required for meaningful participation in agricultural enterprises.

Given the increasing emphasis on skill acquisition and entrepreneurship in education, there is an urgent need to assess the specific competency needs of Agricultural Science teachers in farm management. Identifying these gaps is essential for designing targeted training programs, revising curriculum content, and ultimately improving the quality of

agricultural education in secondary schools.

The main purpose of the study is to assess the competency needs of Agricultural Science teachers for farm management in secondary schools in Ekiti State. Specifically, the study

- i. determined the level of Agricultural Science teachers competencies in farm management in secondary schools in Ekiti State
- ii. identified specific areas where teachers require competencies in farm management skills in secondary schools.
- iii. examined the influence of teacher experience on farm management competencies.
- iv. ascertained available professional development activities for enhancing farm management skills.

Research Questions

The following research questions were raised to guide this study.

- i. What are the level of Agricultural Science teachers competencies in farm management in secondary schools in Ekiti State?
- ii. What specific areas of farm management do Agricultural Science teachers identify as needing competencies?
- iii. What are the influence of teacher experience on farm management competencies.
- iv. What are the professional development programmes for enhancing farm management skills.

Research Hypothesis

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

- i. There is no significant influence in teaching experience and farm management competency.

- ii. There is no significant relationship between professional development opportunities and competency in farm management.

Literature Review

Agricultural science is largely expressed as the application of scientific principles for successful production of crops and livestock and other uses for man's benefit. Agricultural science according to Owens (2015) is the cultivation of land for production of crops and rearing of animals for human use, and is the deliberate effort made by man to till the soil, cultivate crops and rear animals for food and sell to the final consumer. It involves various activities such as crop cultivation, animal husbandry, soil management, pest and disease control, and the application of scientific knowledge to enhance productivity and sustainability in agricultural systems. Agricultural science, as a subject in secondary schools, seeks to teach the students the principles of using scarce resources to produce crops and animals to feed the world's population and to service other related uses (Ikehi, Ifeanyieze, & Ugwuoke, 2019; Iderawumi, 2021). As posited by Ezeani (2019), Agricultural Science is not merely a theoretical subject but one that must be taught through experiential learning. This practical approach helps bridge the gap between knowledge and skills, making students more competent and job- ready. The NERDC (2008) specified that secondary school establish a school farm where arable crops and AR least two ruminant animals such as goat, sheep, cattle can be managed.

School farm as defined by Famiwole (2022) is a land laboratory, specifically designed and operated, for the purpose of carrying out practicals in agricultural science or education in order

to impart knowledge and managerial skills to students through practice. It is an area specifically earmarked for agricultural activities, usually sited in the school or at a walking distance to the school. The school farm is typically supervised by agricultural educators or instructors who provide guidance and support to students. They help students set goals, provide technical expertise, and ensure the safety and welfare of the animals and crops on the farm. The school farm contains two main sections: the crop section and the livestock section. (Iderawumi 2020). School farm provides field for learning outside the classroom. It provides both formal and informal education and contributes to a cadre of young knowledge workers associated with relevant disciplines to issues associated with food production and related disciplines. Growing food increases the students' interest to attend school. This will enable the pupils to garner practical knowledge in Agricultural Science as it re-enforces and bring to live what is taught in classroom. On the school farm the students learn how to handle farming equipment, farming techniques, farming systems like mixed cropping, crop rotation, etc. School farms serve as laboratories for practical skills development practical, agriculture is incomplete. Teachers play a crucial role in mentoring students throughout their experiences on the school farm.

Teacher is a person trained and groomed from teacher preparation institutions for quality of skills, knowledge and attitudes to students Okuku (2019). Similarly, Ndem (2016) stated that agricultural science teacher is a person professionally trained in the field of agriculture to acquire skills, knowledge, technical know-how and methodology needed for the teaching of agricultural science. Also, Babayo (2019) described

teachers of agricultural science as a trained individual in the pedagogical and technical areas of agriculture and is charged with the responsibility to imparting knowledge, skills and attitudes to students. Ilesanmi et al (2022) sees Agricultural science teachers as a custodians of knowledge and disseminators of agricultural practice. Furthermore, Babayo and Kesiki (2019) stated that teacher of agricultural science is a person trained in the pedagogical and technical areas of agriculture and charged with the responsibility of imparting knowledge and skills in agriculture to students. Research indicates that several Agricultural Science teachers may not have received adequate training in farm management during their pre-service or in-service training, which affects their performance (Nwachukwu, 2014). Moreover, the growing complexity of agriculture due to technological and environmental changes demands that teachers continuously upgrade their skills to remain effective (Ajayi & Akinyemi, 2020). Identifying and addressing the competency needs of Agricultural Science teachers is therefore crucial for improving the teaching and practice of farm management in schools.

According to Okorie (2021), competency needs are the deficiencies in the knowledge, skills, and attitudes that individuals require to perform their occupational roles successfully. They emerge when expected performance standards surpass actual performance levels. In the context of Similarly, Akinyemi (2020) conducted a study that focused on identifying specific skill gaps in farm management among Agricultural Science teachers in Lagos State. The study revealed gaps in machinery operation, farm record-keeping, and resource allocation. Interview responses highlighted the need for practical

demonstrations and access to real farm environments for skill acquisition. Ibrahim, & Abdullahi, (2019) examined farm management competencies among Agricultural Science teachers in Northern Nigeria. Findings indicated that teachers lacked competencies in farm planning, risk assessment, input procurement, and agribusiness strategies. The study recommended the inclusion of these components in teacher retraining programs.

The extent to which a teacher of Agricultural science could perform his/her managerial and operational functions often depend on the level of competency skills and capabilities possessed by each teacher.

Skill is the ability to effectively and efficiently carry out a particular activity or task, it involves both the practical application of knowledge and mastery of certain tasks or action. A teacher's skill can also be referred as the proficiency in performing a task that has been developed through experience and training. For effective management of a school farm, there's the need for skill development for every teacher of Agricultural science. Skills development refers to the process of improving, enhancing, or acquiring new abilities, competencies, or expertise to perform tasks or jobs more effectively. It encompasses a wide range of activities, including education, training, hands-on experience, mentoring, and self-learning, aimed at upgrading a person's ability to meet the demands of a particular role or to prepare for new challenges.

Similarly, Omoleye, et al (2020) carried out a descriptive survey of all 150 Agricultural Science teachers in Ekiti State. Data were gathered using a 103-item questionnaire validated by experts, with an internal consistency reliability of 0.84. Analysis was carried out using the

need-gap approach (difference between needed and possessed competency). Results revealed significant professional development needs in farm power and mechanization as well as agricultural economics and extension—both central to farm management. In a related study, Afolabi, et al, (2024) examined the in-service training programmes attended by secondary school Agricultural Science teachers in Kwara Central Senatorial District. The descriptive survey design was adopted to assess training types, organizers, and constraints. Findings revealed that seminars and workshops were the most common forms of professional development attended. These programmes were often organized by the Ministry of Education, Teaching Service Commission, Ministry of Agriculture and Natural Resources, and universities. Constraints included inadequate funding and lack of time for teachers to attend trainings.

This process gives a value called need gap. The need gap value indicates level of capacity building needs of teachers of agricultural science in the management of school farms in secondary schools in Ekiti State. Identifying and addressing these professional needs of Agricultural Science teachers is therefore crucial for improving the teaching and practice of farm management in schools.

A study conducted by Yusuf & Ogundele (2020) assessed the current skill levels of Agricultural Science teachers in Oyo State regarding core farm management areas. A survey research design was adopted. The population included 200 teachers. A sample of 120 was drawn using purposive sampling. The data collection instrument was a questionnaire, validated by experts, with a reliability coefficient of 0.81. Data were analyzed using descriptive statistics. The

study found that teachers demonstrated high competency in crop production planning but low competency in farm mechanization and marketing strategies. The study recommended refresher training. The study is similar to the current study in that both examined current skill level but differ in research design.

A study conducted by Okorie (2021) determined the specific farm management competencies lacking among Agricultural Science teachers in Abia State. The study employed a descriptive survey design. The population comprised 210 Agricultural Science teachers in public secondary schools. A sample of 120 teachers was selected using simple random sampling. The instrument was a structured questionnaire validated by experts and tested for reliability using Cronbach Alpha ($r = 0.86$). Data were analyzed using mean and standard deviation. Findings showed significant deficiencies in areas such as farm budgeting, pest control, and marketing of farm produce. Teachers reported limited exposure to practical budgeting and enterprise cost analysis. Both studies examined specific areas where teachers requires improvement and they both employed the same research design.

A study conducted by Ajibare, Ogunjobi & Olalekan (2025) assessed Secondary school agricultural science teachers' professional training, development and students' performance. The study adopted a descriptive survey research design. The population consisted of Agricultural Science teachers and students in selected secondary schools in Nigeria. A structured questionnaire was used for data collection. Data were analyzed using descriptive statistics and regression analysis. The study revealed that teachers

with more years of experience and professional development demonstrated higher instructional competence and improved students' performance in Agricultural Science.

In another study, Ogunleye (2023) examined the role of professional development programmes in enhancing agricultural science teachers' competency in farm management. Descriptive survey research design was adopted. The population comprises of 200 Agricultural Science teachers in Ogun State, a sample of 140 teachers were selected using stratified random sampling. A well-Structured questionnaire titled Professional Development in Agriculture Questionnaire (PDAQ) was validated by experts with an internal consistency reliability of 0.85. Data were analyzed using Mean, standard deviation, and frequency counts. The findings indicated that Participation in workshops, seminars, and in-service training significantly improved teachers' knowledge and practical skills in farm management. Teachers reported that such programmes helped them adopt modern farming techniques, improved classroom supervision, and enhanced their confidence in handling school farm operations.

In a related study, Chukwuemeka (2022) assessed continuous professional development as a tool for enhancing agricultural science teachers' skills in farm management. Descriptive survey design was adopted for the study. Population of 180 teachers in Anambra State was employed. Sample of 120 teachers selected using purposive sampling. The instrument was validated by experts with an internal consistency reliability of 0.82. Data were Analyzed using mean and standard deviation. The study found out that continuous professional development programmes were found to

enhance both theoretical understanding and practical competence. Teachers who regularly attended training reported better supervisory skills, improved record-keeping practices, and effective planning of farm operations.

Research Methods

The descriptive research design of the survey type was adopted for this study. The population of this study consisted of the 248 Agricultural Science teachers in Senior Secondary Schools in Ekiti State. According to the [State Ministry of Education, 2024 data], there are approximately 607 Agricultural Science teachers across the public secondary schools Ekiti State

The sample for the study comprised 248 Teachers of Agricultural Science selected from public Secondary schools in rural and urban areas from the three Senatorial District of public Secondary School in Ekiti State using multi stage sampling procedures. Two self-designed instrument for teachers of Agricultural Science and Ministry of Education schools tagged Competency Needs Questionnaire. The validity of the instruments were ensured by presenting it to two experts from the Faculty of Agricultural Science, also the instruments were given to two experts each from Vocational and Technical Education, Test and Measurement all from Faculty of Education and the researcher's supervisor for proper scrutiny in Ekiti State University, Ado Ekiti. Based on their corrections, the instruments were restructured and the corrected versions were used for data collection. In order to

ensure that the instruments used for this study was reliable, the researcher used Crobach's alpha to test the internal consistency of the instruments. The instruments (QCNASYFM) were administered on 20 Agricultural Science teachers outside the sampled schools. The result yielded 0.77. The researcher sought the permission of the Principals of the selected schools before the distribution of the copies of questionnaire to the Agricultural Science teachers. Agricultural Science teachers in the sampled schools were given necessary orientations as to the purpose of the research instruments, and copies of the questionnaire were administered by the researcher together with the two trained research assistance in the secondary schools. The data was analyzed using descriptive and inferential statistics. All the research questions raised were answered using descriptive statistics such as frequency counts, mean, standard deviations and percentages. Any mean that is above 2.50 will be regarded as agreed, while mean below 2.50 will be regarded as not agreed. Inferential statistics Analysis of Variance (ANOVA) was used to test hypotheses 1 while Pearson's Products Moments Correlation. (PPMC) was used to test the hypotheses 2. All the hypotheses were tested at 0.05 level of significant.

Results and Discussions

Research Question1:

What are the current levels of competency in farm management among Agricultural Science teachers in secondary schools?

Table 1: Descriptive Analysis of the current levels of competency in farm management among Agricultural Science teachers in secondary schools

SN	Item	M	SD	Remark
1	Possess ability in planning school farm operations.	2.98	0.82	High
2	Possess ability to supervise students during practical farm activities.	3.19	1.18	High
3	Understand and apply principles of farm budgeting and record keeping.	2.98	0.82	High
4	Capable of diagnosing and solving problems that arise on the school farm.	3.19	0.66	High
5	Adequate knowledge of crop production management.	2.79	0.51	High
6	Confident in handling livestock management tasks on the school farm.	1.98	0.82	Low
7	I can manage school farm resources efficiently.	3.34	0.48	High
8	Ability to use check listing technique to assess students acquired skills	3.66	0.48	High
Cut -Off Mean; 2.50		Grand Mean: 3.01		

Table 1 shows that the $\bar{x}$ scores ranges from 1.98 – 3.66 above the parameter $\bar{x}$ score of 2.50. All the items in the scale except item 8 had their mean score above the cut off mean of the scale considering the Grand mean (3.01) of the scale and the mean cut off of the scale. It could be said that the level of competency of teachers of agricultural

science in farm management is moderately high.

Research Question 2:

What specific areas of farm management do Agricultural Science teachers identify as needing improvement?

Table 2: Descriptive Analysis of the specific areas of farm management to which Agricultural Science teachers identify as needing improvement (N=248)

SN	Item	M	SD	Remark
1	Ability to prepare and manage a farm budget	1.87	0.79	Not Needed
2	Knowledge of soil preparation and fertility management techniques	3.66	0.48	Needed
3	Skills in crop rotation and soil conservation	3.00	0.00	Needed
4	Pest and disease identification and control on the school farm	3.65	0.48	Needed
5	Record keeping and farm documentation practices	2.69	0.96	Needed
6	Management of agricultural tools and equipment	3.31	0.95	Needed
7	Marketing and sale of farm produce	.02	0.82	Needed
8	Supervision and coordination of student practical activities	2.00	0.81	Needed

Cut -Off Mean; 2.5

Table 2 shows that the $\bar{x}$ scores ranges from 1.87 – 3.66 above the parameter $\bar{x}$ score of 2.50. while the mean scores of 1.87 and 2.00 below the

parameter Cut-Off Mean scores of 2.50. This indicates that majority of the respondents agreed on the criteria of the Perception on the specific areas of farm

management to which Agricultural Science teachers identify as needing improvement. Item 2 (Knowledge of soil preparation and fertility management techniques) has the highest $\bar{x}$ score of 3.66 while item 1 has the lowest $\bar{x}$ score

of 1.87 (Ability to prepare and manage a farm budget)

Research Question 3

How do teachers' experience influence competency in farm management?

Table 4: Frequency and percentage of the influence of teachers' experience on competency in farm management

S/N	Item	Agree		Disagree	
		Freq	%	Freq	%
1	Teachers' years of experience contribute to effective management of school farms.	243	97.98	5	2.02
2	Teachers with more teaching experience are more capable of guiding students during farm practical activities.	228	91.94	20	8.06
3	Experience in teaching Agricultural Science improves teachers' decision-making in farm management practices.	240	96.77	8	3.23
4	Teachers who have acquired more experience are more competent in planning farm activities and record keeping.	238	95.97	10	4.03
	Teachers' experience enhances their ability to supervise students during farm operations.	215	86.69	33	13.31
	Experience helps teachers to apply appropriate farming techniques in school farms.	218	87.90	30	12.10
	Experienced Agricultural Science teachers are better at organizing and coordinating farm activities.	223	89.92	25	10.08

Table 3 shows the frequency and percentage of influence of teachers experience on competency in farm management. The responses of the teacher were collapsed to agree and disagree for easy interpretation. 243(97.98%) of the respondents agreed that teachers' years of experience contribute to effective management of school farms, showing a strong consensus on the importance of experience in overall farm administration. While, 240 (96.77%) of the respondents agreed that teaching experience improves decision-making in farm management. Also, 238(95.97%) of the respondents agreed

that experienced teachers are more competent in planning farm activities and record keeping, while, 228 (91.94%) of the respondents agreed that experienced teachers are more capable of guiding students during farm practical activities. Also. 223 (89.92%) of the respondents agreed that experienced teachers are better at organizing and coordinating farm activities.

The findings clearly indicate that teachers' experience has a strong positive influence on competency in farm management. Across all items, agreement levels are consistently high (above 86%), suggesting that experience

is a key factor in improving practical skills, decision-making, supervision, and overall effectiveness in Agricultural Science teaching.

Research Question 4

What professional development programmes exist for improving teachers' farm management skills?

Table 3: Frequency and percentage of professional programmes for improving teachers farm management skills.

S/N	Item	Agree		Disagree	
		Freq	%	Freq	%
1	I have attended workshops on modern farm management in the last two years.	108	43.54	140	56.45
2	There are limited professional development opportunities in agricultural education.	82	33.06	166	66.93
3	I am aware of government-sponsored training programs for teachers.	81	33.66	167	67.33
4	I need regular training to stay updated with modern farm techniques	166	66.93	82	33.06
5	In-service training helps me improve my farm management skills.	144	58.06	104	41.93
6	Teachers' capacity-building programs are relevant and effective.	130	52.41	118	47.58
7	There are collaboration programs with local agricultural agencies for teacher development.	120	48.38	128	51.61

Table 4 shows the frequency and percentage of professional programmes for improving teachers farm management skills. The responses of the teacher were collapsed to agree and disagree for easy interpretation. 166 (66.93%) of the respondents agreed that they need regular training to stay updated with modern farm techniques, while 144 (58.06%) of the respondents agreed that in-service training helps improve farm management skills. Also, 130 respondents (52.41%) agreed that teachers' capacity-building programmes are relevant and effective.

Testing of Hypotheses

Hypothesis one

H₀₁: There is no significant difference between teachers' teaching experience and their competency in farm management.

In testing the hypothesis, scores were obtained from bio data information of section A and items 1-48 of section B Competency Capacity Building Needs of Agricultural science Teachers in Management of School Farm for skill acquisition among Secondary School Students in Ekiti State. These scores were subsequently subjected to statistical analysis involving Analysis of Variance. The result is shown in Table 8.

Table 5: ANOVA on difference between teachers' teaching experience and their competency in farm management.

	Sum of Squares	df	Mean Square	F	P value	Remark
Between Groups	1163.43	6	193.91	2.01	2.34	Not Significant
Within Groups	4051.00	42	96.45			
Total	5214.43	48				

$p > 0.05$

Table 8 shows the difference between groups and within groups as 6 and 42 respectively. The $F_{cal} = 2.01$, P value = 2.34 at 0.05 level of significance. Therefore, since P value > 0.05 the Null hypothesis is accepted, this implies that there is no significant difference between teachers' teaching experience and their competency in farm management.

Hypothesis Three

H_{01} : There is no significant relationship between Training and professional

development opportunities programs and their competency in farm management.

In testing the hypothesis, scores relating to different Training and professional development opportunities programs were computed using items 1-48 of section B of and their competency in farm management. These scores were subsequently subjected to statistical analysis involving Pearson's Products Moments Correlation. The result is presented in Table 13.

Table 6: Pearson's Products Moments Correlation of Training and professional development opportunities programs and their competency in farm management. (N=248)

VARIABLE	$\bar{x}$	SD	r	P value	Remark
professional development opportunities programs	24.62	1.90	0.62	<0.001	Significant.
competency in farm management	154.92	10.02			

$P < 0.05$

Table 6 shows that $r_{cal} = 0.62$ and P value = <0.001 at 0.05 level of significance. Therefore, since P value < 0.05, the Null hypothesis is not accepted, this implies that there is significant relationship professional development programs and their competency in farm management.

Discussion

The finding of the study reveals that teachers' experience significantly influences competency in Agricultural Science, particularly in farm management in secondary schools. Supporting this findings, Adebayo & Ilesanmi (2015) reveals that experienced teachers were better at providing students with practical skills related to farm management, The findings of the study equally revealed that there is relationship professional development opportunities programs and their competency in farm management. This is in line with Afolabi

et al (2024) who explored the training opportunities available for Agricultural Science teachers to improve their farm management skills and assessed the in-service training programmes attended by secondary school Agricultural Science teachers in Kwara Central Senatorial District, Nigeria. It was found out from the study that the teachers who participated in these programs felt more competent in managing school farms, especially in areas like crop planning, pest control, and record keeping. In a similar study, Omoleye, et al (2020) investigated the Competency improvement needs of Agricultural Science teachers for effective teaching, availability and impact of professional development programs aimed at improving Agricultural Science teachers' farm management skills in Ekiti State, Nigeria. The study found that: the teachers who participated in training programs reported increased confidence

in managing school farms and applying modern farming techniques.

Conclusion and Recommendations

Based on the findings of this study, it could be concluded that there is a significant relationship between participation in training and professional development opportunities and teachers' competency in farm management. This indicates that while formal education and experience alone may not enhance competency, targeted training and professional development programs play a crucial role in improving teachers' skills and effectiveness in farm management.

Recommendations

Based on the findings of this study, it was recommended that:

1. Education stakeholders should organize regular, hands-on training and workshops specifically focused on farm management practices to enhance teachers' practical skills and competence.
2. Government should design professional development programs tailored to address current gaps in farm management competency, incorporating real-life scenarios, case studies, and modern agricultural techniques.
3. Schools and agricultural education departments should encourage teachers to pursue continuous learning through short courses, certifications, and seminars related to farm management, regardless of their academic qualifications.
4. Government should include regular practical farm-based activities and community farm engagement as part of teachers' professional development to bridge the gap between theory and practice.

References

- Adebayo, K., & Kolawole, A. (2023). Gender analysis in agricultural education in Nigeria. *Journal of Agricultural Extension*
- Afolabi, K. Q., Akintola, E., Oloyede, A., & Onifade, T. (2024). Assessment of in-service training programmes attended by secondary school Agricultural Science teachers in Kwara Central Senatorial District, Nigeria. *Journal of Educational Management*, 10, University of Cape Coast.
- Akinyemi, I. C. (2020). Teacher Characteristics as Predictors of Farm Management Skills among Agricultural Science Teachers in Enugu State. *African Journal of Educational Management*, 11(1), 65–74.
- Alade, I.A. (2022): *Evaluation of technical education curriculum in colleges of education Nigeria*. PhD Thesis, Department of Vocational Teacher Education, University of Nigeria, Nsukka.
- Ajibare, A. Y. Ogunjobi, O. P. & Olalekan, O. M. (2025). Secondary school agricultural science teachers' professional training, development and students' performance. *Fuoye International Journal of Education*, 8(1), 1–15.
- Babayo, Y & Kesiki, W.B. (2019). Professional competencies needed by agricultural science teachers for effective task performance in senior secondary school Gor sustainable development in Adamawa State. *Journal of Agricultural Education Teachers Association of Nigeria*, 3(1), 110-118

- Chukwuemeka, I. (2022). In-service training and teacher competency. *Anambra: Education Research Review*, 8(3), 55–70.
- EUROSTAT (2023). Practical agriculture, a means to poverty eradication, self-reliance and national development. *Academic Excellence Journal*, 7(2), 43-44
- Famiwole, R.O. (2024). Dynamics of Agricultural science and agricultural education pedagogies; The missing link leverage. Inaugural lecture, Faculty of Education, Ekiti state University, Ado-Ekiti.
- Federal Republic of Nigeria (2013). National policy on Education, Yaba, Lagos.
- Federal Republic of Nigeria (2013); *National Curriculum of Agricultural science for secondary schools*, Abuja. National Educational Research Development Council Press.
- Hummingbird Journals (2024). Impact of Agricultural School Farm on the academic performance of Agricultural Science students in Ardo-Kola LGA, Taraba State. *Journal of Contemporary Education Research*.
- Ibrahim, U. S., & Abdullahi, M. I. (2019). Farm Management Competencies of Agricultural Science Teachers in Northern Nigeria. *Journal of Science and Vocational Education*, 10(2), 49–58.
- IJRPR (2022). Impact of school farm on entrepreneurial skills development of Agricultural Science students in public secondary schools in Rivers State.
- Ikehi, M. E., Ikeoji, C. N, Ibrahim, K. S., & Umar, N. D. (2024). Factors limiting the use of the school farm in teaching and learning Agricultural Science among senior secondary schools in rural areas of Udenu LGA. *International Journal of Agricultural Education Research*.
- National Open University of Nigeria (NOUN). (2014). AGE 421: *Teaching Vocational Agriculture in Schools* (courseware).
- National policy on education (2013): *Federal government of Nigeria Abuja*: Government press.
- Nwachukwu, C. C. (2021). Assessment of Farm Management Competency Levels among Agricultural Science Teachers in Imo State. *Journal of Agricultural Education and Practice*, 9(1), 14–22
- Obue, A. (2019). Problems associated with managing school farms in secondary schools. *Journal of Academic Association of Vocational and Technical Educators of Nigeria (JAVTEN)*.
- Ogunbameru, T. (2019): Establishment of standard agricultural farms for teaching agricultural science in secondary schools. <https://www.Uniproject.com.my>
- Okorie, E. U. & Eneh, C. I. (2021). In-service training needs of agricultural science teachers for effective curriculum implementation in secondary schools. *African Journal of Teacher Education*, 10(2), 101–110.

- Okon, U. A. (2021). Insecurity of school farms and teaching of Agricultural subjects in secondary schools in Akwa Ibom State. *The Intuition*. globalacademicgroup.com
- Omoleye, O., Famiwole, R. O., Afolabi, A.O &Ogunjobi. (2020). Competency improvement needs of Agricultural Science teachers for effective teaching in Ekiti State. *Nigerian Journal of Curriculum Studies*, 27(4), 175–188.
- Onwumere, M. (2016). Influence of school farm on teaching of Agricultural Science in senior secondary schools, Ikwuano LGA, Abia State. *Open Journal of Social Sciences*.
- Yusuf, M. A., &Ogundele, B. O. (2020). Evaluation of Agricultural Science Teachers' Competency Levels in Farm Management in Oyo State. *Nigerian Journal of Curriculum and Instruction*, 25(2), 89–97.

SECRETARIAL SKILLS COMPETENCIES AND SECRETARIES JOB PERFORMANCE IN UNIVERSITIES IN EKITI STATE, NIGERIA

Prof. ONAJITE Godwin Onnoh¹, OMIDIJI Samuel Ajetomobi², OLATUNJI Rufus Oladimeji³

¹Vocational & Technical Education Department, Ekiti State University, Ado Ekiti

²Office Technology & Management Department, Federal Polytechnic, Ado

Omidijisamuel17@gmail.com

³Office Technology & Management Department, Federal Polytechnic, Ado

olatunji.rufus@yahoo.com

Abstract

This study investigates secretarial skills competencies and secretaries job performance in universities in Ekiti state, Nigeria. The main objective of this study was to determine how ICT skills, Communication skills and Interpersonal skills influence the job performance of secretaries in universities in Ekiti State. Descriptive design of survey type was adopted for the study. Two research questions were raised with one hypothesis formulated and tested 0.05 of significances for the study. The population comprises 100 secretaries in three selected Universities in Ekiti State. All the entire population size was used because of the manageable size. The instrument for the study was structured questionnaire titled: Questionnaire on secretarial skills competencies and secretaries job performance in Ekiti State (QSSCSJP) was used to elicit responses. The questionnaire was validated by three experts, one from Test and Measurement, one from Business Education department and one Vocational and Technical Education department. Reliability of the instrument was ensured using Cronbach's alpha and the reliability co-efficient of 0.81 was obtained. The data collected was analyzed using descriptive statistical tool for the research questions and inferential statistical tool for the testing of the hypothesis. The findings revealed that ICT skills, Communication Skills and Interpersonal Skills predicts the job performance of secretaries in universities in Ekiti State. The study concluded that, secretaries have having issues in utilizing the latest ICT resources for enhanced job performance. It was recommended that, university management should procure the latest digital ICT facilities with good networking and internet facilities to enhance the performance of the secretaries in the institutions. Based on the findings, it was recommended that secretaries should be sent on training and retraining to up skill themselves on the application of ICT devices, communication and interpersonal skills in the new normal for enhanced job performance.

Keywords: Secretarial Skills, Competency, Secretaries and Job Performance.

Introduction

Universities are institutions that rely heavily on effective administration to achieve their academic and developmental goals. In Nigeria, universities have been observed to face enormous challenges such as inadequate

funding, infrastructural deficits, limited teaching resources, and the pressure of managing a rapidly growing student population. Administrative efficiency is pivotal for the optimal functioning of universities especially in Nigeria, where institutions grapple with different

challenges coupled with a rapidly growing student population. Efficient administrative processes ensure that resources are utilized effectively, tasks are completed promptly, and objectives are met within set timelines. This translates to smooth operations, timely delivery of services, and overall institutional success. In universities, administrative efficiency supports the institution's ability to adapt to increasing students' population, technological advancements, and evolving educational demands. Secretaries are part of the non-teaching staff handling administrative works in the universities. Secretaries according to Ementa (2022) was defined as an assistance to an executive, possessing of office skills such as information and communication skills, data base management skills, management information system and keyboarding skills, who display initiatives, assume responsibility without direct supervision and exercise judgement according to his or her scope of assigned authority. The qualities of secretaries include possession of effective professional and personal trait to manage a unique of dynamic academia in the area of strict confidential and integrity, advanced tech competency, exceptional interpersonal skills, detailed oriented and accurate, adaptability and time management. The role of secretaries has evolved significantly over time, moving from traditional clerical duties to more complex and strategic administrative functions. Traditionally, secretaries were primarily responsible for tasks such as typing, filing, taking dictation, and scheduling appointments. These roles were largely routine and focused on supporting other staff members in completing their tasks efficiently, (Ojo, 2018). Historically, secretaries performed these basic administrative functions,

ensuring that daily operations ran smoothly but with limited involvement in decision-making processes. However, with technological advancements, globalization, and increasing demands for efficiency, the role of secretaries has expanded. Modern secretaries are expected to possess a wide range of competencies, including proficiency in information and communication technology (ICT), effective written and verbal communication, organizational skills, and interpersonal abilities. They now handle tasks such as managing digital correspondence, coordinating meetings and events, maintaining complex records, preparing reports, and even assisting in strategic planning and decision-making (Abimbola and Adedoyin, 2020). This shift reflects a move from a purely supportive role to a more professional and proactive function within organizations.

The evolving role of secretaries is particularly important because they act as the interface among administrative offices, academic staff, students, and external stakeholders. Their ability to efficiently manage information, communicate effectively, and coordinate activities directly influences institutional performance and service delivery. As noted by Adebayo and Oladipo (2019), secretaries who are equipped with modern administrative skills contribute significantly to organizational efficiency, employees' productivity, and stakeholders' satisfaction. In the modern administrative environment, secretaries are required to possess a range of competencies that go beyond traditional clerical skills. The complexity of university administration in Nigeria, coupled with technological advancements, has made it necessary for secretaries to develop proficiency in information and communication technology (ICT), strong

communication skills, organizational abilities, and interpersonal skills. These competencies are expected to make secretaries to perform their roles efficiently and contribute meaningfully to institutional growth. (Amahi,, Otomiewo, and Jacob, 2023)

ICT skills enable them to use computers, digital tools, and online platforms efficiently. Adegboye and Olowu (2021), asserted that secretaries who are adept at ICT can manage information more efficiently, reduce errors, and enhance the speed of administrative processes in Nigerian universities. Secretaries who are comfortable with digital tools can complete tasks more efficiently, reduce errors, and manage information more effectively. In Nigerian universities while communication skills will help in delivering clear messages and managing correspondence. Oni and Adebayo (2021), effective communication by secretaries improves collaboration, minimizes misunderstandings, and ensures that administrative instructions are correctly implemented. Secretaries with good communication skills are expected to convey information clearly, coordinate effectively with colleagues and students, and ensure that messages are understood correctly. When communication skills are weak, misunderstandings can arise, slowing down administrative processes and affecting overall institutional performance.

Organizational skills are expected to support time management, record-keeping, and coordination of multiple tasks. Secretaries with strong organizational skills can prioritize responsibilities, manage competing deadlines, and maintain well-organized records (Akunama, 2025). This ensures that work flows smoothly, deadlines are

met, and institutional operations are not disrupted. Conversely, weak organizational skills can lead to misplaced documents, missed deadlines, and a chaotic work environment.

While interpersonal skills are to facilitate teamwork, collaboration, and positive interaction with stakeholders. These competencies are crucial because they directly influence how effectively secretaries carry out their responsibilities.

Job performance of secretaries is reflected in indicators such as efficiency, accuracy, timeliness, productivity, ability to maintain work balance, and contribution to institutional goal attainment. Performance is sometimes affected by some factors, such as outdated training, limited resources, and institutional challenges, which may make it difficult for secretaries to meet the growing demands of modern administrative work. Observations revealed that secretaries are with ample opportunity to produce a mailable documents using ICT devices in the course of creating letter, memo, manuscripts by installing scanner on their phone to scan the document as single or multiple documents, after scanning the documents, they should convert the documents into word and subject it the grammarly software to check for errors and email it to the boss as softcopy or print through Noko Print. observably, it was observed that varieties of errors such as typographical errors, syntax errors, transposition errors and sentence structure are noticeable in the tasks created by the secretaries. It was also observed that many secretaries also face difficulties in adapting to new technologies, managing heavy workloads, and receiving adequate professional recognition. In addition, gaps in ICT and organizational skills may prevent some secretaries from

performing optimally. As a result, universities in Ekiti State may not be fully utilizing the potential of their secretarial staff. Limitations in training, access to resources, and structural constraints may likely reduce efficiency in administrative processes and slow down the achievement of institutional objectives. Addressing these challenges through continuous professional development, improved resource allocation, and streamlined administrative procedures could enhance secretaries' performance, allowing them to contribute more effectively to the smooth functioning and overall success of the universities.

Available studies have examined the relationship between employee competencies and job performance in various organizations, however, there is limited research focusing specifically on secretarial staff in universities. Most existing studies concentrate on academic or general administrative personnel, leaving the role and contributions of secretaries underexplored. Moreover, there seems to be shortage of empirical studies from universities in Ekiti State, and little is revealed about the specific skills secretaries possess, the challenges they face, and how their competencies influence their job performance. This observed gap highlights the need for research that investigates secretarial skills and job performance in these universities, providing insights that could guide training programmes, administrative policies, and strategies to improve overall institutional efficiency in Ekiti State.

Statement of the Problem

The advent of technology in all facets of human endeavours has put more challenges on different professionals including the secretary. By this, secretarial work has changed from

traditional clerical abilities to proficiency in ICT, in the course of their job performance. Secretaries can create letters, memo, manuscripts and reports documents without touching their laptop or tablets. They will just install nook Print and scanner on their phone and produce a mailable documents for the boss or end users. However, it seems that many secretaries lack these competencies, tasks may take longer time to be completed, errors may occur more frequently, and the overall efficiency of administrative processes may decline.

Secretarial staff in universities in Ekiti State are expected to be equipped with secretarial skills such as communication skills and organizational skills which seem not to have been fully utilized. Thereby affecting institutional effectiveness. Another area that seems to be affected appears in limited empirical evidence on how their competencies relate to job performance within this context. A clearer understanding of the specific skills that may influence performance of secretaries could help universities to make more informed decisions regarding staff development, resource allocation, and the improvement of administrative efficiency. This study therefore investigated the relationship between secretarial skills competencies and job performance of secretaries in universities in Ekiti State, Nigeria.

The main purpose of this study was to investigate how secretarial skills competencies influence secretaries' job performance in Universities in Ekiti State, Nigeria. The study specifically;

- i. examined secretarial skills competencies on job performance of secretaries in universities in Ekiti State;
- ii. investigated how secretarial skills competencies (ICT,

communication, organizational, and interpersonal skills) significantly influence effective job performance of secretaries; and

Research Questions

The following research questions are raised to guide this study:

- i. What is the influence of secretarial skills on job performance of secretaries in universities in Ekiti State?
- ii. Are there challenges faced by secretaries in using secretarial skills in the performance of their duties in universities in Ekiti State?

Hypothesis

This null hypothesis was formulated and tested at 0.05 level of significance

H₀₁: There is no significant difference in the mean ratings of Secretaries in BOESTI and EKSU on Information Communication Technology (ICT) skills will not significantly influence job performance of secretaries in universities in Ekiti State.

Method

Descriptive survey research design was adopted for this study. The population of the study comprised one hundred (100) secretaries which made up of twenty-six (26) secretaries from Federal University Oye, Oye Ekiti, forty four (44) secretaries from Ekiti State University, Ado Ekiti, thirty (30) secretaries from Bamidele Olumilua University of Education, Science and Technology, Ikere, Ekiti State. The entire population was studied because of

manageable size. The instrument for data collection was a self-structured questionnaire tagged "Questionnaire on the Secretarial Skills Competencies and Secretaries Job Performance in University in Ekiti State (QSSCSJPUES). The questionnaire was designed on 4-point rating scale of Strongly Agree (SA), (4), Agree (A) Disagree (D) 2, and Strongly Disagree (SD) 1, to capture respondents opinion and experiences on research question one and for research question 2, Very High Extent (VHE-4 points) High Extent (HE-3 points) Moderate Extent (ME-2 points) and Low Extent (LE-1 point) respectively. The instrument was validated by three experts in business education and test and measurement. Cronbach Alpha was used for the reliability and 0.81 reliability coefficient was obtained. Data obtained from the respondents were analyzed using descriptive statistics and inferential statistics of t-test was adopted to test the two null hypotheses at 0.05 level of significance. The decision rule for the two research questions was that any mean ratings of 2.50 and above were considered as high extent and items of mean with below 2.50 and above were considered as low extent. Thus, hypothesis is accepted when t-calculated value is less than t-critical value and rejected when t-calculated value is greater than t-critical value.

Results

Research Question 1: What are the influence of secretarial skills on job performance of secretaries in universities in Ekiti State, Nigeria.

Table 1: Influence of Secretarial Skills on Job Performance of Secretaries in Universities in Ekiti State

S/N	Pedagogy Resources	X	SD	Decision
1	Streamlining Workflows	3.26	0.27	Agree
2	Accelerating Data Access	3.25	0.26	Agree
3	Boost Productivity	3.62	0.49	Agree
4	Accelerated Task Execution	3.25	0.26	Agree
5	Increase Work Flexibility	3.26	0.27	Agree
6	Reduction of Errors	3.25	0.26	Agree
7	Operational Agility	3.26	0.27	Agree
8	Data Driven Decision Making	3.66	0.55	Agree
9	Personalized Development	3.25	0.26	Agree
10	Increase Work Autonomy	3.65	0.47	Agree
11	Increase Speed and Accuracy	3.26	0.27	Agree
12	Efficient Record Management	3.25	0.26	Agree
13	Enhance Communication	3.78	0.50	Agree
14	Task Enrichment	3.75	0.69	Agree
15	Optimizing Performance	3.25	0.26	Agree
Grand Mean		3.20	0.36	

Field work, 2026

Data presented in Table 1 above indicates that streamlining workflows, accelerating data access, boost in productivity, accelerated task execution, increase work flexibility, reduction of errors, operational agility, data driven decision making, personalized development, increase work autonomy, increase speed and accuracy, efficient record management, Enhanced communication, task enrichment and optimizing performance are the influence

of secretarial skills competencies on job performance of secretaries in universities in Ekiti State, Nigeria. This was showed from the means responses of the respondents that was above 2.50 bench mark for decision criteria and grand mean of 3.20.

Research Question 2: Are there challenges faced by secretaries in using secretarial skills in the performance of their duties in universities in Ekiti State?

Table 2: Challenges faced by Secretaries in using Secretarial skills in the performance of their duties in universities in Ekiti State

S/N	Pedagogy Resources	X	SD	Decision
1	Secretarial Skills gaps	3.77	0.66	Agree
2	Technostress	3.25	0.26	Agree
3	The Skills Mismatch	3.83	0.86	Agree
4	Connectivity Barriers	3.26	0.27	Agree
5	Internet Bandwidth Issue	3.78	0.95	Agree
6	Digital Burnout	3.26	0.27	Agree
7	Training Deficit	3.80	0.90	Agree
8	Inadequate Infrastructures	3.25	0.26	Agree
9	Resistance	3.83	0.78	Agree
10	Technological Advancement	3.26	0.27	Agree
11	Automation	3.83	0.78	Agree
12	Digitization	3.25	0.26	Agree
13	Hardware and Software issue	3.87	0.72	Agree
14	High Job Stress	3.26	0.27	Agree
15	High Pressure Environment	3.83	0.86	Agree
Grand Mean		3.30	0.62	

Field Work, 2026

Data presented in Table 2 above revealed that the identified challenges in applying secretarial skills competencies by the secretaries in Ekiti State universities ranges from secretarial skills gaps, technostress, the skills mismatch, connectivity barriers, Internet Bandwidth issues, digital burnout, training deficit, inadequate infrastructures, resistance, technological advancement, automation, digitization, hardware and software issue, high job stress and high pressure environment This was showed from the means responses of the

respondents that was above 2.50 bench mark for decision criteria and the grand mean of 3.30.

Hypothesis 1

H0₁: There is no significant difference in the mean ratings of Secretaries in FUOYE and EKSU on Information Communication Technology (ICT) skills will not significantly predict job performance of secretaries in universities in Ekiti State.

Table 3: Summary of t-test analysis of Secretaries in FUOYE and EKSU on Information Communication Technology (ICT) skills will not significantly predict job performance of secretaries in universities in Ekiti State, Nigeria.

Variables	N	X	DF	SD	t-cal	t-crit	Decision
FUOYE Secretary	20	2.25	1.13	38	0.23	1.95	accepted
EKSU Secretary	20	2.30	1.10				

From Table 3 above, the t-calculated value of 0.23 is less than t-critical of 1.95. Thus, the null hypothesis earlier stated is therefore upheld. By implication, there is no significant difference in the mean ratings of Federal University, Oye secretaries and Ekiti State University secretaries on the Information Communication Technology (ICT) skills will not significantly predict job performance of secretaries in universities in Ekiti State. Nigeria.

Discussion of Findings

The results of data analysis in table 1 showed that all the identified items are the influence of secretarial skills competencies on job performance of secretaries in universities in Ekiti State, Nigeria. This was showed from the means responses of the respondents that was above 2.50 bench mark for decision criteria. This was also indicated from the grand mean of 3.30. The grand mean

was also greater than the decision bench mark of 2.50. This findings of this studies corroborate the finding of Onajite and Aina (2025) who reported that application of information and communication skills by the secretaries enhances communication, task enrichment optimizing performance and increase productivities in tertiary institutions. This findings was in agreement with the report of Onche and Adenekan, (2023) who reported that the influence of secretarial skills competencies on job performance of secretaries in tertiary institutions are accelerated data access, boost in productivity, accelerated task execution, increase work flexibility and increase in institutional productivity.

The results of data analysis in table 2 showed that all the identified items are the challenges that secretaries face in applying secretarial skills competencies in the performance of their

duties in universities in Ekiti State, Nigeria. They were also utilized in the institutions for instructional delivery and for teaching and learning process. This was showed from the means responses of the respondents that was above 2.50 bench mark for decision criteria. This was also indicated from the grand mean of 3.30. The grand mean was also greater than the decision bench mark of 2.50. This findings of this studies corroborate with the finding of Aina and Ezeani, (2023) who reported that technostress, the skills mismatch, connectivity barriers, Internet Bandwidth issues, digital burnout, training deficit, inadequate infrastructures, resistance, technological advancement, automation, digitization, hardware and software issues are the challenges bedeviling secretaries in the application of secretarial skills competencies in their job performance in tertiary institutions in Nigeria.

On the test of hypothesis 1, the result indicated that the t-calculated value of 0.23 is less than t-critical of 1.95. Thus, the null hypothesis earlier stated is therefore upheld. By implication, there is no significant difference in the mean ratings of Federal University, Oye secretaries and Ekiti State University OTM secretaries on the Information Communication Technology (ICT) skills will not significantly predict job performance of secretaries in universities in Ekiti State, Nigeria.

Conclusion

Based on the findings of this study, it is concluded that the exploration of ICT skills, communication skills and interpersonal skills by the secretaries revealed significant potential for enhancing job performance in the working place and fostering tremendous improvement in the attainment of institutional goals in the universities in

Ekiti state. By leveraging secretarial skills will reduces job redundancy, minimize waste and improve productivities. Empirical research as highlighted in the literature, underscore the importance of evaluating the secretarial skills competencies on the job performance of secretaries in the workplace. As scholars and practitioners continues to investigates the impact of secretarial skills competencies on the job performance of secretaries in the workplace. It is imperative to priotize how efficiency, timelines and accuracy of secretaries in application of secretarial skills to ensure optimum job performance in the universities in Ekiti state. This has reduced redundancy, waste and maximized productivity for result oriented and promote excellence. It was also concluded that there is no significant difference in the mean ratings of Federal University, Oye secretaries and Ekiti State University OTM secretaries on the Information Communication Technology (ICT) skills will not significantly influence the 8 job performance of secretaries in universities in Ekiti State, Nigeria.

Recommendations

1. School management in university in Ekiti State should prioritize procurement of latest ICT resources for secretaries job performance in the universities in Ekiti State
2. Institutional management should regularly set aside funds for seminars and workshops where secretarial practitioners can be effectively trained and retrained on the use of modern ICT resources in the course of their job performance.

References

- Abdullahi, H. A. (2025) The Challenges and Prospects of Secretarial Profession in the Modern Technology era in North-West, Nigeria. *Nigerian Journal of Business Education*, 12(2), 10-16
- Amahi, F. U., Otomiewo, E. E. & Jacob, M. O. (2023) Digital Switch-over and Instructional Delivery of Academic Programme in Tertiary Institutions in Delta State, Nigeria. *Nigerian Journal of Business Education*, 10(2), 179-188.
- Adegboye, F., & Olowu, A. (2021). ICT skills and administrative efficiency in Nigerian universities. *Journal of Administrative Studies*, 9(2), 56–67
- Akunama, I. A. (2025) Exploring the Impact of AI Integration in Business Incubators and accelerators on Entrepreneurship Education and Startup Success. *Nigerian Journal of Business Education*, 10(2), 36-42.
- Amahi, F. U., Otomiewo, E. E. & Jacob, M. O. (2023) Digital Switch-over and Instructional Delivery of Academic Programme in Tertiary Institutions in Delta State, Nigeria. *Nigerian Journal of Business Education*, 12(2), 179-188.
- Afolabi, O., & Adeoye, A. (2022). Challenges of ICT utilization in Nigerian tertiary institutions: Implications for administrative staff. *Journal of Educational Administration*, 15(2), 45–60.
- Aina, M. A. (2023). Effectiveness of the Use of Technology in Teaching for Promoting Economic Growth Among Business Education Graduates in Ekiti State. *British Journal of Education Learning and Development Psychology*. 6(2) 1-12.
- Aina, P., & Adeyemi, T. (2022). Secretarial competencies and administrative efficiency in Nigerian universities. *Journal of African Higher Education Studies*, 10(2), 45–59.
- Ezeani, N. S. & Aina, M. A. (2023). Secretarial Profession and the Training Needs of Secretaries for The Future Office Work. *Nigerian Journal of Business Education*, 6(2), 159-165.
- Enang, C. E. (2023) Digital Entrepreneurial Skills and Competencies Required from Business Education Students to work in the Digital Era. *Nigerian Journal of Business Education*, 10(2), 172-178
- Ofume, A. O. (2025) Challenges and Strategic Measures for Application of Artificial Intelligence in Business Education Research in Nigeria Tertiary Institutions in Nigeria. *Nigerian Journal of Business Education*, 12(2), 1-9
- Onajite, G. O., & Aina, M. O. (2025) ICT Competency for Sustainability in Instructional Delivery of Academic Staff in Business Education. *Social Science Education Journal*, 1(1) 71-79
- Onche, U., & Adenekan, R. (2023). Influence of organizational skills on the performance of secretaries in federal universities in South-West Nigeria. *Journal of Administrative Research*, 11(1), 55–70.
- Oni, O., & Adebayo, S. (2021). ICT adoption and secretarial roles in Nigerian public universities. *Nigerian Journal of Business Education*, 8(2), 120–134.
- Oyinlola, G.O., Aderoju, J.A, and Felicia, K. O. (2022) Skills-Enhanced Collaborative Teaching and Learning Practices for Preparing Business Education Students Towards Working in a Changing World. *Nigerian Journal of Business Education*, 9(1), 203-212

GAMIFICATION AS A PEDAGOGICAL STRATEGY FOR IMPROVING STUDENT ENGAGEMENT AND COMPETENCY ACQUISITION IN ELECTRICAL AND ELECTRONIC TRADES EDUCATION AT TECHNICAL COLLEGES

¹YISA, S. N., ²OGUNDOLA, I. P., ³FANIBUYAN, V. E., ⁴KALAT. I. K. & ⁵IDOGHO. F

¹Department of Industrial and Technology Education,
Federal University of Technology Minna.

²Department of Vocational and Technical Education, Ekiti State University, Ado-Ekiti

⁵Vocational and Industrial Technology Education,
Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti

Abstract

Electrical and electronic trades are considered among the most challenging subjects because of their nature, which involves calculations and practical activities. This perception is largely attributable to the teaching methods employed in delivering these subjects. The integration of gamification into technical and vocational education represents a transformative shift in pedagogical practice, particularly within the domain of electrical and electronic trades in Nigeria Technical Colleges. This study examined the theoretical frameworks, empirical evidence, and practical implications of gamification as a pedagogical strategy for enhancing students' engagement and competency acquisition in electrical and electronic trades programmes at Nigerian Technical Colleges. The paper identifies key gamification elements including points, badges, leaderboards, simulation-based challenges, and narrative-driven problem-solving elements that demonstrably improve learner motivation, psychomotor skill development, and cognitive retention in trade-specific contexts. The study proposes a contextually responsive Gamified Technical Competency Framework (GTCF) for implementation in Nigerian Technical Colleges. Findings affirm that when gamification is purposively aligned with TVET curriculum standards and competency benchmarks, it yields significant gains in student engagement and practical skill mastery. The paper concludes with targeted recommendations for curriculum developers, Nigeria technical college administrators, and policymakers.

Keywords: Gamification, Pedagogical Strategy, Student Engagement, Competency Acquisition, Electrical and Electronic Trades, Technical Colleges, TVET, Nigeria

Introduction

The development and growth of any nation depend on the quality of education given to its citizens. This is the kind of education that equips individuals to become self-reliant and acquire all the skills needed to fit into the labour market. Such forms of education include STEM and Technical and Vocational Education and Training (TVET). TVET is one of the education systems in Nigeria which, if

effectively implemented, enhances the human capital development agenda, serving as the primary channel and pathway through which the nation's industrial and technological workforce is produced. TVET can be implemented at different levels of education, particularly at Nigeria technical colleges. Nigeria technical colleges stand as one of the key institutions reliable and adequate for the delivery of TVET. Technical colleges are

designed and mandated to equip learners with practical and other relevant trade competencies. One of the most relevant trades offered at Nigeria technical colleges is electrical and electronic trades. The electrical and electronic sector is a critical area given its growing relevance to national infrastructure development and the emerging digital economy (Federal Republic of Nigeria, [FRN] 2014; UNESCO-UNEVOC, 2021). Electrical and electronic trades serve and occupy a special place in the development of any nation.

Electrical and electronic trade is acknowledged as an important aspect of national development. A pervasive concern in Nigerian Technical Colleges is the persistent decline in student engagement, motivation, and practical skill acquisition. Research has revealed that the basic teaching method employed at the technical college level is a teacher-centred method, where students are passive receivers of knowledge who neither contribute nor engage actively in the classroom. As Olaitan (2020) and Nwosu and Ezema (2022) observed, "Instructional delivery in these institutions remains largely dominated by conventional didactic methods chalk-and-talk lectures, rote memorisation, and passive observation which are poorly suited to the hands-on, problem-solving demands of technical trades." The chances of an electrical and electronic trade graduates being employable or self-employed are undermined by the gap between classroom instruction and workshop competency.

It is therefore an important step to fill this gap by providing an alternative, effective, and student-centred pedagogy that enables students to be active, engaged, and contributing members of the teaching and learning process in the classroom. One of the teaching

pedagogies that could address this gap is gamification.

Against this backdrop, gamification broadly defined as the application of game design elements and mechanics into non-game contexts has emerged as an innovative, student-centred pedagogical strategy globally. Merriam-Webster (2026) define gamification as the process of adding games or game-like elements to something (such as a task) to encourage participation. At different stages and levels of the education system, gamification has been linked to improved motivation, engagement, technical and 21st century skill mastery, particularly in STEM and TVET disciplines (Ukgoda, 2025; Coelho et al., 2025; Ortiz-Rojas et al., 2025; Mirmotahari et al. 2025). The application of gamification within trade-specific technical education, however, remains underexplored, particularly in the Nigerian TVET context. This paper addresses this gap by systematically examining the theoretical bases, empirical evidence, and practical implications of gamification as a pedagogical strategy for improving student engagement and competency acquisition in electrical and electronic trades education at Nigerian technical colleges.

Theoretical Framework

Looking at gamification critically, one might be compelled to agree that it is not theoretical in nature when applied to education. Nevertheless, when it is studied more closely, there are established theories and models that can be used to explain its application in electrical and electronic trades education. The following theories underpin the study: Self-Determination Theory (SDT), Flow Theory, Behaviourist and Constructivist Learning Theories, and the

Competency-Based Education (CBE) Framework.

Self-Determination Theory (SDT)

Self-Determination Theory (SDT), propounded by Deci and Ryan (1985, 2000), is a macro-theory of human motivation that explains how intrinsic and extrinsic motivations influence behaviour, engagement, and performance. The theory posits that individuals are naturally inclined toward growth, mastery, and psychological integration when their fundamental psychological needs are satisfied. These core needs are autonomy, competence, and relatedness. There is a deep relationship between SDT and gamification, as its elements align directly with these three core needs. Points and badges provide immediate feedback that reinforces a student's sense of competence; gamified environments, which support autonomy, give students the choice to learn at their own pace and in their own time; and collaborative or competitive game structures cultivate relatedness. In electrical and electronic trades at Nigeria technical colleges, where concepts are frequently perceived by learners as abstract or disconnected from real-world experience, gamification's ability to situate learning within engaging, self-referential narratives is particularly significant (Ryan & Deci, 2000; Mekler et al., 2017). Gamification helps make electrical and electronic trades more engaging and contextually relevant, allowing students to participate fully in all teaching and learning processes both in physical and remote learning environments.

Behaviourist and Constructivist Learning Theories

Behaviourist and Constructivist Learning Theories provide another

relevant theoretical framework for this study. When gamification is well structured and applied effectively, it provides students with visible indicators of their progress and rewards them through points, badges, and leaderboards that reflect behaviourist principles of reinforcement and operant conditioning (Skinner, 1938), providing extrinsic motivational scaffolding that can, when gradually faded, give way to intrinsic engagement. Concurrently, simulation-based and problem-based game tasks are deeply constructivist, requiring learners to actively build and test knowledge schemas through authentic, contextualised practice.

Competency-Based Education (CBE) Framework

Nigeria's National Board for Technical Education (NBTE) mandates a competency-based approach to technical trades curriculum delivery. Gamification aligns naturally with CBE principles: gamification and CBE focused on the outcome, they both are built on repetition of task until you master it, scaffolded practice, and allows students to progress on their own and at their individual's rate. Gamified platform allows students to be assessed without pen-and-paper. Norton, (2008) NBTE, (2019) "gamified assessment tools such as simulation-based performance tasks can serve as valid, authentic measures of occupational competency, replacing or supplementing conventional pencil-and-paper assessments that poorly reflect real-world trade demands".

Core Gamification Mechanics in Electrical and Electronic Trades Education

Gamification as earlier explained is the application of game-based mechanics to a non-game situation to enhance

teaching and learning. For the purpose of this study, we distinguish between structural gamification (the application of game mechanics to existing content) and content gamification (the redesign of content itself using game principles). Both have meaningful applications in electrical and electronic trades instruction. These mechanics includes: point, badges and leaderboards.

Points, Badges, and Leaderboards (PBL)

Points, badges, and leaderboards are the most commonly used and often criticized gamification mechanics. Points is used to measure the level at which students performed on specific tasks, such as correctly wiring a three-phase motor simulation. Badges is another gamification mechanics that shows the level of achievement of the student. It shows as a symbolic proof recognition for achieving competency milestones, for example, badges are given when a student becoming a "Circuit Diagnosis Specialist." Leaderboard is a gamification mechanics that is awarded to student whenever they partake in a competition or collaborative work. Leaderboards create social comparisons that can encourage competitive learners. However, relying too heavily on points, badges, and leaderboards can increase extrinsic rewards while reducing or undermining intrinsic motivation. Deci et al. (1999) noted that excessive extrinsic rewards can harm intrinsic motivation, a phenomenon known as the "over justification effect." In the electrical and electronic trade, using points, badges, and leaderboards is more effective when focused on mastery rather than just performance.

Points, badges, and leaderboards are common gamification elements used to improve students' participation and

motivation during learning activities. In electrical and electronic trades education, points are awarded to students based on their performance in practical and classroom activities such as wiring circuits, identifying electrical faults, or completing workshop tasks correctly. Through points, students are able to monitor their progress and understand how well they are performing in different activities. Badges are also used as symbols of achievement or recognition whenever students successfully complete specific tasks or demonstrate mastery of practical skills. For example, a student may receive a badge for successfully diagnosing electrical faults or completing a practical wiring exercise. Leaderboards, on the other hand, display students' rankings during competitions or group activities and encourage healthy competition among learners. The use of points, badges, and leaderboards helps to make learning more interesting and engaging for students. Learners become more active during lessons because they are motivated to perform well and achieve recognition for their efforts. These gamification elements also encourage students to participate fully in both theoretical and practical activities. However, excessive dependence on rewards may reduce students' intrinsic motivation. According to Deci et al. (1999), too much focus on external rewards can make students learn mainly for rewards instead of genuine understanding. Therefore, in electrical and electronic trades education, points, badges, and leaderboard should focus more on skill mastery and competency development rather than competition alone.

When properly applied, points, badges, and leaderboards can improve students' confidence, participation, and practical skill acquisition. Students

become more willing to engage in practical activities because they receive immediate feedback and recognition for their performance. As a result, these gamification elements create an interactive and motivating learning environment that supports effective teaching and learning in electrical and electronic trades in technical colleges.

Simulation-Based Learning Games

Electrical and electronic concepts can be simulated by developing a local gamified platform or modules or by adopting the existed platforms such as: Multisim, Proteus, Tinkercad, and purpose-built virtual laboratories allow learners to manipulate circuit components, test hypotheses, diagnose faults, and observe consequences. The gamified environment accommodates students to effectively carried out their experimental activities in a risk-free, repeatable, and immediate feedback-rich environment. There will not be physical hazards, risk or any physical infrastructure. These simulations embody core game principles (challenge, feedback, interactivity, narrative) while directly developing the psychomotor and cognitive competencies central to electrical and electronic trades (Papastergiou, 2009; Hussein, 2015; Ebenuwa-Okoh & Adakole, 2021). When students are engaged in an activity that look similar to the real environment, its increases their motivation, engagement, performance, retention, and interest.

Simulation-based learning games contribute greatly to effective teaching and learning in electrical and electronic trades education. They provide students with a practical and interactive environment where they can practice wiring, circuit construction, fault diagnosis, and other technical operations

without exposure to physical danger or equipment damage. These simulations also allow students to repeat tasks several times until mastery is achieved. As a result, learners become more confident, motivated, and engaged in practical activities. Simulation-based learning also improves students' understanding of abstract concepts and enhances both cognitive and psychomotor skills required in electrical and electronic occupations.

Simulation-based learning games involve the use of virtual platforms and interactive environments that allow students to practice electrical and electronic activities in a safe and controlled setting. These simulations may be developed locally or adopted from existing platforms such as Multisim, Proteus, and Tinkercad. Through these platforms, students can construct circuits, test electrical connections, diagnose faults, and observe outcomes without exposure to physical danger or equipment damage. Simulation-based learning provides students with opportunities to practice repeatedly until they achieve mastery of technical skills. Simulation games are important in electrical and electronic trades education because they improve students' understanding, motivation, and practical performance. In addition, Hussein (2015) and Ebenuwa-Okoh and Adakole (2021) explained that simulation environments improve students' retention, engagement, and practical competencies in technical education. Students become more confident when they are allowed to practice practical tasks several times in a risk-free environment.

Furthermore, simulation-based learning games help students to understand abstract concepts more easily because they combine theory with practical activities. Learners can perform wiring exercises, troubleshoot faults, and

test circuits repeatedly until they fully understand the procedures involved. This method also encourages active participation and learner-centred instruction since students are directly involved in the learning process. Consequently, simulation-based learning games contribute significantly to the development of cognitive and psychomotor skills required in electrical and electronic occupations.

Narrative and Quest-Based Learning

This is another approach and environment in gamification whereby students are presented with real-world situations, challenges, or problems that need to be solved. For example: 'Your community's power grid has failed; diagnose and restore it within 60 minutes.' In this scenario, students transform abstract technical content into purposeful, contextualised problem-solving. Quest-based structures decompose complex trade competencies into sequenced, achievable missions, providing learners with clear goals, progressive challenge, and a sense of narrative agency. Barata et al. (2013) and Su and Cheng (2015) revealed that "the approach is particularly effective for developing higher-order competencies such as fault diagnosis, systems thinking, and project planning, which are increasingly demanded by the electrical industry." It allows students to study, break down challenges into different stages, and work through them step by step. As the student progresses, feedback and rewards are given to them, reinforcing their motivation to persist and improve.

Narrative and quest-based learning contribute to students' problem-solving abilities and active participation in learning activities. By presenting

lessons in the form of missions, challenges, or real-life technical problems, students become more interested and emotionally connected to the learning process. This approach encourages learners to think critically, analyse situations carefully, and apply technical knowledge in solving practical problems. It also helps students to complete complex tasks step by step while receiving feedback and rewards that motivate them to continue learning. Through this process, learners develop persistence, creativity, and confidence in handling electrical and electronic tasks.

Narrative and quest-based learning is a gamification approach where students are presented with real-life situations, missions, or challenges that require practical solutions. In electrical and electronic trades education, learners may be asked to solve problems such as restoring a faulty power supply system or repairing electrical installations within a specific period. This approach helps to transform abstract classroom concepts into meaningful and practical learning experiences. Through quests and missions, complex technical tasks are broken down into smaller and achievable stages, making learning easier and more interesting for students. Narrative and quest-based learning improve students' motivation, problem-solving abilities, and participation during lessons. Learners become emotionally connected to the activities because the lessons are presented in the form of realistic challenges and missions. Su and Cheng (2015) explained that this approach is effective in developing higher-order skills such as fault diagnosis, critical thinking, systems analysis, and project planning. These skills are important in electrical and electronic trades because technicians are often required to solve practical problems in real work environments.

In addition, narrative and quest-based learning encourages students to think critically and apply technical knowledge in solving practical problems step-by-step. As students progress through the various missions, they receive feedback and rewards that motivate them to continue learning and improving. This process also helps learners to develop persistence, confidence, and creativity in handling technical tasks. Therefore, narrative and quest-based learning creates an engaging and interactive environment that enhances effective teaching and learning in electrical and electronic trades education.

Collaborative and Competitive Game Structures

Gamification has an environment that encourages teamwork and collaborative activities. This collaborative game structure makes it suitable for electrical and electronic trade subjects in technical colleges. Collaborative structures such as workshop-floor game challenges, where groups must collectively install and test an electrical distribution board, foster teamwork, communication, and peer learning competencies essential to professional trade practice. Competitive structures motivate high-achieving learners and create visible benchmarks for aspiration. The literature suggests that a hybrid approach cooperative team competition (inter-group competition with intra-group collaboration) yields the most consistent motivational and learning benefits (Johnson & Johnson, 1989; Sung & Hwang, 2013). Collaborative learning improves the teamwork skills of individuals, which are applicable in real-life situations.

Collaborative and competitive game structures contribute significantly to

the development of teamwork and communication skills among students in electrical and electronic trades education. Collaborative activities encourage students to work together in solving technical problems, sharing ideas, and assisting one another during practical exercises. This promotes peer learning and strengthens interpersonal relationships among learners. On the other hand, competitive activities motivate students to improve their performance and participate actively in classroom tasks. The combination of cooperation and competition creates an engaging learning environment that prepares students for real workplace situations where teamwork, communication, and performance are highly important.

Collaborative and competitive game structures are important gamification strategies used to improve teamwork, communication, and active participation among students. In electrical and electronic trades education, collaborative activities involve students working together in groups to solve technical problems, perform practical tasks, or complete workshop activities. For example, students may work together to install and test electrical systems or troubleshoot faults during practical lessons. Collaborative learning encourages peer interaction, idea sharing, and cooperation among learners, which are important skills required in technical occupations. Competitive game structures also motivate students to participate actively in classroom and workshop activities. Learners become more interested in practical tasks when they are given opportunities to compete with one another in a healthy manner. Competition encourages students to

improve their performance and strive for excellence during learning activities.

Furthermore, collaborative and competitive game structures help students to develop workplace-related competencies such as teamwork, leadership, communication, and problem-solving skills. Through collaboration, learners are able to learn from one another and improve their understanding of practical concepts. Competition also promotes confidence, determination, and active participation during lessons. The combination of collaborative and competitive activities therefore creates a motivating and engaging learning environment that prepares students for real-life electrical and electronic work situations.

Empirical Evidence: Gamification and Trade Education Outcomes

There is a need to review the empirical evidence and research on gamification in electrical and electronic trades education at technical colleges. This section synthesizes findings across key outcome variables.

Student Engagement and Motivation

There are many studies that show positive and significant improvements in student motivation and engagement through the application of gamification in teaching and learning at different levels of the education system. Hamari et al. (2014) conducted a systematic review titled *Does Gamification Work?* The review comprised 24 peer-reviewed studies and found that gamification had significant positive effects on motivation, engagement, and enjoyment. In a related study focused on vocational and technical education contexts, Dichev and Dicheva (2017) reviewed 221 gamification papers and revealed that the

findings were consistent, with the majority supporting a motivational gain, particularly in subjects that learners perceived as abstract or difficult. Electrical and electronic trade students frequently perceived these concepts as abstract, complex, and difficult.

Cognitive and Knowledge Outcomes

Student motivation and engagement alone do not determine the effectiveness of a pedagogical approach. There is a need to review its effectiveness in terms of cognitive and knowledge outcomes as well. Studies examining gamification's impact on knowledge acquisition and retention in technical subjects revealed that the results were encouraging. Su and Cheng (2015) reported significant improvements in science knowledge retention in mobile gamified learning environments. In electrical engineering education, Hussein (2015) found that simulation-based gamified instruction produced significantly higher post-test scores than conventional instruction on circuit analysis tasks, with particularly strong effects for low-prior-knowledge learners. Ebinuwa-Okoh and Adakole (2021), in a study conducted across Nigerian technical colleges, reported that gamified instructional approaches yielded a 34% improvement in mean scores on Basic Electricity theory assessments compared to conventional methods.

Psychomotor and Practical Competency Outcomes

One of the challenges of electrical and electronic trades at the technical college level is the acquisition of psychomotor and practical skills. Studies have revealed that the application of gamification improves students' practical and psychomotor skills. Evidence

suggests that simulation-based gamification is practically effective: designing and constructing working circuits, installing components, practising wiring diagrams, and diagnosing faults repeatedly in a virtual environment before transitioning to live-panel work has been shown to accelerate psychomotor skill development and reduce workplace accidents in training contexts (Papastergiou, 2009; Ibiam et al., 2020). It is worth noting that gamification or gamified simulation only complements physical workshop practice but does not replace it.

Attendance and Persistence

The marking of attendance is one of the most important aspects of teaching and learning, because it is one of the key criteria for determining students' progress. Several studies have noted improvements in attendance, course persistence, and task completion rates in gamified learning environments. Dominguez et al. (2013) found that students in gamified learning environments submitted more assignments and achieved higher scores on practical exercises than those in control groups, though some evidence suggested that low-performing students may disengage if game mechanics create social comparison anxiety. Gamification helps both teachers and students to track their progress, monitor attendance, and record how often tasks were completed.

A Proposed Gamified Technical Competency Framework (GTCF) for Nigerian Technical Colleges

It is necessary to propose a gamified framework applicable to Nigerian technical colleges, specifically within electrical and electronic trades. The framework is drawn from the theoretical and empirical literature

reviewed above and is informed by the specific contextual realities of Nigerian technical colleges. This paper proposes a five-component Gamified Technical Competency Framework (GTCF) for integrating gamification into electrical and electronic trades in technical colleges. The five components are: competency mapping, progressive challenge design, multimodal feedback systems, collaborative quest structures, and reflective mastery assessment.

Competency Mapping: One of the main goals of electrical and electronic trades is to provide skilled manpower that will be able to use their competencies to design, develop, and construct things that are useful to society. Competency mapping aligns gamified tasks explicitly with NBTE competency standards and trade occupation profiles. In developing the gamified tasks, each mission targets a specific unit of competency, such as wiring a single-phase motor, tracing a fault in a circuit, reading electrical diagrams, and constructing circuits using different methods.

Progressive Challenge Design: It is necessary to ensure that teaching and learning flow from simple to complex, from known to unknown. With this approach, students will be motivated to complete any task or project. Progressive Challenge Design structures gamified content using graduated difficulty to maintain flow and prevent disengagement. It is applicable as introductory circuit challenges progress to complex fault-diagnosis scenarios and full installation projects, starting from the identification of elements and components through troubleshooting, repair, and testing. These processes motivate students to complete any

project they begin because there is visible progress.

Multimodal Feedback Systems: In electrical and electronic trades, it is important to receive instant feedback. Multimodal Feedback Systems combine immediate digital feedback from simulation software with instructor and peer feedback loops. This is demonstrated through automated simulation error reports supplemented by teacher debriefs and peer review of wiring diagrams.

Collaborative Quest Structures: Collaborative learning is one of the most effective learning approaches, in which students share different ideas and work together to achieve a goal. Collaborative quest structures employ team-based game missions that mirror real-world trade project structures. Groups collectively plan, install, test, and troubleshoot an electrical installation that is scored on accuracy, safety compliance, and teamwork.

Reflective Mastery Assessment: The ability of students to master a task depends on the number of times they repeat such activities. Electrical and electronic trade is a field of study that needs mastery of all domains. Reflective mastery assessment replaces or supplements conventional tests with mastery-based game assessments that permit repeated attempts. Students re-attempt simulation fault-diagnosis challenges until mastery criteria are met, with each attempt logged for portfolio evidence.

At the technical college level, students are prepared to be self-employed, employable, and useful to themselves and society. It is also clear that there are challenges related to

infrastructure, including physical, digital, and other technical facilities. Electrical and electronic trade subjects, which are among the backbones of all trades, should be taught in such a way that they are meaningful and prepare students for the real world. The teaching methods and pedagogy adopted should represent the actual activities of the real world. The proposed GTCF is deliberately designed for contextual adaptability. In resource-constrained technical colleges lacking digital infrastructure, the proposed GTCF can be integrated into a locally developed gamified module or platform that is aligned with NBTE curriculum standards. Such a module or platform would require no digital technology. As institutional capacity grows, digital simulation tools can be progressively integrated without disrupting the framework's pedagogical architecture.

Discussion

Based on the review conducted in this paper, there is a need to discuss the findings and suggestions in detail regarding gamification as a pedagogical strategy in electrical and electronic trades education at Nigerian technical colleges. Several cross-cutting themes warrant discussion.

Based on the findings of this review, it is evident that gamification improves motivation; however, its effectiveness is not intrinsic to the game mechanics themselves but is contingent on purposive pedagogical design. The application of points and other game mechanics can only motivate learners for a while but do not on their own develop students' cognitive and psychomotor domains in electrical and electronic trades. Kapp (2012) explained that the mere addition of points or badges to existing instructional activities termed 'pointsification' yields minimal

educational benefit and may actively undermine motivation. Genuine gamification requires the deliberate re-engineering of learning experiences around game principles of challenge, narrative, feedback, and agency. This insight has direct implications for how gamification is introduced to technical college teachers, who must be equipped with design competencies, not merely technological ones.

The condition of Nigeria technical colleges is pathetic, which needs critical intervention. Therefore, there is a need to empirically study the environment and develop gamified packages that are suitable for and can be integrated into Nigerian culture and context for easy adaptation and application. The Nigerian context imposes specific conditions on gamification design that global literature does not fully address. The intersection of resource scarcity, large class sizes, examination pressure, and cultural orientations toward authority and collectivism requires that internationally developed gamification models be critically adapted rather than uncritically adopted. The GTCF proposed in this review represents one such adaptation, though further empirical validation in specific Nigerian technical college settings is urgently needed.

Finally, the long-term sustainability of gamification initiatives in Nigeria technical colleges requires systemic institutionalisation: embedding gamified pedagogy in official curriculum documents, incorporating gamification design into teacher education programmes, establishing industry-linked gamified competency benchmarks, and creating institutional communities of practice among technical trade teachers. Isolated, project-based gamification pilots, however successful, rarely survive

beyond their initial champions without this structural scaffolding.

Conclusions

This review has demonstrated that gamification, when theoretically grounded, contextually adapted, and purposively designed, represents a powerful pedagogical strategy for addressing the persistent challenges of student disengagement and inadequate competency acquisition in electrical and electronic trades education at Nigerian technical colleges. The convergence of self-determination theory, flow theory, constructivist learning principles, and competency-based education frameworks provides a robust theoretical foundation for gamification in this context, while empirical evidence — though still thin in the Nigerian TVET-specific literature consistently supports gamification's motivational and cognitive benefits.

The proposed Gamified Technical Competency Framework (GTCF) offers a practical, scalable, and contextually responsive implementation structure that can be adopted progressively by institutions at different levels of technological readiness. Its deliberate alignment with NBTE competency standards ensures that gamification serves, rather than subverts, the core mandate of technical trades education.

Recommendation

On the basis of this review, the following recommendations are offered:

1. The National Board for Technical Education (NBTE) and the Federal Ministry of Education should formally recognise gamification as an approved pedagogical strategy within the national TVET curriculum framework and develop accompanying teacher resource

- packs and professional development modules.
2. Technical college administrators should establish pilot gamification programmes in electrical and electronic trades departments, beginning with offline game-based activities and simulation software, and supported by robust monitoring and evaluation mechanisms.
 3. TVET teacher education institutions should integrate gamification design and digital pedagogical competencies into pre-service and in-service training curricula for technical trade teachers.
 4. Researchers should prioritise rigorous experimental and quasi-experimental studies examining gamification outcomes in Nigerian technical college settings to build the local evidence base.
 5. Industry stakeholders, including the Electricity Distribution Companies (DISCOs), the Nigeria Electricity Regulatory Commission (NERC), and electrical contractors, should collaborate with technical colleges to develop industry-validated, gamified competency benchmarks that reflect real-world trade demands.
 6. Gamification design in technical colleges should explicitly incorporate gender-responsive and culturally contextualised elements to ensure equitable engagement across all learner groups.

References

- Barata, G., Gama, S., Jorge, J., & Gonçalves, D. (2013). Improving participation and learning with gamification. Proceedings of the 1st International Conference on Gameful Design, Research, and Applications (Gamification '13), 10-17.
- Coelho, F., Rando, B., Aparício, D., Pontífice-Sousa, P., Gonçalves, D., & Abreu, A. M. (2025). The impact of educational gamification on cognition, emotions, and motivation: a randomized controlled trial. *Journal of Computers in Education*, 1-48.
- Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. Plenum Press.
- Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6), 627-668.
- Dichev, C., & Dicheva, D. (2017). Gamifying education: What is known, what is believed and what remains uncertain. *International Journal of Educational Technology in Higher Education*, 14(1), 1-36.
- Dominguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernandez-Sanz, L., Pages, C., & Martinez-Herraz, J.-J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, 63, 380-392.
- Ebenuwa-Okoh, E. E., & Adakole, S. E. (2021). Effects of gamified instructional approach on students' achievement in basic electricity in technical colleges in Cross River State, Nigeria. *International Journal of Innovative Science and Research Technology*, 6(5), 982-990.

- Federal Ministry of Education. (2019). National policy on education (6th ed.). NERDC Press.
- Federal Republic of Nigeria. (2014). *National technical and vocational education and training (TVET) policy*. Federal Ministry of Education.
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. *Proceedings of the 47th Hawaii International Conference on System Sciences*, 3025-3034.
- Hussein, B. A. (2015). Applying game mechanics and simulation in electrical engineering education. *Procedia - Social and Behavioral Sciences*, 174, 87-94.
- Ibiam, U. A., Agwu, A. O., & Onah, C. C. (2020). Effect of simulation-based instruction on students' achievement and retention in electrical installation trade in technical colleges. *Nigerian Journal of Technical Education*, 17(1), 12-24.
- Johnson, D. W., & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Interaction Book.
- Kapp, K. M. (2012). The gamification of learning and instruction: Game-based methods and strategies for training and education. Pfeiffer.
- Mekler, E. D., Bruhlmann, F., Tuch, A. N., & Opwis, K. (2017). Towards understanding the effects of individual gamification elements on intrinsic motivation and performance. *Computers in Human Behavior*, 71, 525-534.
- Merriam-Webster. (n.d.). *Gamification*. In *Merriam-Webster.com dictionary*. Retrieved May 24, 2026.
- Mirmotahari, O., Grun, H. N., & Berg, Y. (2025). Gamification as a transferable pedagogical innovation for technology education: Developing 21st-century skills through collaborative game-based learning. *Frontiers in Education*, 10, 1684459.
- National Board for Technical Education. (2019). *Curriculum for electrical installation works trade (Technical College level)*. NBTE.
- Norton, R. E. (2008). DACUM handbook (3rd ed.). The Center on Education and Training for Employment.
- Nwosu, C. C., & Ezema, N. E. (2022). Challenges of teaching and learning electrical trades in Nigerian technical colleges: A review. *Journal of Vocational and Technical Education in Africa*, 4(1), 33-45.
- Olaitan, S. O. (2020). *Vocational and technical education in Nigeria: Issues, challenges, and prospects*. Agitab Publishers.
- Ortiz-Rojas, M., Chiliza, K., & Valcke, M. (2025). How gamification boosts learning in STEM higher education: A mixed methods study. *International Journal of STEM Education*, 12, 1.
- Papastergiou, M. (2009). Digital game-based learning in high school computer science education:

- Impact on educational effectiveness and student motivation. *Computers & Education*, 52(1), 1-12.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54-67.
- Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis*. Appleton-Century-Crofts.
- Su, C.-H., & Cheng, C.-H. (2015). A mobile gamification learning system for improving the learning motivation and achievements. *Journal of Computer Assisted Learning*, 31(3), 268-286.
- Sung, H.-Y., & Hwang, G.-J. (2013). *A collaborative game-based learning approach to improving students' learning performance in science courses*. *Computers & Education*, 63, 43-51.
- Ukgoda, H. (2025). Gamification in education: Its impact on engagement, motivation, and learning outcomes. *Journal of Educational Technology Development and Exchange*, 18(3), 41-66.
- UNESCO-UNEVOC. (2021). *Skills for work and life. Transforming technical and vocational education and training (TVET) for successful and just transitions*. World TVET database of Nigeria. UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training.

ASSESSING THE IMPACT OF LEARNING ENVIRONMENT ON THE ACADEMIC PERFORMANCE OF ELECTRICAL AND ELECTRONIC TECHNOLOGY STUDENTS OF EKITI STATE UNIVERSITY ADO-EKITI

¹Yisa, S. N., & ²Ogundola I. P.

¹Department of Industrial and Technology Education Federal University of Technology Minna.

²Department of Vocational and Technical Education. Ekiti State University, Ado Ekiti State

Correspondent email: snyisafut@gmail.com
Phone:08066986924

Abstract

The study assessed the impact of the learning environment on the academic performance of Electrical and Electronic technology students in Ekiti State University, Ado-Ekiti, Ekiti State. Three specific purposes guided the study, and three research questions were raised in line with the purposes. A descriptive survey research design was adopted for the study. The study was carried out in the Department of Vocational and Technical Education, Ekiti State University, Ado-Ekiti. The population of the study consisted 17 undergraduate and postgraduate students (Electrical and Electronic unit). A structured questionnaire titled "Impact of Learning Environment and Academic Performance of Questionnaire (ILEAPQ)" was used for data collection. The correlation coefficients were found to be 0.79. The value was considered high enough for establishing the reliability of the instrument. Data collected were analyzed using descriptive statistic of mean and standard deviation. The findings of the study revealed that physical learning facilities positively impact the academic performance of electrical and electronic technology students in EKSU. The study also found that the psychosocial learning environment significantly impacts the academic performance of electrical and electronic technology students in EKSU among others. Based on the findings of the study, it was recommended that the university management should improve funding for laboratory equipment, strengthen ICT infrastructure, provide stable electricity supply, and enhance access to modern simulation software to improve students' academic performance in Electrical and Electronic Technology. Conclusively, available, adequate and functioning physical, psychosocial and technological learning environments significantly impact the academic performance of electrical and electronic technology students of Ekiti State University, Ado-Ekiti.

Keywords: learning environment, academic performance, Electrical and Electronic students, vocational and technical education, Ekiti State University.

Introduction

The development of any nation depends largely on the quality and effectiveness of its educational system. Education is a continuous process through which individuals acquire

knowledge, skills, and competencies required to function effectively in society and contribute to national development. It promotes intellectual growth, innovation, and adaptability in a rapidly changing world (Dewey, 1916; World

Bank, 2020). One of the major determinants of effective education is the learning environment. The learning environment refers to the physical, psychology, social, and technological conditions under which teaching and learning take place (Fraser, 2018). It includes classrooms, workshops, laboratories, interpersonal relationships, and digital learning resources that collectively influence students' academic experiences and outcomes. Research has shown that a well-structured and supportive learning environment enhances student engagement, motivation, and academic achievement (Rusticus et al., 2023; Ogbuanya & Efuwape, 2018). With effective and adequate learning environment, there will be effective academic performance.

The learning environment is generally categorized into three major components: physical, psychosocial, and technological environments. The physical environment consists of infrastructure such as classrooms, workshops, laboratories, tools, and equipment, which are essential for practical-based disciplines like Electrical and Electronic Technology. Studies have established that adequate physical facilities significantly improve skill acquisition and academic performance in technical education (Nwabudike et al., 2023; Ogu, 2024). The psychosocial environment refers to the quality of interaction between students and lecturers, peer relationships, and the overall emotional climate of the institution. A positive psychosocial environment fosters collaboration, reduces anxiety, and enhances students' motivation to learn (Li & Xue, 2023; Procedia-Social and Behavioral Sciences, 2015). Poor interpersonal relationships and lack of academic support negatively affect students' academic performance.

The technological environment involves the availability, adequacy and use of ICT tools, e-learning platforms, simulation software, and digital learning resources that support modern teaching and learning processes. In Electrical and Electronic Technology, access to simulation software, internet facilities, and computer-based tools is critical for effective learning and practical training (Murire & Gavaza, 2025; Muhammad et al., 2023). This study is anchored by Bronfenbrenner's Ecological Systems Theory, which posits that human development is influenced by multiple interacting environmental systems (Bronfenbrenner, 1979). The theory explains that students' academic performance is shaped by their interaction with physical, social, and technological learning environments. Teaching and learning of electrical and electronic technology concept with available and adequate learning environment impact the students' academic performance.

Academic performance refers to the extent to which students achieve educational objectives as measured through examinations, practical assessments, and overall academic outcomes (Hailu et al., 2024). In vocational and technical education, academic performance also includes practical competence and the ability to apply theoretical knowledge in real-life situations. Vocational and Technical Education (VTE) is designed to equip learners with employable and practical skills necessary for industrial and technological development (Okoro, 2010; UNESCO, 2022). One of the courses in vocational and technical education is electrical and electronic technology. Electrical and Electronic Technology is a core area of VTE that focuses on installation, maintenance, and

repair of electrical systems. Effective training in this field requires adequate facilities and a conducive learning environment.

Ekiti State University (EKSU), Ado-Ekiti, offers Vocational and Technical Education programmes, including Electrical and Electronic Technology. However, concerns persist regarding the impact of learning environments in many Nigerian tertiary institutions, particularly in technical disciplines. This study examines the impact of the learning environment on the academic performance of Electrical and Electronic students in EKSU.

Statement of the Problem

One of the key factors influencing effective teaching and learning, as well as the academic performance of students, is the learning environment. Learning environment encompasses the physical, social, psychology, technology, and digital contexts within which teaching and learning occur. Vocational and technical education in particular, effective, adequate and relevant physical, digital and psychosocial learning environment is necessary for effective teaching and learning. In an ideal situation learning environment is not an option but necessary and need to be adequate and functional. This is applicable to electrical and electronic technology.

In Electrical and Electronic Technology programmes, a functional learning environment is critical because students require adequate laboratories, workshops, equipment, tools, and practical exposure to develop relevant knowledge, technical skills, entrepreneurship skills, soft skills. The achievement of the above-mentioned skills depends on the provision of a learning environment that prepares

students for a rapidly changing and technology-driven world. In this regard, the United Nations Sustainable Development Goal 4 (SDG 4) emphasizes inclusive and equitable quality education, highlighting the importance of conducive learning environments that support skill acquisition and lifelong learning. Consequently, Nigerian universities, including Ekiti State University (EKSU), are expected to invest in modern workshops, technological facilities, and qualified academic support that will impact the academic performance of students in electrical and electronic technology.

It is revealed from different studies and experience that dispart the significant of learning environment on the academic performance of students it is observed across several Nigerian universities that learning environments are often not adequately equipped to support effective practical training in Electrical and Electronic Technology programmes. Public universities in Nigeria continue to face challenges of chronic underfunding, which has resulted in inadequate laboratory equipment, obsolete tools, overcrowded practical sessions, insufficient technical infrastructure, limited access to modern digital resources, and unfavourable psychosocial conditions between students and lecturers. These deficiencies negatively affect students' understanding of core concepts, practical competence, and overall academic performance in Electrical and Electronic studies.

There are several studies on learning environment and it impacts on academic performance, however, most studies focus on secondary schools and general university population; few studies examine technology-based disciplines. There is no evidence of study specifically

targeting electrical and electronic technology students at Ekiti State University, Ado-Ekiti. These challenges are widely reported in Nigerian public universities, it remains unclear whether the same conditions exist in Ekiti State University, Ado-Ekiti (EKSU), particularly within the Electrical and Electronic Technology programme. In particular, the extent to which the physical, technological, and psychosocial aspects of the learning environment impact the academic performance of Electrical and Electronic students at EKSU has not been sufficiently investigated. This creates a gap of empirical evidence of the impact of learning environment on the academic performance of electrical and electronic technology students in EKSU. This raises a fundamental question on the impact of learning environment on electrical and electronic technology students of Ekiti State University.

Purpose of the Study

The main purpose of the study is to assess the impact of the learning environment on academic performance of Electrical and Electronic Technology Students in Ekiti State University, Ado-Ekiti. Specifically, the study:

- i. examined the impact of physical learning facilities on the academic performance of Electrical and Electronic students in EKSU.
- ii. determined the impact of the psychosocial environment on students' academic performance.
- iii. assessed the impact of technological resources on the academic performance of Electrical and Electronic students.

Research Questions

The following research questions were raised to guide the study:

1. What is the impact of physical learning facilities on the academic performance of Electrical and Electronic Technology students in EKSU?
2. What is the impact of the psychosocial environment on the academic performance of Electrical and Electronic Technology students in EKSU?
3. What is the impact of technological resources on the academic performance of Electrical and Electronic Technology students in EKSU?

Methodology

The study employed a descriptive survey research design. A descriptive survey design is appropriate because it enables the collection of data from respondents without manipulation of variables, allowing for the objective description of existing conditions in the learning environment (Creswell & Creswell, 2018). The design was used to determine the impact of learning environment on academic performance of electrical and electronic technology students in Ekiti State University, Ado-Ekiti

The population of the study comprised 17 participants made up of 4 postgraduate students and 13 undergraduate students of Electrical and Electronic Unit in the Department of Vocational and Technical Education (VTE), Faculty of Education, Ekiti State University, Ado-Ekiti. The study adopted a census sampling technique, where all members of the population were included in the study.

The instrument used for data collection was a structured questionnaire titled: "Impact of Learning Environment on the Academic Performance of Electrical and Electronic Technology

Students Questionnaire (ILEAPUPSQ)". The questionnaire was divided into two sections: Session A which obtained the demographic information of the respondents and session B that sought answers to the Impact of Learning Environment on the Academic Performance of Electrical and Electronic Technology Students of Ekiti State University which was further divided to three stages. Stage 1: comprised 12 items seeking answers to research question one on the impact of physical learning facilities on the academic performance of Electrical and Electronic students in EKSU. Stage 2 was made up of 12 items answered research question two on the impact of the psychosocial environment on the academic performance of Electrical and Electronic students in EKSU. While, stage 3 also comprises 12 items sought answers to research question three on the impact of technological resources on the academic performance of Electrical and Electronic students. All items were structured on a 4-point scale: Strongly Agreed (4) Agreed (3) disagreed (2) and strongly disagreed (1).

The research instrument undergoes face and content validity. The instrument was validated by three experts in electrical and electronic technology, department of Vocational and Industrial Technology Education, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti. The observation and corrections made by the experts were corrected and fixed before the final copied were administered to the respondents. Reliability of the instrument

was determined through a pilot study conducted on 5 electrical and electronic students in the department of Vocational and Industrial Technology Education, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti. Split- half test was used to determine the reliability coefficient of the instrument. The data collected on the test were subjected to Cronbach Alpha. A reliable coefficient of 0.79 was obtained, and the instrument was adjusted to be reliable for the study.

All the Google forms questionnaire were administered online to the respondents and the returned rate representing 100%. Respondents were given adequate time to complete the questionnaire, and completed copies were collected immediately to ensure a high return rate.

Data collected were analyzed using descriptive statistic of Mean and Standard Deviation to answered the research questions raised for the study. The criterion mean score of 2.50 was adopted as the decision rule for interpreting responses to each item on the instrument. Consequently, any item with a mean score of 2.50 and above were regarded as Agree, while any item with a mean score below 2.50 was regarded as Disagree.

Results

Research Question 1: What is the impact of physical learning facilities on the academic performance of Electrical and Electronic students in EKSU?

Table 1: the responses of the respondents on the impact of physical learning facilities on the academic performance of Electrical and Electronic students in EKSU.

S/N	Item	$\bar{x}$	SD	R
1	Electrical/Electronic workshop are well equipped with functioning instruments and equipment to carry out practical training	3.00	0.82	A
2	The workshop and project studio spaces available in the department are well-maintained, safe, and adequate for carrying out engineering project work.	2.80	0.75	A
3	The seating arrangements and furniture in classrooms are comfortable enough to sustain my attention and engagement during long lectures	2.60	0.83	A
4	Electricity supply in the department supports my academic performance	2.40	0.85	D
5	Safety facilities are properly provided in the workshop	3.10	0.74	A
6	Classrooms are conducive for teaching and learning	3.20	0.71	A
7	The library resources relevant to Electrical and Electronic Technology are sufficient to support my academic work.	2.70	0.80	A
8	The lecture halls in my department are spacious enough and adequately furnished to support effective learning during classes	2.30	0.84	D
9	The general cleanliness, aesthetic condition, and maintenance culture of departmental facilities create an environment that is conducive to academic concentration and performance.	2.50	0.88	A
10	The availability of functional demonstration and simulation equipment in the department enhances my understanding of theoretical concepts taught in class.	2.60	0.82	A
11	Workshop environment is conducive for learning	2.90	0.78	A
12	Adequate lighting and ventilation in classrooms and workshops make it comfortable for me to concentrate and learn effectively.	3.00	0.76	A
Grand Mean		2.72	0.79	A

Keys: $\bar{x}$ = Mean, SD = Standard Deviation, R = Remark, A = agree and D = disagree

The findings show that physical learning facilities are generally adequate, with most items rated above 2.50. However, power supply (2.40) and equipment maintenance (2.30) were rated below the acceptance level, indicating challenges in these areas. The grand mean of 2.72 confirms that physical learning facilities have a significant positive impact on academic performance of electrical and electronic technology students in EKSU. Although, there is need for improvement is needed

in power supply and equipment maintenance. The grand standard deviation is 0.79 which indicated that the respondents are not too far and consistent in the respondents' opinions.

Research Question 2: What is the impact of psychosocial environment on the academic performance of electrical and electronic technology students in EKSU?

Table 2: the responses of the respondents on the impact of psychosocial environment on the academic performance of electrical and electronic technology students in EKSU.

S/N	Item	$\bar{x}$	SD	R
1	The quality of relationship i have with my lecturers motivates me to put in greater effort in my academic work.	3.20	0.76	A
2	Lecturers in my department demonstrate sufficient mastery of their subject matter, which helps me to understand course content effectively.	3.00	0.77	A
3	The feedback I receive from lecturers on assignments and examinations is timely and constructive enough to improve my academic performance.	2.80	0.8	A
4	The level of collaboration encouraged among students in laboratory and project work in my department positively contributes to my academic achievement.	2.60	0.81	A
5	Stressful interpersonal relationships within the department is manageable	2.30	0.85	D
6	Academic counselling and student support services in EKSU are accessible and have been helpful in improving my academic performance.	3.10	0.75	A
7	The level of encouragement i receive from lecturers to participate actively in class discussions enhances my understanding of course material.	3.20	0.72	A
8	The emotional atmosphere in my department makes me feel safe enough to ask questions and seek academic help without fear of ridicule.	2.67	0.8	A
9	Competition and peer pressure among students in my department support my academic concentration and performance.	2.40	0.83	D
10	Interactions with my fellow students in the department create a supportive academic environment that positively influences my performance.	3.10	0.78	A
11	Being recognised and acknowledged for my academic efforts by lecturers or peers in the department increases my motivation to study harder.	2.90	0.76	A
12	The social cultural activities enhance my emotion to learn	3.20	0.74	A
Grand Mean		2.83	0.78	A

Keys: $\bar{x}$ = Mean, SD = Standard Deviation, R = Remark, A=Agree and D= Disagree

Table 2 revealed that the psychosocial environment is generally supportive, with most items above the acceptance level of 2.50. However, stress interpersonal relationship (2.30) and competition and peer relationships (2.40) were rated below 2.50, indicating disagree. This mean that stress and unhealthy competition and relationship negatively impact their academic performance. The grand mean of (2.83) and standard deviation (0.78) indicates

that psychosocial factors have a positive impact on the academic performance of electrical and electronic technology students in EKSU and their response are not far from one another.

Research Question 3: What is the impact of technological resources on the academic performance of Electrical and Electronic technology students in EKSU?

Table 3: the responses of the respondents on the impact of technological resources on the academic performance of Electrical and Electronic technology students in EKSU

S/N	Item	$\bar{x}$	SD	R
1	I have access to functional computers positively impact my academic performance	3.00	0.82	A
2	The availability of reliable internet access within the department enables me to access academic materials and resources that improve my academic performance.	2.40	0.88	D
3	The engineering simulation software (such as MATLAB, PSPICE, or Proteus) are available and adequate in the department laboratory	2.30	0.85	D
4	The absence or inadequacy of modern digital teaching aids in some courses in my department limits my understanding of complex courses	2.80	0.79	A
5	My ability to use digital research tools has significantly contributed to the quality of my assignments and projects.	3.00	0.76	A
6	Lecturers who use technology-enhanced instructional methods make course content clearer and more engaging	2.50	0.84	A
7	The department's use of an e-learning platform or learning management system (LMS) supports my academic work.	2.40	0.86	D
8	The use of digital assessment tools by lecturers in my department improves my engagement and academic outcomes.	2.70	0.81	A
9	Computer laboratories are functional	3.00	0.77	A
10	Technical support is available	2.60	0.82	A
11	E-learning resources are adequate	2.50	0.8	A
12	Current industry-relevant digital technologies and software in my department's curriculum increase my academic performance	3.10	0.74	A
Grand Mean		2.66	0.81	A

Keys: $\bar{x}$ = *Mean*, *SD*= *Standard Deviation*, *R*= *Remark*, *A*=*Agreed* and *D*=*Disagreed*

The results on table 3 shows that technological resources have impact the academic performance of electrical and electronic technology students of EKSU. This is because the grand mean of 2.66 is greater than the criterion mean of 2.50. It is revealed also that some of the technology learning environments do not impact the academic performance of electrical and electronic technology students such as items 2, 3 and 7 which have their mean less than 2.50. which is below the acceptance level, indicating major gaps in digital infrastructure.

Discussion of Findings

The findings of research question one revealed that physical learning facilities impact the academic performance of electrical and electronic technology students in Ekiti State University, Ado-Ekiti. This indicates that facilities such as laboratories, workshop tools, classroom spaces, safety equipment, and ventilation largely contribute to teaching and learning and practical activities of electrical and electronic technology students which in turn have positive impact on their academic performance. This finding is consistent with the study of Edokpolor and Dumbiri (2019), who reported that

adequate physical facilities are essential for effective teaching and learning in Technical and Vocational Education and Training (TVET) programmes. Nwabudike et al. (2023) found that adequate workshops and laboratory infrastructure significantly improve students' academic performance in technical education. It means that, physical learning facilities if available, adequate and functional impact academic performance of students.

However, the result also revealed that power supply and the lecture hall are available do not support the academic performance of electrical and electronic technology students in EKSU. This supports Ogu (2024), who observed that unstable electricity supply and poor maintenance culture negatively affect practical skill acquisition in vocational institutions. These deficiencies may limit students' ability to fully engage in hands-on electrical and electronic practical sessions.

The findings of research question two indicated that the psychosocial learning environment impact the academic performance of electrical and electronic technology students in EKSU. It was revealed that there is effective relationship between lecturers-students and between students-students, the lecturers demonstrated the teaching professional by mastering and effectively delivered their lecture for better understanding of the students. The suggests that lecturer-student relationships, classroom interactions, motivation, and academic guidance were largely positive and conducive to learning. This finding agrees with the findings of Fraser (2018), who emphasized that a positive psychosocial environment enhances student engagement and academic achievement. Similarly, Rusticus et al. (2023) reported

that supportive learning environments characterized by respect, encouragement, and teacher accessibility significantly improve student performance. Li and Xue (2023) also confirmed that psychosocial factors such as teacher support and peer collaboration have a strong influence on academic success of the student. The effective psychology and social environment improve and enhances the emotion of the students and increase the students' interest that will enhance the learning activities which will impacts the academic performance of the students.

The findings of research question three showed that technological resources impact the academic performance of electrical and electronic technology students in EKSU. It was revealed that with accessibility of computer, digital tools and other technology resources electrical and electronic students' academic performance were improve. This is contrary to the finding of Okolocha and Onyeneke (2021), who reported that inadequate ICT infrastructure limits effective teaching and learning in vocational education programmes in Nigerian universities. Similarly, et al. (2025) noted that poor digital infrastructure and weak internet connectivity in developing countries reduce students' engagement in technology-based learning.

It was revealed that there is lack of internet connectivity and some of the digital tools in the department which limit the students accessibility to some of updated online resources that will enhance their academic performance, this finding agree with the findings of World Bank (2024) emphasized that limited access to digital learning tools continues to hinder technical education in developing economies. Since Electrical

and Electronic Technology depends heavily on simulation tools such as Proteus and MATLAB, the absence or inadequacy of these resources may reduce students' practical competence and technical skill development.

Conclusion

The learning environment plays a significant role in impacting the academic performance of electrical and electronic students. Learning environment comprises physical learning facilities, psychosocial environment, and technological resources that collectively support effective teaching and learning. The availability, adequacy and functionality of these components enhance students' academic performance, practical skills development, and overall learning experience.

The study was anchored on Bronfenbrenner's Ecological Systems Theory, which emphasizes that an individual's development and academic performance are influenced by interactions within their learning environment. The theory highlights the importance of providing a supportive, well-structured, and resourceful learning environment to enhance students' academic success.

The findings of the study revealed that physical learning facilities significantly impact the academic performance of electrical and electronic technology students in Ekiti State University, Ado-Ekiti with a grand mean of 2.72. The study further established that the psychosocial environment is supportive and conducive for teaching and learning, with a grand mean of 2.83. Which indicated that electrical and electronic technology students' academic performance in EKSU is impacted positively.

In addition, the study revealed that technological resources with a grand mean of 2.66. indicated that there is significant impact on the academic performance of electrical and electronic technology students in EKSU. Although the learning environment at Ekiti State University impacts the academic performance of Electrical and Electronic students to a reasonable extent, there is still a need for significant improvement in technological infrastructure and key aspects of physical facilities to achieve optimal academic outcomes and practical competence.

Recommendations

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

1. The university management in collaboration with the state government and Non-Governmental Organization should provide stable electricity through alternative energy sources such as solar power systems to support practical activities in Electrical and Electronic workshop.
2. The university should collaborate with Non-Governmental Organizations and other bodies to install and improve internet connectivity and provide reliable high-speed internet services to facilitate research, online learning, and access to digital educational resources.
3. Modern simulation software such as Proteus, MATLAB, Multisim, and other Electrical/Electronic design applications should be made available to students to enhance practical learning and technical competence. The department in collaboration with the school management to reach out to the

graduated students who are working with foreign and education bodies for contribution and donations.

References

- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. Macmillan.
- Edokpolor, J. E., & Dumbiri, W. M. (2019). Technical and vocational education and training (TVET) and the development of sustainable skills in Nigeria. *Journal of Education and Practice*, 10(26), 39–45.
- Fraser, B. J. (2018). Classroom learning environments: Retrospect, context and prospect. In D. B. Zandvliet & B. J. Fraser (Eds.), *Thirty years of learning environments research* (pp. 1–20). Brill.
- Hailu, T., Bekele, S., & Tadesse, A. (2024). Academic performance indicators among university students: A review of measurement approaches. *International Journal of Educational Research Review*, 9(2), 112–126.
- Li, F., & Xue, E. (2023). Dynamic interaction between students' learning behaviour and learning environment: A meta-analysis of student engagement and learning outcomes. *Education Sciences*, 13(3), 1–18. <https://doi.org/10.3390/educsci13030118>
- Murire, J., & Gavaza, P. (2025). Digital infrastructure and learning outcomes in higher education institutions in developing countries. *International Journal of Educational Technology*.
- Nwabudike, C. M., Olisa, J. A., & Osakue, F. (2023). Effect of physical infrastructure and environment on academic achievement of technical college students in Nigeria. *International Journal of Research*, 10(12), 45–60.
- Ogu, U. K. (2024). School facilities utilization and students' academic performance in technical and vocational institutions in Northeast Nigeria. *Nigerian Journal of Educational Administration*, 9(2), 13–25.
- Okolocha, C. C., & Onyeneke, E. N. (2021). Influence of ICT facilities on students' academic performance in vocational education in Nigerian universities. *International Journal of Education and Development Using ICT*, 17(3), 88–101.
- Okoro, O. M. (2010). *Principles and methods in vocational and technical education*. University Trust Publishers.

- Rusticus, S. A., Pashootan, T., Mah, A., & Walker, M. (2023). What are the key elements of a positive learning environment? Perspectives from students and faculty. *Learning Environments Research*, 26(2), 421–438.
<https://doi.org/10.1007/s10984-023-09456-x>
- Umukoro, O. S., & Igberaharha, C. O. (2025). Availability of ICT facilities and students' academic performance in Nigerian tertiary institutions. *Journal of Educational Technology Research*, 12(1), 66–80.
- UNESCO. (2022). Technical and vocational education and training (TVET): Global priorities and trends. UNESCO Publishing.
- Wong, K. (2024). Education, innovation and national development in the twenty-first century. *International Journal of Educational Development*, 102, 102891.
<https://doi.org/10.1016/j.ijedudev.2024.102891>
- World Bank. (2020). Education for development. World Bank Group.
- World Bank. (2024). Digital transformation in education: Enhancing access and quality in developing countries. World Bank Publications.

IMPACT OF DIGITAL TOOLS ON BUSINESS EDUCATION STUDENTS' ACCOUNTING SKILLS IN STATE OWNED UNIVERSITIES IN EKITI STATE, NIGERIA

¹ONOVO, Anthonia Chinaza and ²AINA Mathew Adebayo

¹anthoniachinaza@gmail.com

^{1&2}Department of Vocational and Technical Education, Faculty of Education, Ekiti State University, Ado-Ekiti, Ekiti State

Abstract

This study investigated the impact of the use of digital tools on Business Education students' accounting skills in state-owned universities in Ekiti State, Nigeria. The descriptive survey research design was adopted, and the study's population comprised 221 Business Education students specializing in accounting, drawn from Ekiti State University (EKSU) and Bamidele Olumilua University of Science and Technology, Ikere-Ekiti (BOUSTI). Given the manageable size, the entire population was studied without sampling. A structured questionnaire, designed on a four-point Likert scale, was used as the instrument for data collection. The instrument was validated by experts in Vocational and Technical Education and Test and Measurement, and its reliability was confirmed through a pilot test with a Cronbach Alpha coefficient of 0.82. Data were collected personally by the researcher with the help of trained assistants and analyzed using descriptive statistics (mean, and standard deviation) for the research questions, while Pearson Product Moment Correlation (PPMC) was employed to test the hypotheses at a 0.05 level of significance. Findings revealed that the use of digital tools enhances the accounting skills of Business Education students in state-owned universities. The study concluded that effective integration of digital tools will foster improved competence, efficiency, and practical skill acquisition in accounting education. Based on the findings, it was recommended among others that lecturers should integrate digital tools such as spreadsheet software, accounting software into their teaching methods, universities should invest in modern digital tools such as spreadsheet software, Sage and provide continuous training for both lecturers and students in the use of technology-driven approaches into the teaching and learning of accounting to ensure students are adequately equipped for workplace demands.

Keywords: Accounting Skills, Digital tools, Business Education, Teaching Methods

Introduction

In recent years, the integration of digital tools into teaching and learning processes has transformed the delivery of accounting education, particularly within Business Education programmes. The integration of digital tools into Business Education has become an essential component of 21st-century learning, particularly in enhancing students'

accounting skills. The dynamic shift from traditional teaching methods to technology-driven learning platforms has redefined how Business Education students in Nigerian universities acquire, process, and apply accounting knowledge (Ademiluyi & Olawuyi, 2022). This transformation aligns with global trends where digital competence is a prerequisite for professional excellence

in accounting and related disciplines. Berikol & Killi, (2020) revealed that digital transformation represents the strategic integration of digital tools into all facets of accounting education and professional practice. However, the degree to which these tools contribute to skill acquisition remains a subject of empirical investigation, especially in state-owned universities in Ekiti State. Understanding this relationship requires exploring the nature and extent of digital tool utilization among business education students. This leads to the consideration of how such digital tools directly influence specific skill sets such as accounting competence.

Digital tools refer to the technological resources used in instructional and learning processes. According to Merdekawati et al (2024), digital tools refer to technological applications, platforms, and software systems that facilitate the collection, processing, analysis, storage, and sharing of data in accounting education and practice. These tools enhance efficiency, accuracy, and accessibility of accounting processes by automating tasks, supporting real-time collaboration, and enabling the integration of various financial functions. Examples include cloud-based accounting systems, data analytics platforms, artificial intelligence-powered applications, and digital learning management systems that improve both teaching and professional accounting activities. In recent years, technology has been recognized as a catalyst for improving the quality of teaching and learning in business education. For instance, Aina and Onajite (2017) emphasized that the effective use of technology fosters graduates' contribution to economic growth, while Kee (2024) noted that incorporating digital skills in accounting

education strengthens students' readiness for the evolving workforce. Yet, these benefits depend largely on the availability of resources, institutional support, and students' digital literacy levels. This underscores the need to examine not just the availability, but also the functional impact of these tools on Business Education.

Business Education is a branch of vocational education that equips learners with the knowledge, skills, competencies, and attitudes required for effective participation in business, office occupations, entrepreneurship, and for meaningful living in society. It is designed to prepare individuals for both paid employment and self-reliance through the acquisition of practical and theoretical business skills. According to Aina (2018), Business Education is "an educational programme designed to equip learners with the relevant skills, knowledge, competencies, and attitudes needed for gainful employment, entrepreneurial development, and effective participation in business-related activities. With the rapid integration of technology into education, the use of digital tools has become a key driver in enhancing these skills. Digital platforms such as accounting software, and online learning applications improve students' mastery of accounting tasks, data analysis, and record management, thereby strengthening their overall competence. The adoption of digital tools directly influences the quality of skill acquisition in Business Education, ensuring that students are not only academically prepared but also technologically empowered for the relevant digital tools needed in the workplace environment.

The adoption of digital tools promotes innovation and enhances problem-solving capacities among students. Al-Hattami (2025) highlighted

the role of technological self-efficacy and digital literacy in maximizing the benefits of digital accounting education. Similarly, Oluseyi-Sowunmi and Samuel (2025) found that online learning innovations directly influence student engagement and learning outcomes, which are central to skill mastery. Despite these advantages, disparities as identified by Sawyer and Otamiri (2024) in infrastructure, training, and digital exposure still pose challenges to effective learning. These challenges could potentially influence the extent to which accounting skills are developed, creating the need for an in-depth investigation within the state-owned universities.

State-owned universities are public higher education institutions established, funded, and managed primarily by the government, with the aim of providing affordable and accessible education to citizens while contributing to national development goals. In Ekiti State, Nigeria, an example of such an institution is Ekiti State University (EKSU) and Bamidele Olumulua University, Ikere-Ekiti (BOUSTI) which plays a pivotal role in offering quality education to indigenes and non-indigenes, fostering research, and supporting the socio-economic development of the state. Given these insights, it becomes imperative to study how the use of digital tools influences the accounting skills of business education students in state-owned universities in Ekiti State. Such an investigation will provide empirical evidence between technological adoption and skill acquisition, while also highlighting the challenges that might hinder optimal outcomes.

Statement of the Problem

In recent years, the integration of digital tools into teaching and learning

has transformed the way accounting skills are acquired in higher institutions. Business Education students, particularly those specializing in accounting, now have access to various digital tools such as accounting software, spreadsheet applications, cloud-based platforms, e-learning resources among others. These tools have the potential to enhance accuracy, efficiency, and problem-solving abilities in accounting practices. Despite the availability of these tools, there are growing concerns about whether students are effectively using them to develop the necessary competencies required for professional success. Some students may lack adequate exposure to relevant digital tools, while others may face difficulties in applying them to real-life accounting tasks. Moreover, the extent to which these tools actually improve accounting skills remains unclear, especially within state-owned universities in Ekiti State. It appears that students often seem to encounter various challenges such as inadequate training, poor internet connectivity, lack of institutional support, and limited access to updated software. These issues can hinder the potential benefits of digital tools in enhancing accounting skills. This situation raises important questions: What specific digital tools are Business Education students using? How do these tools impact their accounting skills? And what challenges do they face in using them? Addressing these questions is important for designing effective strategies that will enhance students' competency in accounting through the optimal use of digital tools.

Purpose of the Study

The main purpose of this study is to investigate the impact of the use of digital tools on the accounting skills of Business Education students in state-

owned universities in Ekiti State, Nigeria. Specifically, the study seeks to:

1. identify the digital tools used by Business Education students in learning and applying accounting concepts.
2. examine how the use of these digital tools impacts the accounting skills of the students.
3. identify the challenges faced by Business Education students in using digital tools for accounting-related learning activities.

Research Questions

The following research questions were raised to guide the study

1. What are the digital tools used by Business Education students in state-owned universities in Ekiti State?
2. What are the impact of these digital tools on the accounting skills of Business Education students?
3. What challenges do Business Education students face in using digital tools for accounting skill development?

Research Hypotheses

1. There is no significant relationship between the use of digital tools and the accounting skills of Business Education students in state owned universities in Ekiti State.

Methodology

This study adopted the descriptive survey research design, as it seeks to examine the impact of the use of digital tools on Business Education students' accounting skills in state-owned universities in Ekiti State, Nigeria. The population for this study comprised all Business Education students specializing in accounting from the two state-owned universities in Ekiti State. Specifically, this

included 194 students from Ekiti State University (EKSU) and 27 students from Bamidele Olumilua University of Science and Technology, Ikere-Ekiti (BOUSTI), that specialized in accounting making a total population of 221 respondents. Due to the manageable size of the population, the entire population was used for the study; hence, there was no need for sampling.

A structured questionnaire was used as the instrument for data collection. The questionnaire was divided into three sections and was designed using a four-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) to capture respondents' opinions effectively. The validity of the instrument was ensured through face and content validation by three experts. Two in the Vocational and Technical Education Department and one in the Test and Measurement department who reviewed the questionnaire for clarity, relevance, and appropriateness. To determine the reliability of the instrument, a pilot test was conducted using 20 Business Education students from a university outside the study area. The Cronbach Alpha method was employed to compute the reliability coefficient, which yielded a value of 0.82, indicating a high level of internal consistency. The researcher personally administered the questionnaire to the respondents with the help of two trained research assistants to ensure a high return rate. Data collected were analyzed using descriptive statistics such as mean scores and standard deviation to answer the research questions, while inferential statistics was employed to test the hypotheses at a 0.05 level of significance. The decision rule was based on the mean benchmark of 2.50, which represented the cut-off point on the four-point Likert scale used. This implies that mean values

of 2.50 and above were interpreted as agreement (i.e., acceptance of the item), while mean values below 2.50 were interpreted as disagreement (i.e., rejection of the item). This decision rule ensured that the responses were meaningfully categorized for clearer interpretation of the findings.

Results

Research Question 1: What are the digital tools used by Business Education students in state-owned universities in Ekiti State?

Table 1: Digital tools used by Business Education Students

S/N	Items	Mean	SD	Decision
1	I use spreadsheet software (e.g., Microsoft Excel, Google Sheets) for recording and analyzing accounting data.	2.03	0.84	Disagree
2	I use accounting software (e.g., QuickBooks, Sage, Tally ERP) for practicing accounting concepts.	1.91	0.81	Disagree
3	I use presentation tools (e.g., Microsoft PowerPoint, Google Slides) to present accounting reports.	2.08	0.89	Disagree
4	I use online learning platforms (e.g., Google Classroom, Moodle) for accessing accounting lectures and materials.	2.09	0.86	Disagree
5	I use data visualization tools (e.g., Power BI, Tableau) to prepare and interpret accounting charts and reports.	1.91	0.82	Disagree

The result in Table 1 shows the mean ratings of digital tools usage among Business Education students in state-owned universities in Ekiti State. The findings revealed that the mean scores of all the items were below the decision rule benchmark of 2.50. Specifically, spreadsheet software had a mean score of 2.03, accounting software 1.91, presentation tools 2.08, online learning platforms 2.09, and data visualization tools 1.91. Based on the decision rule, this implies that students disagreed with the frequent use of these digital tools. Although online learning platforms ($M = 2.09$) and presentation tools ($M = 2.08$)

had relatively higher mean values compared to other tools, they still fell below the acceptable cut-off point, indicating low utilization. This result therefore suggests that Business Education students in state-owned universities in Ekiti State generally do not make adequate use of digital tools for their learning activities.

Research Question 2: What are the impact of these digital tools on the accounting skills of Business Education students?

Table 2: Impact of digital tools on accounting skills

S/N	Items	Mean	SD	Decision
1	The use of spreadsheet software (e.g., Microsoft Excel, Google Sheets) has improved my ability to organize and analyze financial data.	2.15	0.98	Disagree
2	Accounting software (e.g., QuickBooks, Sage) has enhanced my speed and accuracy in preparing financial statements	2.06	0.95	Disagree
3	Online collaborative platforms (e.g., Google Drive, Microsoft Teams) have improved my ability to work with others on accounting tasks.	2.19	0.97	Disagree
4	Digital simulation tools and tutorials have deepened my understanding of complex accounting concepts.	2.10	0.94	Disagree
5	The use of online databases and financial information resources has improved my ability to make informed accounting decisions.	2.05	0.92	Disagree

The analysis in Table 2 reveals that Business Education students generally disagreed that digital tools significantly impacted their accounting skills, as all the mean scores ranged between 2.05 and 2.19, below the benchmark of 2.50. This implies that the students' accounting skills development has not been effectively enhanced through the use of spreadsheet software,

accounting packages, online collaborative platforms, simulations, or financial databases.

Research Question 3: What challenges do Business Education students face in using digital tools for accounting skill development?

Table 3: Challenges in Using Digital Tools for Accounting Skills Development

S/N	Items	Mean	SD	Decision
1	I experience frequent internet connectivity problems when using online accounting platforms.	3.05	0.89	Agree
2	I lack adequate training on how to use digital tools for accounting tasks.	2.96	0.92	Agree
3	I have limited access to computer laboratories or digital resources in my institution.	2.96	0.93	Agree
4	I find it difficult to afford personal access to licensed accounting software (e.g., QuickBooks, Sage, Peachtree).	3.08	0.87	Agree
5	I receive insufficient guidance from lecturers on integrating digital tools into accounting assignments	2.94	0.91	Agree

The findings in Table 3 indicate that students faced significant challenges in using digital tools for accounting skill development. All items had mean scores above the 2.50 benchmark, suggesting agreement among respondents. The major challenges identified include

internet connectivity issues ($M = 3.05$), high cost of licensed accounting software ($M = 3.08$), inadequate training ($M = 2.96$), limited access to computer laboratories ($M = 2.96$), and insufficient guidance from lecturers ($M = 2.94$).

Test of Hypotheses

Table 4: Pearson Product Moment Correlation between Use of Digital Tools and Accounting Skills

Variable	N	Mean	SD	r-cal	P-value
Use of Digital Tools	221	2.00	0.84	0.421	.000
Accounting Skills	221	2.11	0.95		

*** $P < 0.05$**

The Pearson Product Moment Correlation analysis revealed a moderate positive and statistically significant relationship between the use of digital tools and the accounting skills of Business Education students in state-owned universities in Ekiti State ($r = 0.421$, $p < 0.05$). This indicates that students who make greater use of digital tools tend to demonstrate higher levels of accounting skills. Since the p-value is less than 0.05, the null hypothesis that “there is no significant relationship on the use of digital tools and the accounting skills of Business Education students in state-owned universities in Ekiti State” is rejected. Therefore, the study concludes that digital tools usage significantly impacts students’ accounting skills.

Discussion of Findings

The findings of this study revealed that Business Education students in state-owned universities in Ekiti State make limited use of digital tools in their accounting learning. Tools such as spreadsheet software, accounting software, presentation tools, online platforms, and data visualization applications were not frequently employed by students, as the mean scores for their usage fell below the decision rule of 2.50. This suggests that while students are aware of these tools, their adoption is irregular and inconsistent, often restricted to “sometimes” or “rarely.” This result aligns with the observations of Sawyer and Otamiri (2024), who highlighted

infrastructural and training gaps as major barriers to digital adoption in higher education. It also reflects the argument of Ademiluyi and Olawuyi (2022), that although digital resources have the potential to transform accounting education, the extent of their integration remains inadequate in many Nigerian universities.

With respect to the impact of digital tools on accounting skills, the findings indicated that students perceived minimal benefits. Items relating to improved speed, accuracy, collaboration, and deeper understanding of accounting concepts did not record high agreement among the respondents. This implies that students are yet to fully experience the transformative benefits of digital accounting education. The finding contrasts with Berikol and Killi (2020), who emphasized that digital integration enhances efficiency, innovation, and overall competence in accounting practice. The discrepancy suggests that the poor utilization of tools in State-owned universities in Ekiti State may be undermining the potential positive outcomes. Thus, the limited adoption of digital tools appears to be a critical factor inhibiting skill development.

The analysis of challenges revealed that students face multiple barriers in integrating digital tools into their academic activities. These include frequent internet connectivity issues, inadequate training, limited access to computer facilities, high cost of software, and insufficient guidance from lecturers.

This aligns with the findings of Oluseyi-Sowunmi and Samuel (2025), who reported that digital learning outcomes are contingent upon institutional support and lecturer engagement. The persistence of such barriers highlights the systemic nature of digital adoption challenges within Nigerian public universities, further explaining the low level of impact observed in this study.

The hypothesis testing revealed a statistically significant relationship between the use of digital tools and the accounting skills of Business Education students ($r = 0.421$, $p < 0.05$). This implies that the more effectively students use digital tools, the higher their level of accounting competence. The strength of the positive relationship confirms earlier studies such as Al-Hattami (2025), who identified digital literacy and technological self-efficacy as strong predictors of skill acquisition in accounting. Therefore, the problem is not the lack of potential impact, but rather the poor utilization and access to these tools by students in Ekiti State universities.

The findings suggest that while digital tools hold significant potential for improving accounting skills among Business Education students, systemic challenges such as inadequate training, poor infrastructure, limited access, and lack of lecturer support continue to hinder their effective adoption. Unless these barriers are addressed, the integration of digital tools in accounting education will remain below optimal levels, thereby limiting students' preparedness for the demands of the modern accounting profession.

Conclusion

This study investigated the relationship between the use of digital tools and the accounting skills of Business Education students in state-owned

universities in Ekiti State. The findings revealed that while students are aware of the importance of digital tools such as spreadsheet applications, accounting software, and online collaborative platforms, their effective usage remains limited due to several challenges. These challenges include inadequate training, poor internet connectivity, insufficient access to computer laboratories, and lack of licensed accounting software. The Pearson Moment Correlation analysis showed a significant positive relationship between the use of digital tools and the accounting skills of Business Education students. This implies that increased and effective integration of digital tools enhances students' competencies in financial data organization, preparation of financial statements, teamwork, and decision-making in accounting contexts. However, the insufficient utilization of these tools hinders students from fully developing essential accounting skills required in today's digital-driven work environment. Therefore, it can be concluded that while digital tools have the potential to significantly improve accounting skills, the challenges limiting their use must be addressed for Business Education students to maximize their benefits and remain relevant in the dynamic accounting profession.

Recommendations

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

1. Lecturers should integrate digital tools into their teaching methods and assignments, providing students with sufficient guidance on how to apply these tools in solving real accounting problems.
2. Universities should invest in reliable internet facilities, functional computer laboratories, and

adequate access to modern accounting software such as Sage, Quick book, spreadsheet software to support students' learning.

3. Regular training workshops and seminars should be organized to improve students' proficiency in using spreadsheet applications, accounting software, and digital platforms for accounting tasks.
4. Universities, in collaboration with software providers, should provide students with affordable or free access to licensed accounting software such as QuickBooks, Sage, and Peachtree, as it's integration will enhance students' competencies and exposure to it's effectiveness in interpreting financial data.

References

- Ademiluyi, A. F., & Olawuyi, O. O. (2022). Utilization of ict resources for learning by business education students in colleges of education. *KWASU Journal of the Business of Education*, 3(1), 208-218.
- Aina, M. A. (2018). Towards effective skill acquisition in business education programme. *Technical and Vocational Education and Training Journal*, 202-209.
- Aina, A. M., & Onajite, G. O (2017). Effectiveness of the Use of Technology in Teaching for Promoting Economic Growth among Business Education Graduates in Ekiti State.
- Al-Hattami, H. M. (2025). Understanding how digital accounting education fosters innovation: The moderating roles of technological self-efficacy and digital literacy. *The International Journal of Management Education*, 23(2), 101131.
- Berikol, B. Z., & Killi, M. (2020). The effects of digital transformation process on accounting profession and accounting education. In *Ethics and Sustainability in Accounting and Finance*, Volume II (pp. 219-231). Singapore: Springer Nature Singapore.
- Chukwu, C. H., Bridget, L., & Aderoju, J. A. Integrating Soft Skills into the Accounting Practices of Business Education for Effective Job Performance of Business Education Graduates in the Digital Era.
- Imoyera, U. C. (2023). Teachers' acquisition of digital skills and the future of business education in Nigeria. *Journal Of Business Educators (AAUJBE)*.
- Joshua, S., & Apuru, J. I. (2024). Influence of Digital Skills Acquisition on Perceived Employability Prospects of Accounting Education Students: Moderating Role of Geographic Location and Family Income. *Higher Education*, 9(5), 138-147.
- Kee, H. Y. (2024). Incorporating digital skills in accounting education. In *Digital transformation in accounting and auditing: Navigating technological advances for the future* (pp. 3-27). Cham: Springer International Publishing.
- Lawal, S, I, daniel, S. O., Usman, S., & John, F. N. (2024). assessing the relevance of concept and objective

- of accounting education on the prospect of business education program in digital era in Nigeria.(case study of Ahmadu Bello university, Zaria). *Studies in Education*, 22(1), 1-12.
- Merdekawati, E., Nasrun, M., & Ferawati, A. (2024). The Impact of Technology on Accounting Education and Practice. *Economics and Digital Business Review*, 5(2), 1084-1098.
- Olaniyi, O. N., & Ajoke, O. S. (2025). Extent of utilization of artificial intelligence technologies in business education programme for effective teaching and learning in tertiary institutions in Ekiti State. *African Journal of Educational Management, Teaching and Entrepreneurship Studies*, 15(2).
- Okolocha, C. C., & NWAUKWA, F. C. (2020). Extent of utilization of social software technologies for enhancing self-regulated learning by Business education students in Anambra State, Nigeria. *Nigerian Journal of Business Education (NIGJBED)* Volume, 7(1).
- Oluseyi-Sowunmi, O. S., & Samuel, R. E. (2025). Online Learning Innovations in Accounting Education: A Study of Students' Engagement and Learning Outcome. *WSEAS Transactions on Computer Research*, 13, 103-115.
- Osiesi, M. P., Sikeade, M. A., Fadiya, A. A., & Blignaut, S. (2024). Assessment of Entrepreneurial Digital Skills, Knowledge, and Use among Business Education Undergraduates in the Federal University Oye-Ekiti, Nigeria. *Journal of African Education*, 5(1), 265.
- Oyerinde, O. D., Onajite, O. G., & Aina, A. M. (2020). Competency Needs of Business Educators in Osun State Secondary Schools, Nigeria. *International Education Studies*, 13(2), 80-87.
- Sawyer, P., & Otamiri, S. (2024). Educational Digitalization and Accounting Education Delivery in Tertiary Institutions of South-South, Nigeria. *FUO-Journal of Educational Research*, 3(1).
- Ufondu, C. C., Obi, O. C., & Chiedozi, C. F. (2023). Digital transformation of business education program in Nigerian universities for 21st-century skill acquisition. *Journal Plus Education*, 33, 288-300.
- Ukata, P. F., & Udeh, C. P. (2022). Utilization of new technologies by business education lecturers for teaching accounting courses in tertiary institutions in Rivers state. *International Journal of Innovative Information Systems & Technology Research*, 10(2), 29-38.

IMPACT OF BIOENERGY IN ILORIN SOUTH LOCAL GOVERNMENT AREA OF KWARA STATE, NIGERIA

¹ADEKEYE Olawale and ²OLAOYE Ajiboye Ojo

¹talktoolawale17@gmail.com

^{1&2}Department of Vocational and Technical Education, Faculty of Education, Ekiti State University, Ado-Ekiti

Abstract

This study investigated sustainable bioenergy production from wood biomass in Ilorin South Local Government Area of Kwara State, Nigeria, focusing on available biomass resources, awareness levels, and perceived challenges to utilization. A descriptive survey research design was adopted. The population of 126 respondents, comprising 39 sawmill workers and 87 carpenters registered under the Ilorin South Carpentry Association. Data were collected using a structured instrument developed by the researcher. The questionnaire was organized into four sections and measured on a four-point Likert scale (Strongly Agree to Strongly Disagree). The validity of the instrument was ensured through experts in Vocational and Technical Education and Test and Measurement. The reliability of the instrument was determined by Cronbach Alpha and yielded coefficient of 0.84. Data collection involved on-site visits to sawmills and carpentry workshops, with verbal consent obtained from all participants. Descriptive statistics such as frequency counts, and percentages were employed to answer the research questions. Findings revealed that wood biomass is abundant in the area and holds strong potential for sustainable bioenergy production, but utilization is hindered by high equipment costs, inadequate technical knowledge, poor government support, and limited access to efficient technologies. The study concluded that wood biomass possesses significant potential as a renewable energy source, however, its utilization is constrained by several challenges whereby when efforts are integrated by the government and other stakeholders, in providing solutions will unlock the economic and environmental benefits of wood biomass. The study recommended targeted capacity building, policy incentives, and investment in biomass conversion technologies to enhance sustainable bioenergy adoption in the region.

Keywords: Bioenergy, wood biomass, sawmill workers, carpenters, Ilorin South, Kwara State.

Introduction

The global shift towards renewable energy sources has placed biomass, particularly wood biomass, at the forefront of sustainable energy discussions. According to Fatma et al. (2018), wood biomass refers to the woody, lignocellulosic parts of plant material such as tree stems, branches, forestry residues, and wood-processing by-products rich in the structural polymers cellulose, hemicellulose, and

lignin. It is commonly used as a renewable feedstock in bioenergy and biofuel production. Accordingly, lignocellulosic biomass from wood is a highly abundant and renewable feedstock with significant potential for sustainable bioenergy generation due to its carbon-neutral nature and wide availability. In regions where forestry and sawmilling are common, wood residues form a substantial portion of the biomass resource base. This makes them a viable

for renewable energy production that aligns with climate change mitigation strategies. The sustainable utilization of wood biomass requires a clear understanding of both its availability and the technologies needed for efficient conversion, which has led researchers to investigate regional case studies such as Ilorin South in Kwara State.

Ilorin South, one of the sixteen Local Government Areas in Kwara State, is characterized by a mix of urban and semi-rural settlements, with economic activities that include agriculture, small-scale manufacturing, and wood-based industries. The area hosts several sawmills and timber-processing workshops, generating substantial quantities of wood residues. Despite this potential. It is observed that wood residues from sawmilling and timber processing remain particularly underutilized in Nigeria, leading to environmental pollution and economic waste. Alhassan et al. (2019) estimated the volume of wood residues generated from sawmilling activities in Kwara State and highlighted their untapped energy potential for electricity generation and thermal applications. This implies that, if those wood residues are properly harnessed, wood residues could provide a reliable and sustainable energy source for local communities. The real challenge, however, lies in developing sustainable production systems that convert these residues into bioenergy efficiently.

Bioenergy is a form of renewable energy derived from biological materials known as biomass such as plants, agricultural residues, forestry waste, and organic municipal waste. These materials store energy through the process of photosynthesis, and when they are converted (through combustion, fermentation, gasification, or other technologies), the stored chemical energy

is released in the form of heat, electricity, or biofuels. Bioenergy, according to Abdul Hamid and Abdull Razis (2023), refers to energy derived from wood waste specifically lignocellulosic biomass converted into bioethanol through pretreatment technologies. This process enables the sustainable production of second-generation biofuels, positioning wood waste as an eco-friendly and renewable energy resource. Sustainable bioenergy production involves not only tapping into available biomass resources but also adopting environmentally friendly conversion technologies. Abdul Hamid and Abdull Razis (2023) emphasized that pretreatment technologies, such as torrefaction, pyrolysis, and fermentation, enhance the efficiency of bioethanol production from wood waste, making the process both sustainable and economically viable. This focus on process optimization links directly to the broader discussion on how wood biomass can be leveraged for sustainable energy development in Nigeria.

Harnessing Nigeria's abundant renewable resources demands more than just technological availability; it requires deliberate strategic planning. Oyedepo et al. (2019) emphasize that Nigeria's bioenergy sector must prioritize coordinated efforts in knowledge advancement, infrastructure investment, and capacity building. This is because achieving these elements would strengthen the sector's ability to contribute effectively to Sustainable Development Goal 7, which focuses on ensuring access to affordable and clean energy for all. This highlights that without strong technical skills, proper facilities, and human resource development, the sector may not reach its full potential in supporting sustainable energy goals. Building on this perspective, Okoro et al.

(2024) stressed that without such integrated strategies, Nigeria risks lagging in the global transition to renewable energy systems. In Kwara State, Olaoye et al. (2022) points out that adopting innovations such as improved biomass stoves and efficient conversion equipment is essential. These technologies not only enhance energy efficiency but also reduce environmental pollution, thereby maximizing the benefits of wood biomass utilization. This means that Nigeria's ability to remain competitive in the global energy market depends on implementing comprehensive and forward-looking policies that align with international energy trends. Expanding on the national picture, Aworunse et al. (2023) present the shift towards bioenergy as part of Nigeria's broader movement into a post-oil bioeconomy. They argue that sustainable bioenergy production can serve as a catalyst for rural economic growth, creating jobs, stimulating small enterprises, and supporting community livelihoods. This growing recognition of bioenergy's economic and environmental value is also evident internationally, where different regions have integrated it into their renewable energy strategies, offering Nigeria a useful model for aligning national goals with global best practices.

Bioenergy from forest biomass plays a significant role in renewable energy strategies, especially in the European Union where Kozuch et al. (2024) note its importance amidst changing geopolitical conditions. In Nigeria, this global trend is mirrored in the rising interest in local bioenergy development, supported by the availability of raw materials such as wood residues in areas like Ilorin South. Thiffault et al. (2023) further emphasize that integrating wood residue utilization

into energy planning can aid in the transition to a sustainable bioenergy future. Therefore, assessing the potential, sustainability, and economic viability of wood biomass in Ilorin South becomes a critical step in contributing to Nigeria's renewable energy portfolio. This study, therefore, aims to investigate the sustainable production of bioenergy from wood biomass in Ilorin South LGA of Kwara State, focusing on its availability, conversion potential, environmental benefits, and socio-economic implications. By drawing from both local and international literature, the research situates Ilorin South within the broader discourse on sustainable energy transitions, providing evidence-based insights that could guide policy, technology adoption, and rural development initiatives.

Statement of the Problem

Energy demand in Nigeria continues to rise, while access to clean and affordable energy remains a major challenge, especially at the local level. In many urban and semi-urban communities like Ilorin South Local Government Area of Kwara State, traditional energy sources such as firewood and charcoal are still widely used for cooking and small-scale heating. Large amounts of wood waste from sawmills, carpentry workshops, and furniture industries are generated daily, often left unused or improperly disposed. It is not clearly known whether these abundant wood residues are being effectively harnessed as a sustainable source of bioenergy. The extent to which stakeholders in Ilorin South are aware of or capable of utilizing wood biomass for clean energy production has not been fully established. The environmental, economic, and social viability of bioenergy production from wood waste

in the area remains uncertain. Without sufficient empirical data on the availability, awareness, and utilization of wood biomass for energy purposes, it becomes difficult to determine its actual potential as a sustainable solution to local energy needs. This study, therefore, seeks to explore the availability, current usage, and feasibility of sustainable bioenergy production from wood biomass in Ilorin South LGA, with the aim of bridging the knowledge gap and informing policy and practice on renewable energy alternatives.

Purpose of the Study

The main purpose of this study is to examine the impact of Bioenergy in Ilorin South Local Government Area of Kwara State, Nigeria. Specifically, the study aims to:

1. examine the availability of wood waste for sustainable bioenergy production in Ilorin South local Government Area of Kwara State.
2. assess the level of awareness of wood biomass for sustainable bioenergy production in Ilorin South Local Government Area.
3. examine the challenges of utilizing wood biomass for sustainable bioenergy production in Ilorin South Local Government Area

Research Questions

The following research questions were raised to guide the study

1. What types of wood biomass are available for bioenergy production in Ilorin South LGA?
2. What is the level of awareness among woodworkers and other local users regarding energy production from wood waste?
3. What are the perceived challenges of utilizing wood biomass for sustainable bioenergy in the area?

Methodology

This study adopted a descriptive survey research design to examine sustainable bioenergy production from wood biomass in Ilorin South Local Government Area of Kwara State. The population of the study comprised 39 sawmill workers and 87 carpenters registered under the Ilorin South Carpentry Association, giving a total population of 126 respondents. The entire population was used as the sample for the study through a census sampling technique due to its manageable size.

A structured questionnaire was developed by the researcher as the main instrument for data collection. The questionnaire was divided into four sections using a four linket scale (SA for Strongly Agree, A for Agree, D for Disagree and SD for Strongly Disagree). Section A comprised demographic information of the respondents, section B entails information on the types of wood biomass, section C consist of information on the level of awareness among woodworkers and section D entails information on the challenges of utilizing wood biomass. The instrument was validated by three experts, two from the Vocational and Technical Education Department and one from Test and Measurements Department in Ekiti State University, Ado-Ekiti, to ensure content and face validity. A pilot test was conducted with twenty respondents outside the study area, and the reliability of the instrument was determined using Cronbach's Alpha, yielding a reliability coefficient of 0.84, indicating high internal consistency.

Data collection was carried out through on-site visits to sawmills and carpentry workshops within Ilorin South LGA, with the assistance of two trained research assistants. Respondents were

given adequate time to complete the questionnaire, and verbal consent was obtained prior to participation. Data collected were coded and analyzed using descriptive statistics such as frequency counts and percentages.

Results

Research Question 1: What types of wood biomass are available for bioenergy production in Ilorin South LGA?

Table 1: Types of wood waste available for sustainable bioenergy production

Types of wood waste	Frequency	Percentage (%)
Sawdust	32	25.40
Wood shavings	21	16.60
Tree bark	18	14.30
Broken wood pieces	55	43.60

Table 1 indicates that broken wood pieces is the most common type of wood waste available with a percentage of 43.6%, followed by sawdust with a percentage of 25.4%, wood shavings (16.7%), and tree bark (14.3%). This variety of biomass materials suggests

multiple potential feedstocks for bioenergy production.

Research Question 2: What is the level of awareness among woodworkers and other local users regarding energy production from wood waste?

Table 2: Level of Awareness Among Woodworkers and Other Local Users Regarding Energy Production

Items	SA (%)	A (%)	D (%)	SD (%)
I understand the basic processes involved in producing energy from wood waste.	50(39.7)	38(30.2)	38(30.2)	0(0.0)
I have received training or information on bioenergy production from wood biomass.	40(31.7)	20(15.9)	48(38.1)	18(14.3)
I can identify the benefits of using wood waste for energy production.	48(38.1)	23(18.3)	55(43.7)	0(0.0)
I know of local projects or initiatives that use wood waste for bioenergy production.	33 (26.2)	40 (31.7)	25 (19.8)	28 (22.2)

The results indicate that 70% of respondents understand the basic processes involved in producing energy from wood waste, showing a generally good awareness level. Only 47.6% of respondents have received training or information related to bioenergy production, indicating a gap in formal education or exposure. About 56.4% could identify the benefits of wood waste for energy production, but awareness of

local projects or initiatives remains limited, with only 57.9% acknowledging knowledge of such efforts, showing room for improvement in community-level engagement.

Research Question 3: What are the perceived challenges of utilizing wood biomass for sustainable bioenergy in the area?

Table 3: challenges of utilizing wood biomass for sustainable bioenergy

Items	SA (%)	A (%)	D (%)	SD (%)
High cost of bioenergy production equipment discourages use of wood biomass	60(47.6)	40(31.7)	15(11.9)	11(8.7)
Lack of technical knowledge limits utilization of wood biomass	65(51.59)	42(33.33)	10(7.94)	9(7.14)
Inadequate government support hinders wood biomass energy projects	70(55.56)	35(27.78)	12(9.52)	9(7.14)
Poor access to efficient wood biomass conversion technology is a challenge	68(53.97)	40(31.75)	11(8.73)	7(5.56)
Traditional preferences for other energy sources reduce interest	45(35.70)	38(30.20)	22(17.50)	21(16.70)

Table 3 above revealed the major challenges affecting the utilization of wood biomass for sustainable bioenergy production. The results show that a majority of respondents agreed that the high cost of bioenergy production equipment discourages the use of wood biomass, with a percentage of 79.3%, indicating a high level of agreement. Similarly, the statement that a lack of technical knowledge limits the utilization of wood biomass for bioenergy recorded 84.92%, further suggesting that inadequate expertise remains a significant constraint. Inadequate government support was also identified as a challenge, with a percentage of 83.34%, showing general agreement among respondents. Poor access to efficient wood biomass conversion technology was highlighted, with a percentage of 85.72%, underscoring the technology gap in the sector. Lastly, traditional preferences for other energy sources were acknowledged as a limiting factor, with 67.9%, indicating that socio-cultural influences also play a role in reducing the adoption of wood biomass utilization. These findings suggest that overcoming economic, technical, policy, and traditional barriers is essential to promoting the adoption of wood biomass for sustainable energy production.

Discussion of Findings

The findings of the study revealed that sawdust, wood shavings, tree bark, and broken wood pieces were the major types of wood biomass available in Ilorin South LGA for potential bioenergy production. This aligns with the report by Alhassan et al. (2019), who observed that sawmilling activities in Kwara State generate significant quantities of wood residues with substantial energy potential. Similarly, Adeleke et al. (2023) emphasized that Nigeria's biomass resources, including wood waste, are underutilized despite their abundance. The availability of these biomass types in the study area underscores the possibility of establishing a steady feedstock supply chain for bioenergy production. However, as Fatma et al. (2018) note, effective utilization requires proper classification, collection, and processing to ensure efficiency in bioenergy conversion. This availability naturally raises the question of whether local users have the knowledge to harness these materials effectively.

The outcome of the study showed a moderate to high level of awareness among woodworkers and other local users about converting wood waste into usable energy, though gaps in training and practical knowledge were evident. Many respondents agreed they

understood the basic processes and benefits, yet fewer had received formal training or knew of local bioenergy initiatives. These findings are consistent with Okoro et al. (2024), who highlighted that while awareness of bioenergy potential in Nigeria is growing, practical knowledge and technical capacity remain insufficient. Ezealigo et al. (2021) also observed that without structured training programs, biomass resources risk being wasted due to poor valorization practices. The study by Olaoye et al. (2022) in Kwara State further supports this, noting that targeted sensitization and skill development significantly increase adoption of biomass-based technologies. Nonetheless, awareness alone is not enough, as practical barriers may still limit adoption an issue.

The findings revealed that the perceived challenges to utilizing wood biomass for sustainable bioenergy were found to be predominantly economic, technical, and policy-related. High equipment costs, inadequate technical knowledge, poor government support, and limited access to efficient conversion technologies were major concerns. These findings correspond with Adeleke et al. (2023), who identified similar barriers in Nigeria's biomass sector, particularly the financial constraints faced by small-scale producers. Aworunse et al. (2023) linked these limitations to Nigeria's slow transition towards a bioeconomy, noting that policy gaps and insufficient infrastructure compound the problem. Abdul Hamid and Abdull Razis (2023) stress that appropriate pretreatment technologies can enhance efficiency, but these require investments that are often out of reach for local operators. Furthermore, cultural preferences for traditional energy sources, as found in this study, mirror the observations of Edeh and Okpo (2023), who argued that

social acceptance is as critical as technical feasibility in bioenergy adoption. The study's findings indicate that while Ilorin South LGA has abundant wood biomass resources and a reasonable level of awareness among local users, significant challenges hinder full-scale adoption of sustainable bioenergy production. Addressing these constraints will require integrated approaches that combine resource mobilization, technical training, financial support, and policy reforms.

Conclusion

The study on Sustainable Bioenergy Production from Wood Biomass in Ilorin South LGA, Kwara State revealed that wood biomass possesses significant potential as a renewable energy source in the area. However, its utilization is constrained by several key challenges, including the high cost of bioenergy production equipment, limited technical knowledge among stakeholders, inadequate government support, poor access to efficient biomass conversion technologies, and cultural preferences for alternative energy sources. Despite these constraints, the findings indicate that with appropriate policy support, technological advancement, and community sensitization, wood biomass can serve as a viable and sustainable solution to meeting local energy demands while reducing environmental degradation and dependence on fossil fuels. The study underscores the need for integrated efforts from government, private sector, and community members to unlock the economic and environmental benefits of wood biomass utilization.

Recommendations

Based on the findings, the following recommendations are made:

1. Government and development agencies should provide subsidies, grants, or low-interest loans for the acquisition of bioenergy production equipment to reduce the financial burden on investors and small-scale producers. This can be achieved when government and agencies allocate budgets or partner with financial institutions to offer incentives to small-scale producers
2. Organize training workshops for farmers, entrepreneurs, and energy stakeholders to enhance technical skills in biomass processing, conversion, and maintenance of bioenergy systems. By partnering with experts and organizations to conduct capacity-building sessions.
3. Formulate and implement policies that promote renewable energy development, including incentives for private sector investment in wood biomass energy projects and stricter regulations to encourage cleaner energy alternatives. This can be achieved by establishing clear renewable energy targets and incentives by the government.
4. Facilitate the importation, local fabrication, and distribution of cost-effective and efficient biomass conversion technologies to improve production efficiency and reduce operational costs.
5. Conduct awareness programmes to sensitize communities on the environmental and economic benefits of wood biomass energy, while addressing traditional biases against its use, by collaborating with community leaders and influencers to promote benefits.

References

- Abdul Hamid, Z. A., & Abdull Razis, A. F. (2023). Wood Waste as a Renewable Energy Source: Effect of Pretreatment Technology for Sustainable Bioethanol Production. In *Wood Waste Management and Products* (pp. 45-58). Singapore: Springer Nature Singapore.
- Adeleke, A. A., Petrus, N., Ayuba, S., Yahya, A. M., Ikubanni, P. P., Okafor, I. S., ... & Adesibikan, A. A. (2023). Nigerian Biomass for Bioenergy Applications: A Review on the Potential and Challenges. *Journal of Renewable Materials*, 11(12).
- Alhassan, E. A., Olaoye, J. O., Adekanye, T. A., & Okonkwo, C. E. (2019). Estimation of Wood Residues generation from Sawmilling Activities and energy potential in Kwara state, Nigeria. *Nature Environment and Pollution Technology*, 18(3), 1023-1027.
- Alhassan, E. A., Olaoye, J. O., Adekanye, T. A., & Okonkwo, C. E. (2019). Wood Residues Generation from Sawmilling Activities and Energy Potential. *Nature Environment and Pollution Technology*, 18(3), 1-5.
- Andrade, D. S., Gavilanes, F. Z., Silva, H. R., Castro, G. H. L., & Telles, T. S. (2020). Sustainable bioenergy production. In *Recent Developments in Bioenergy Research* (pp. 363-391). Elsevier.
- Aworunse, O. S., Olorunsola, H. A., Ahuekwe, E. F., & Obembe, O. O. (2023). Towards a sustainable bioeconomy in a post-oil era Nigeria. *Resources, environment and sustainability*, 11, 100094.

- Edeh, I., & Okpo, S. O. (2023). Biomass to biofuels: A sure sustainable energy strategy in Nigeria. *Petro Chem Indus Intern*, 6(2), 106-117.
- Ezealigo, U. S., Ezealigo, B. N., Kemausuor, F., Achenie, L. E. K., & Onwualu, A. P. (2021). Biomass valorization to bioenergy: Assessment of biomass residues' availability and bioenergy potential in Nigeria. *Sustainability*, 13(24), 13806.
- Fatma, S., Hameed, A., Noman, M., Ahmed, T., Shahid, M., Tariq, M., ... & Tabassum, R. (2018). Lignocellulosic biomass: a sustainable bioenergy source for the future. *Protein and peptide letters*, 25(2), 148-163.
- Kożuch, A., Cywicka, D., & Górna, A. (2024). Forest biomass in bioenergy production in the changing geopolitical environment of the EU. *Energies*, 17(3), 554.
- Okoro, P. A., Chong, K., & Röder, M. (2024). Bioenergy potential in Nigeria, how to advance knowledge and deployment to enable SDG 7. *Wiley Interdisciplinary Reviews: Energy and Environment*, 13(4), e531.
- Olaoye, I. J., Bolaji, M., & Oloyede, A. O. (2022). Adoption of innovation technology in the face of efficient energy use: A case of improved biomass stoves in Kwara State, Nigeria. *African Journal of Science, Technology, Innovation and Development*, 14(1), 1-11.
- Osman, A. I., Fang, B., Zhang, Y., Liu, Y., Yu, J., Farghali, M., ... & Yap, P. S. (2024). Life cycle assessment and techno-economic analysis of sustainable bioenergy production: a review. *Environmental Chemistry Letters*, 22(3), 1115-1154.
- Oyedepo, S. O., Dunmade, I. S., Adekeye, T., Attabo, A. A., Olawole, O. C., Babalola, P. O., ... & Leramo, R. O. (2019). Bioenergy technology development in Nigeria-pathway to sustainable energy development. *International Journal of Environment and Sustainable Development*, 18(2), 175-205.
- Thiffault, E., Gianvenuti, A., Zuzhang, X., & Walter, S. (2023). The role of wood residues in the transition to sustainable bioenergy.

IMPACT OF REGENERATIVE AGRICULTURE ON RESTORING THE ECOSYSTEM THROUGH FARMING PRACTICES IN SECONDARY SCHOOLS IN EKITI STATE

ADEYEYE Ruth Folasayo

Vocational and Technical Education, Faculty of Education, Ekiti State University,
Ado-Ekiti

Abstract

This study examined the impact of regenerative agriculture on restoring the ecosystem through farming practices in secondary schools in Ekiti State. Specifically, the study examined the contribution of regenerative agriculture to soil health restoration in school farms, assessed the impact of regenerative agriculture on biodiversity improvement in school ecosystems, and established the relationship between school farming practices and ecosystem restoration. A descriptive survey research design was adopted for the study. The population for the study comprised 23,640 Senior Secondary School students from 202 public secondary schools in Ekiti State, while a sample size of 390 respondents was selected using multistage sampling technique. A structured questionnaire titled Regenerative Agriculture on Ecosystem Restoration Questionnaire (RAERQ) was used for data collection. The instrument was validated by experts in Agricultural Education and Test and Measurement, while a reliability coefficient of 0.82 was obtained using Cronbach Alpha method. Data collected were analyzed using mean and standard deviation to answer the research questions, while Pearson Product Moment Correlation and regression analysis were used to test the hypotheses at 0.05 level of significance. The findings revealed that regenerative agriculture contributed significantly to soil health restoration and soil fertility improvement in school farms. The study also found that regenerative agriculture supported biodiversity improvement and that school farming practices had a significant positive relationship with ecosystem restoration. Based on the findings, it was concluded that regenerative agriculture promotes environmental sustainability and ecosystem restoration through sustainable school farming practices. The study recommended among others that schools should adopt regenerative agricultural practices such as composting, mulching, crop rotation, and tree planting to improve soil quality and environmental sustainability.

Keyword: Agriculture, Ecosystem, Farming Practices, Regenerative Agricultural, Environmental Sustainability, Soil Health

Introduction

Agriculture remains one of the major human activities that directly interacts with the environment and influences ecosystem sustainability across the world. In recent years, environmental degradation arising from unsustainable farming practices such as excessive use of chemical fertilizers, bush burning, deforestation, monocropping, and overgrazing has contributed to declining

soil fertility, biodiversity loss, erosion, and climate-related challenges. These environmental problems have raised concerns among environmentalists, educators, and agricultural experts on the need for sustainable farming systems capable of restoring degraded ecosystems while supporting food production. Regenerative agriculture has emerged as an environmentally friendly approach that focuses on rebuilding soil

health, conserving biodiversity, improving water retention, and restoring ecological balance through sustainable farming methods. The growing interest in regenerative agriculture has therefore increased the need to understand its role in ecosystem restoration through school farming practices.

Regenerative agriculture refers to a system of farming practices designed to improve and restore the natural environment by enhancing soil quality, increasing biodiversity, and promoting ecological sustainability. According to Diwan, et al (2021), regenerative agriculture involves farming methods that restore degraded soils, conserve water resources, and improve ecosystem functioning while ensuring agricultural productivity. The practices associated with regenerative agriculture include crop rotation, compost application, mulching, cover cropping, reduced tillage, agroforestry, and organic farming. These practices are intended to regenerate the ecological system rather than exploit natural resources. Raven (2020) explained that regenerative agriculture provides opportunities for environmental sustainability by integrating ecological restoration into agricultural production systems. The emphasis on ecological restoration through sustainable agricultural activities has made regenerative agriculture increasingly relevant in educational institutions where practical farming activities are carried out.

School farming activities serve as practical avenues through which students acquire agricultural knowledge, environmental awareness, and sustainable land management skills. Farming activities carried out in schools expose students to agricultural practices capable of influencing the surrounding ecosystem positively or negatively

depending on the methods adopted. Burns (2021) observed that regenerative farming practices in educational settings promote environmental consciousness among learners and encourage sustainable interactions with nature. In many secondary schools, farming practices are still dominated by conventional methods that contribute to soil degradation and environmental stress. The need to incorporate regenerative agriculture into school farming activities has therefore become necessary for improving environmental sustainability and ecosystem restoration within school environments.

One of the major components of ecosystem restoration through regenerative agriculture is soil health restoration. Soil health refers to the ability of soil to function effectively as a living ecosystem that supports plant growth, maintains environmental quality, and sustains biological productivity. Healthy soil contains adequate nutrients, organic matter, microorganisms, and good structural composition necessary for sustainable agricultural production. Sher, et al (2024) noted that regenerative agriculture improves soil health through practices that enhance soil organic matter, reduce erosion, and encourage microbial activities within the soil ecosystem. Soil degradation resulting from poor agricultural practices has remained a major challenge affecting food production and environmental quality in many regions. Babaniyi, et al (2024) explained that regenerative agriculture contributes significantly to soil regeneration by restoring soil nutrients and improving soil biological functions. The importance of soil restoration in sustainable agriculture has therefore increased interest in examining the contribution of regenerative agriculture to soil health restoration in school farms.

The restoration of soil health through regenerative agriculture is closely connected to soil fertility improvement. Soil fertility refers to the capacity of the soil to supply essential nutrients required for healthy plant growth and agricultural productivity. The continuous use of synthetic chemicals and poor land management practices has contributed to nutrient depletion and declining soil productivity in many farming environments. Tindwa et al (2024) stated that regenerative agricultural practices such as composting, crop diversification, and reduced tillage improve nutrient cycling and enhance soil fertility for sustainable food production. Ibrahim-Olesin et al (2025) reported increasing awareness and usage of regenerative agricultural practices among farmers due to their positive effects on soil productivity and environmental sustainability. Ajayi et al (2026) also found that the adoption of regenerative agricultural practices among cassava farmers improved soil conditions and increased sustainable crop production. The role of regenerative agriculture in improving soil fertility has therefore created the need to assess its contribution within school ecosystems.

Apart from soil restoration and fertility improvement, regenerative agriculture also plays an important role in biodiversity improvement within ecosystems. Biodiversity refers to the variety of living organisms including plants, animals, insects, and microorganisms existing within a particular environment. Sustainable ecosystems depend largely on balanced biodiversity for ecological stability and environmental resilience. Conventional farming practices involving heavy chemical applications and land degradation have contributed to declining biodiversity in many

agricultural environments. Vamshi, et al (2024) explained that regenerative agriculture enhances biodiversity by creating healthier habitats for organisms, improving vegetation cover, and reducing harmful environmental disturbances. Nwosu, et al (2024) further emphasized that regenerative practices support climate change management and ecological restoration through biodiversity conservation and sustainable land use systems. The importance of biodiversity conservation has therefore increased the need to investigate the impact of regenerative agriculture on biodiversity improvement in school ecosystems.

The concept of ecosystem restoration has become increasingly important in environmental sustainability discussions due to rising ecological challenges affecting human survival and environmental health. Ecosystem restoration involves the process of assisting the recovery of degraded ecosystems to improve ecological balance, environmental quality, and sustainability. Agricultural practices influence ecosystem restoration because farming activities directly affect soil conditions, vegetation, water resources, and biological diversity. Agboola, et al (2024) emphasized that regenerative frameworks contribute significantly to environmental transformation and sustainability by promoting restoration-oriented practices. Akahome (2026) also highlighted the growing importance of regenerative approaches in advancing planetary health and societal wellbeing through sustainable environmental practices. The relationship between farming practices and ecosystem restoration has therefore become a critical issue requiring scholarly attention, especially within school environments where future generations are trained.

In Nigeria, environmental sustainability education has become increasingly necessary due to growing concerns about land degradation, deforestation, declining soil productivity, and climate-related environmental problems. School environments provide important platforms for promoting sustainable agricultural practices capable of restoring degraded ecosystems and encouraging environmental stewardship among students. Okorie and Ijeoma (2026) explained that environmental education helps reconcile human activities with nature and promotes sustainable environmental practices among individuals and communities. Olatinwo et al (2026) also observed that the adoption of regenerative agricultural practices among farmers contributes positively to sustainable agricultural development and environmental conservation. Despite the recognized benefits of regenerative agriculture, there is limited empirical evidence on its impact on ecosystem restoration through school farming practices in secondary schools in Ekiti State. This gap in knowledge therefore necessitated this study on the impact of regenerative agriculture on restoring the ecosystem through farming practices in schools.

Statement of the Problem

Research has revealed the degradation of soil quality and the decline in agricultural productivity due to the continuous use of conventional farming methods. These methods, which often rely on chemical fertilizers, monocropping, and intensive land use, have contributed to the depletion of soil nutrients and reduced soil fertility over time. In school farming environments, where students are expected to acquire practical agricultural skills, similar conventional practices are often adopted

without adequate emphasis on sustainable soil management techniques.

Regenerative agriculture, which focuses on restoring soil health through natural and sustainable practices such as composting, crop rotation, mulching, and organic manure application, has been identified as a viable approach to improving soil fertility and restoring ecosystem balance. However, there appears to be limited integration of these practices in school farming activities, and in many cases, students may not be fully exposed to methods that enhance long-term soil productivity. This situation raises concern about the extent to which school farming practices contribute to soil fertility improvement and environmental restoration. If students are not adequately exposed to regenerative agriculture practices, it may affect their ability to understand sustainable farming systems and apply them in real-life agricultural situations. It is therefore necessary to examine the impact of regenerative agriculture on soil fertility within school farm settings and its implications for ecosystem restoration.

Purpose of the Study

The purpose of this study is to examine the impact of regenerative agriculture on restoring the ecosystem through farming practices in schools. Specifically, the study: examined the contribution of regenerative agriculture to soil health restoration in school farms. assessed the impact of regenerative agriculture on biodiversity improvement in school ecosystems. established the relationship between school farming practices and ecosystem restoration.

Research Questions

The study was guided by the following research questions:

1. What are the contributions of regenerative agriculture to soil health restoration in school farms?
2. What is the impact of regenerative agriculture on soil fertility in school ecosystems?
3. What is the relationship between school farming practices and ecosystem restoration

Research Hypotheses

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

1. There is no significant relationship between regenerative agriculture practices and soil health restoration in school farms.
2. Regenerative agriculture practices do not significantly impact soil fertility improvement in school ecosystems.
3. There is no significant relationship between school farming practices and ecosystem restoration

Methodology

The study adopted a descriptive survey research design to examine the impact of regenerative agriculture on restoring the ecosystem through farming practices in schools. The population for the study comprised 23,640 Senior Secondary School (SSS) students drawn from 202 public secondary schools in the state. A sample size of 390 respondents was selected for the study using a multistage sampling technique. Firstly, a simple random sampling technique was used to select public secondary schools across the senatorial districts in the state. Thereafter, a proportionate sampling technique was employed to distribute the respondents according to the population

of students in the selected schools. Finally, simple random sampling technique was used to select the students who participated in the study.

The instrument used for data collection was a structured questionnaire titled "Regenerative Agriculture on Ecosystem Restoration Questionnaire (EAERQ)". The instrument consisted of two sections. Section A focused on the demographic information of the respondents, while Section B contained items relating to regenerative agriculture practices, soil health restoration, soil fertility improvement and ecosystem restoration. The questionnaire items were structured on a four-point Likert type scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) with weighted values of 4, 3, 2, and 1 respectively.

To ensure the validity of the instrument, the questionnaire was subjected to face and content validation by experts in Agricultural Education and Test and Measurement in Ekiti State University. The reliability of the instrument was determined through a pilot study conducted among students outside the sample. The data collected were analyzed using Cronbach Alpha reliability method, and a reliability coefficient of 0.81 was obtained, indicating that the instrument was reliable for data collection.

The researcher, with the help of trained research assistants, administered copies of the questionnaire directly to the respondents in their respective schools. This method ensured proper distribution, monitoring, and high retrieval rate of the instrument. The data collected were analyzed using descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions, while Pearson Product Moment Correlation (PPMC) was used to

test the hypotheses 1 and 3, while hypothesis 2 was tested using regression analysis, all at 0.05 level of significance. A criterion mean of 2.50 was used for decision making, where items with mean scores of 2.50 and above were regarded

as agreed, while items with mean scores below 2.50 were regarded as disagreed.

Results

Research Question 1: What are the contributions of regenerative agriculture to soil health restoration in school farms?

Table1: Mean and Standard Deviation of regenerative agriculture on soil health

S/N	Items	Mean	SD	Decision
1	The use of compost manure makes the soil healthier in our school farm.	3.18	0.81	Agree
2	Planting cover crops helps to prevent soil from being washed away.	3.05	0.88	Agree
3	Changing crops regularly helps to improve the quality of the soil.	2.97	0.91	Agree
4	Mulching helps the soil to keep enough water for plant growth	3.12	0.84	Agree
Grand Mean		3.08		

The table 1 above shows that all the items had mean scores above the criterion mean of 2.50, indicating that respondents agreed that regenerative agriculture contributes positively to soil health restoration in school farms. The

grand mean of 3.08 further confirmed the respondents' agreement.

Research Question 2: What is the impact of regenerative agriculture on soil fertility in school ecosystems?

Table 2: Mean and Standard Deviation showing regenerative agriculture on soil fertility

S/N	Items	Mean	SD	Decision
1	Natural fertilizers improve the fertility of the soil in the school farm.	3.10	0.86	Agree
2	The use of organic materials helps crops grow better on our school farm.	3.06	0.83	Agree
3	Regenerative farming practices help the soil contain more nutrients for crops	2.95	0.83	Agree
4	Reducing the use of chemical fertilizers helps the soil remain fertile for a long time.	3.14	0.80	Agree
Grand Mean		3.06		

The table reveals that all the items recorded mean scores above 2.50, showing that respondents agreed that regenerative agriculture positively affects soil fertility in school ecosystems. The

grand mean of 3.06 indicates overall agreement among the respondents

Research Question 3 What is the relationship between school farming practices and ecosystem restoration?

Table 3: Mean and Standard Deviation showing school farming practices and ecosystem restoration

S/N	Items	Mean	SD	Decision
1	School farming activities help to improve damaged land areas in the school environment	3.09	0.82	Agree
2	Good farming practices help different plants and animals survive in the school environment	3.15	0.79	Agree
3	Planting trees in the school farm helps to protect the environment.	3.22	0.77	Agree
4	Environmentally friendly farming practices help to conserve natural resources in schools.	3.18	0.81	Agree
Grand Mean		3.16		

The table indicates that respondents agreed with all the items relating to the relationship between school farming practices and ecosystem restoration, as all the mean scores were above the criterion mean of 2.50. The grand mean of 3.16 shows that school

farming practices have a positive relationship with ecosystem restoration.

Test of Hypotheses

Hypothesis 1: There is no significant relationship between regenerative agriculture practices and soil health restoration in school farms

Table 4: Correlation Analysis of regenerative Agricultural Practice and soil health restoration

Variable	N	Mean	SD	r-cal	P	Decision
Regenerative Agricultural Practice	390	3.09	0.86	0.72	0.00	Sig.
Soil health restoration	390	3.90	0.82	0.75		

The result in Table 4 shows that the calculated r-value of 0.72 with a p-value of 0.000 is less than the 0.05 level of significance. Therefore, the null hypothesis was rejected. This implies that there is a significant relationship between

regenerative agriculture practices and soil health restoration in school farms

Hypothesis 2: Regenerative agriculture practices do not significantly impact soil fertility improvement in school ecosystems

Table 5: Regression Analysis showing impact of Regenerative Agricultural Practice on soil fertility

Variable	Unstandardized coefficients		Standardized coefficients	T	Sig
	B	Std. Error	Beta		
(Constant)	1.21	0.25	0.71	4.86	0.000
Regenerative Agricultural Practice	0.65	0.07		9.53	0.000

Multiple R= 0.71, R²= 0.50, Adjusted R²= 0.50, F= 90.88

The regression analysis results revealed a strong positive relationship between regenerative agriculture practices and soil fertility improvement in

school ecosystems, with a correlation coefficient (R) of 0.71. The coefficient of determination (R²) of 0.504 indicates that 50.4% of the variation in soil fertility

improvement was explained by regenerative agriculture practices, while 49.6% is attributable to other factors not covered in the study. The result further showed that the regression model was statistically significant, $F(1,388) = 90.878$, $p < 0.05$, indicating that the model adequately fits the data. In addition, the coefficients table revealed that regenerative agriculture practices significantly predicted soil fertility improvement ($\beta = 0.710$, $t = 9.533$, $p <$

0.05). Since the p-value was less than 0.05 , the null hypothesis was rejected. This implies that regenerative agriculture practices have a significant positive influence on soil fertility improvement in school ecosystems

Hypothesis 3: There is no significant relationship between school farming practices and ecosystem restoration

Table 6: Correlation Analysis school farming practices and ecosystem

Variable	N	Mean	SD	r-cal	P	Decision
School farming practices	390	3.16	0.80	0.75	0.000	Sig.
Ecosystem	390	3.20	0.78			

The result in Table 6 reveals that the calculated r-value of 0.75 with a p-value of 0.000 is less than the 0.05 level of significance. Therefore, the null hypothesis was rejected. This indicates that there is a significant relationship between school farming practices and ecosystem restoration

Discussion of Findings

The findings of the study revealed that regenerative agriculture contributed positively to soil health restoration in school farms. Respondents agreed that practices such as compost application, mulching, cover cropping, and crop rotation improved soil quality and reduced soil degradation. The hypothesis tested also showed a significant relationship between regenerative agriculture practices and soil health restoration in school farms. This finding is in agreement with Sher et al (2024), who stated that regenerative agriculture improves soil health by increasing soil organic matter and reducing environmental degradation. The finding also supports the work of Babaniyi et al (2024), who observed that regenerative

agricultural practices contribute significantly to soil regeneration and environmental sustainability.

The study further found that regenerative agriculture significantly influenced soil fertility improvement in school ecosystems. The regression analysis showed that regenerative agriculture practices positively predicted soil fertility improvement among the sampled respondents. This finding agrees with Ajayi et al (2026), who found that the adoption of regenerative agriculture practices improved soil conditions and enhanced agricultural productivity among farmers. The finding is also consistent with Diwan et al (2021), who explained that regenerative agriculture restores soil fertility through sustainable farming methods such as organic nutrient management and reduced chemical application.

The findings also revealed that school farming practices had a significant positive relationship with ecosystem restoration. Respondents agreed that environmentally friendly farming activities and tree planting contributed to restoring degraded environments within

the school ecosystem. This finding aligns with the submission of Vamshi et al (2024), who noted that regenerative agriculture promotes ecosystem restoration through biodiversity conservation and sustainable ecological practices. The finding also corroborates the study of Agboola et al (2024), who emphasized that regenerative frameworks support environmental transformation and ecological sustainability.

The study equally showed that regenerative agriculture supported biodiversity improvement in school ecosystems. Respondents agreed that regenerative farming practices increased plant diversity and encouraged the survival of beneficial organisms within school farms. This finding is in agreement with Burns (2021), who observed that regenerative farming practices in educational settings encourage environmental sustainability and ecological awareness. The finding also supports Raven (2020), who explained that regenerative agriculture integrates ecological restoration into agricultural systems and promotes sustainable interaction between humans and nature.

Conclusion

Based on the findings of the study, it was concluded that regenerative agriculture has significant positive impacts on ecosystem restoration through farming practices in schools. The study established that regenerative agricultural practices such as compost application, mulching, cover cropping, crop rotation, and reduced use of chemicals contributed greatly to soil health restoration and soil fertility improvement in school farms. The findings also showed that regenerative agriculture supports biodiversity conservation by promoting healthier

environmental conditions for plants, insects, and other living organisms within the school ecosystem.

The study further concluded that school farming practices have a significant relationship with ecosystem restoration. Sustainable farming activities carried out in schools were found to contribute positively to environmental conservation, restoration of degraded land, and promotion of ecological balance. The integration of regenerative agriculture into school farming programmes therefore has the potential to improve environmental sustainability, enhance agricultural productivity, and promote environmental awareness among students. The study finally concluded that the adoption of regenerative agriculture in secondary schools in Ekiti State can serve as an effective strategy for restoring ecosystems and promoting sustainable environmental practices within school communities.

Recommendations

1. Secondary school administrators should encourage the adoption of regenerative agriculture practices in school farms to improve soil health and ecosystem restoration. This can be achieved by introducing farming practices such as composting, mulching, crop rotation, cover cropping, and tree planting into practical agricultural activities in schools.
2. Training and workshops for Agricultural Science teachers and students on regenerative agriculture practices and environmental sustainability should be provided by government and educational stakeholders. This can be achieved through regular seminars, practical demonstrations, and collaboration

- with agricultural extension officers and environmental experts.
3. Educational authorities should integrate regenerative agriculture and ecosystem restoration concepts into the secondary school agricultural science curriculum to promote environmental awareness among students. This can be achieved through curriculum review, inclusion of practical environmental activities, and establishment of sustainable school farm projects across public secondary schools in Ekiti State.

References

- Agboola, O. P., Alotaibi, B. S., Dodo, Y. A., Abuhussain, M. A., & Abuhussain, M. (2024). Built environment transformation in Nigeria: the effects of a regenerative framework. *Journal of Asian Architecture and Building Engineering*, 23(2), 789-812.
- Ajayi, R. O., Ifabiyi, J. O., & Uloh, C. O. (2026). Adoption of regenerative agriculture practices among cassava farmers in Kwara State, Nigeria. *Indian Res. J. Ext. Edu*, 26(2), 96-103.
- Akahome, J. E. (2026). Regenerative corporate social responsibility and stakeholder engagement practices in Nigerian companies: advancing planetary health and societal wellbeing. *Corporate Governance: The International Journal of Business in Society*, 1-28.
- Babaniyi, G. G., Ibrahim, F., Akor, U. J., & Daramola, O. E. (2024). Regenerative agriculture for food security. In *Prospects for soil regeneration and its impact on environmental protection* (pp. 227-242). Cham: Springer Nature Switzerland.
- Burns, E. A. (2021). Placing regenerative farming on environmental educators' horizons. *Australian Journal of Environmental Education*, 37(1), 29-39.
- Diwan, A. D., Harke, S. N., Pande, B. N., & Panche, A. (2021). Regenerative Agriculture. *Indian Farming*, 71(12), 03-08.
- Ibrahim-Olesin, S., Lateef Lawal Adefalu, S., Adeyemi Aderinoye-Abdulwahab, A. O., & Kayode, S. B. M. (2025). Usage of Regenerative Agricultural Practices by maize farmers in Kwara State, Nigeria.
- Nwosu, N. J., Oshunsanya, S. O., Okon, P. B., Isong, I. A., Adetuga, A. T., & Singh, H. (2024). Sustainable regenerative practices for land restoration and climate change management in the tropics. In *Handbook of Nature-Based Solutions to Mitigation and Adaptation to Climate Change* (pp. 1-25). Cham: Springer International Publishing.
- Okorie, C. U., & Ijeoma, E. J. (2026). Environmental Education for Humanization: A Quest to Reconcile Farmers with Nature and Promote Environmental Sustainability in Nigeria. *Journal of Humanity and Social Justice*, 23-38.

- Olatinwo, L. K., Komolafe, S. E., Adesiji, G. B., & Paul, G. (2026). Adoption of Regenerative Agricultural Practices among Maize-Based Farmers in Kwara State, Nigeria. *Journal of Agricultural Extension*, 30(1), 11-18.
- Otara, E. N. (2023). Uptake of regenerative agriculture technologies, productivity of selected cereals and pulses and food security in the Drylands of Embu County, Kenya (Doctoral dissertation, UoEm).
- Raven, M. R. (2020). Regenerative Agriculture and Implications for Agriculture, Food, and Natural Resources Education: 2019 Distinguished Lecture, American Association for Agricultural Education. *Journal of Agricultural Education*, 61(1), 1-12.
- Sher, A., Li, H., ullah, A., Hamid, Y., Nasir, B., & Zhang, J. (2024). Importance of regenerative agriculture: Climate, soil health, biodiversity and its socioecological impact. *Discover Sustainability*, 5(1), 462.
- Tindwa, H. J., Semu, E. W., & Singh, B. R. (2024). Circular regenerative agricultural practices in Africa: Techniques and their potential for soil restoration and sustainable food production. *Agronomy*, 14(10), 2423.
- Vamshi, M., Jagadeesan, R., Lamani, H. D., Rout, S., VijayKumar, R., Jagadesh, M., & Sachan, K. (2024). The revolutionary impact of regenerative agriculture on ecosystem restoration and land vitality: A review. *Journal of Geography, Environment and Earth Science International*, 28(4), 1-14.

THE ROLE OF 5G TECHNOLOGY IN ENHANCING OFFICE OPERATIONS IN THE 21ST CENTURY WORKPLACE IN NIGERIA

¹AJAYI, Oluwatoyin R., ²OKE, Jonathan O., ³EZEANI, Nneka. S., ⁴AJAYI, Olubunmi P.

¹Federal College of Education, Ilawe-Ekiti, Ekiti State, Nigeria.
ajayi.oluwatoyin@fceilawe.edu.ng

^{1, 2&3}Department of Vocational and Technical Education,
Ekiti State University, Ado-Ekiti, Ekiti State.

⁴Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti.
Oluwabunmiajayi52@gmail.com

Abstract

This study examined the groundbreaking role of fifth-generation (5G) technology in enhancing office operations in the 21st Century workplace in Southwest Nigeria. It traces the journey from traditional, labour-intensive office setups to the contemporary digital environments that are known today, emphasizing how technology advancements have reshaped office operations in communication, productivity, and workflow efficiency. The paper highlights the concept of 5G technology, Internet of Things and its application in workplace as it enhances operational efficiency, employees experience, and overall productivity. Adoption of 5G in workplace as it enables high-speed connectivity, ultra-low latency, remote work options, real-time collaboration, and the integration of smart office systems via the Internet of Things (IoT). It identifies the key roles of 5G in enhancing office operations, such as improved remote work capabilities, enhanced business communication and collaboration, operational efficiency, enhanced data management, automation of tasks, immersive collaboration experiences, and it also addresses the challenges of implementing 5G technology, which include high infrastructure costs, cyber security vulnerabilities and energy consumption, and the need for organizations to prepare and train their staff. The study concludes that 5G has the potential to significantly transform office operations, boost productivity, and support flexible work practices. It was recommended that organization should make strategic investments in infrastructure, adopting strong cyber security protocols, providing continuous training for employees, and implementing 5G in stages to maximize its benefits in office environments.

Keywords: 5G technology, office operations, 21st-century workplace, Internet of Things, productivity, smart office.

Introduction

The traditional office has long been the backbone of business operations, relying heavily on manual processes such as the use of typewriters for correspondence, the delivery of letters through postal services, paper-based documentation, and face-to-face communication during the analogue era.

The development of the office operations has been strongly influenced by technological advancements and changes in organizational practices. This evolution can be traced from the era of typewriters and analogue systems of office management to the modern digital office. The introduction of the typewriter in the late nineteenth century

revolutionized office work by standardizing document production and improving speed and legibility. During that period, office activities relied on manual typing, shorthand writing, handwritten correspondence, and paper-based filing systems. Clerical workers such as typists and secretaries were essential to organizational operations (Mills, 2006). Office operation was labour-intensive and heavily dependent on human effort and accuracy.

As organizations expanded, offices adopted analogue technologies such as carbon paper, duplicating machines, filing cabinets, landline telephones, and telex systems. Information storage and retrieval were manual, and communication processes were slow and hierarchical. According to Robbins (2005), office efficiency during this period was limited by physical space constraints, excessive paperwork, and delayed information flow. The subsequent introduction of electric typewriters, word processors, and early computers marked a major transition in office operations. Electronic data processing improved document editing, storage, and retrieval, thereby reducing clerical workload and errors (Laudon & Laudon, 2016). This phase represented a shift from purely analogue office operations to partially automated systems.

The modern digital office is characterized by the use of computers, internet technologies, cloud computing, office automation software, and mobile devices. Communication through email, video conferencing, and collaborative platforms has significantly enhanced productivity and flexibility. The continuous evolution of communication technologies of mobile networks spans over four decades, transforming bulky, analog voice-only phones into high-

speed, digital lifelines. It progressed from simple analog calls (1G) to digital texts (2G), mobile browsing (3G), broadband internet (4G), and massive ultra-low latency hyper-connectivity for the Internet of Things (5G) consistently influenced the organization and functioning of workplaces.

In the contemporary era, the emergence of fifth-generation wireless technology (5G) represents a transformative development in office operations. With its higher data speeds, lower latency, and improved connectivity, 5G has the potential to reshape business processes, communication methods, and service delivery. This paper therefore aims to examine the role of 5G technology in enhancing office operations in the 21st Century Workplace in order to improve office output in Nigeria.

Concept of 5G Technology

Fifth Generation (5G) technology refers to the latest generation of mobile wireless communication systems designed to provide significantly faster data transmission speeds, lower latency, and greater network capacity than previous generations. Thus, Dangi, et al. (2021), defines Fifth generation (5G) mobile technology as the latest evolution in mobile networks, providing high data rates, improved quality of service (QoS), low latency, wide coverage, and high reliability, and enabling novel connectivity between people, devices, and machines across diverse use cases. This advancement represents a major shift in telecommunications infrastructure. These improvements are particularly relevant to office environments where real-time data exchange and uninterrupted communication are critical for productivity and service delivery. Singh

et al. (2017) highlight that the integration of Internet of Things (IoT) with 5G networks represents a significant step toward unified digital ecosystems capable of supporting emerging technologies and data-intensive applications. This integration enhances network coordination and enables more efficient communication between connected devices. In the context of workplace environments, such convergence supports improved operational efficiency, enhanced connectivity, and more effective data-driven decision-making processes. As a result, 5G is positioned as

a foundational infrastructure for enabling interconnected digital systems that support modern organizational operations.

Overall, existing literature confirms that the ultra-fast data speeds, minimal latency, and high connectivity capacity of 5G technology have the potential to transform how offices access information, process data, and communicate in real time. These capabilities make 5G a key driver of digital transformation in contemporary office operations.

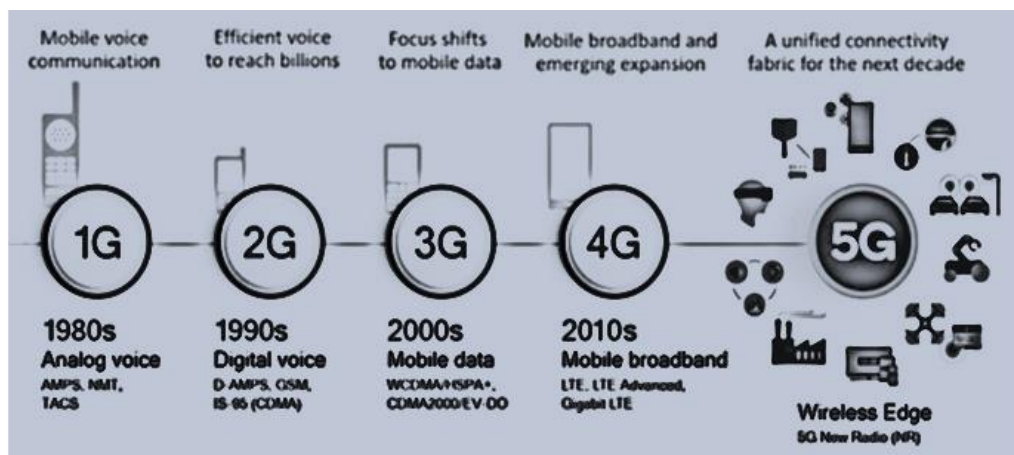


Figure 2.1: Evolution of Mobile Communication Networks from 1G to 5G

Source: Adapted from Qualcomm Technologies, Inc. (2019).

Internet of Things (IoT)

The Internet of Things (IoT) plays a critical role in the contemporary office environments, facilitating the connection and real-time data exchange between devices. However, the success of IoT systems is largely dependent on network capacity, latency, and scalability factors where 5G offers remarkable benefits. 5G technology provides significant advantage for extensive IoT deployment in office settings by enabling a huge number of devices to connect and ensuring ultra-reliable, low-latency communication. This enables organizations to set up smart systems that

improve environmental control, optimize workspaces, manage energy consumption, and enhance employee safety.

According to Nappi, and de Campos (2020), Internet of Things (IoT) technology applications in the workplace serve several key roles that enhance operational efficiency, employee experience, and overall productivity. The main roles identified in their review include environmental monitoring and optimization; space utilization and facility management; employee productivity and task automation; health, safety, and well-

being monitoring and enhanced communication and collaboration:

1. **Environmental Monitoring and Optimization:** IoT devices such as sensors and smart meters continuously monitor temperature, lighting, air quality, and energy consumption within office spaces. By providing real-time data, organizations can adjust environmental conditions automatically to improve comfort and reduce energy costs, contributing to a more productive workplace.
2. **Space Utilization and Facility Management:** Smart sensors track occupancy levels, meeting room usage, and desk availability, enabling organizations to optimize workspace layout and resource allocation. This reduces idle space and ensures employees can access workspaces efficiently.
3. **Employee Productivity and Task Automation:** IoT supports automation of routine office tasks (e.g., automated climate control, lighting, and equipment management) and provides data-driven insights on workflow. This allows employees to focus on core activities, improving efficiency and productivity.
4. **Health, Safety, and Well-being Monitoring:** Wearable IoT devices and smart office sensors track employee movement, ergonomic posture, and environmental exposure. The data can alert employees or management to potential health or safety risks, enhancing workplace safety and well-being.
5. **Enhanced Communication and Collaboration:** IoT-enabled devices connect office equipment,

conference tools, and collaborative platforms, allowing seamless real-time interaction and information sharing. This reduces downtime and improves the responsiveness of teams.

The core roles of IoT in workplaces revolve around automation, real-time monitoring, employee well-being, space optimization, and seamless connectivity, all of which contribute to improved productivity and operational efficiency. This integration represents a shift from traditional reactive office systems to predictive and autonomous workplace environments, where data is continuously collected, analyzed, and applied to improve operational outcomes.

The review provides a thorough insight to how IoT can enhance workplace efficiency. Yet, this study argues that these benefits can only reach their full potential when paired with advanced network infrastructures like fifth-generation (5G) technology. In modern office settings, especially in developing nations like Nigeria, IoT systems often struggle due to network challenges such as latency, inconsistent bandwidth, and device congestion with current wireless technologies. Therefore, adopting 5G is not merely complementary but crucial for unlocking the full capabilities of IoT in office operations. This study adds to the existing literature by highlighting 5G as the crucial backbone that transforms IoT from isolated automation to fully integrated, intelligent workplace ecosystems that can respond in real-time, leverage predictive analytics, and maintain adaptive operational control.

Meaning and Features of 21st Century Workplaces

A workplace is any physical or virtual environment where individuals carry out job-related duties for an employer. Workplaces may exist as traditional office spaces, hybrid environments, mobile workstations, or fully remote locations. Aina and Olawaiye, (2024), defines the workplace as a crucible of human interaction and endeavor, where individuals from diverse backgrounds with different skills and knowledge come together to contribute to the attainment of organizational goals. Armstrong (2014) defines the workplace as the physical and social environment in which employees perform assigned tasks, including structures, systems, and interpersonal relationships that influence work behaviour. These definitions highlight that workplace effectiveness depends not only on physical infrastructure but also on communication systems, which strengthens the relevance of advanced technologies such as 5G. The 21st-century workplace is characterized by a technologically driven and globally interconnected work environment shaped by rapid advances in digital technologies, globalization, and evolving organizational structures. Contemporary workplace systems differ significantly from traditional office environments of the past, as they increasingly emphasize flexibility, digital connectivity, employee well-being, and productivity enhancement. Research indicates that modern workplaces are being redefined by the integration of advanced digital tools such as cloud computing, artificial intelligence, Internet of Things (IoT) systems, and high-speed communication networks, which collectively enable real-time collaboration and workflow automation

(Deloitte, 2023; McKinsey Global Institute, 2021).

Key features of 21st century workplace include digital integration and smart technologies; flexible work arrangements; enhanced collaboration and connectivity; employee-centric and data-driven operational systems:

1. Digital Integration and Smart Technologies:

Today's workplaces are all about harnessing the power of advanced technologies. With tools like cloud computing, IoT devices, artificial intelligence, and super-fast networks like 5G, companies can simplify their workflows, collaborate in real-time, and automate those everyday tasks that often take up too much time.

2. Flexible Work Arrangements:

The modern workplace often supports remote work, hybrid models, flexible hours, and hot-desking, allowing employees to balance professional and personal responsibilities while maintaining productivity.

3. Collaboration and Connectivity:

Teams use digital collaboration tools, video conferencing, and cloud-based platforms to connect employees across locations, fostering teamwork and faster decision-making, regardless of physical distance.

4. Employee-Centric Environment:

Workplaces increasingly prioritize employee well-being, ergonomic design, health monitoring, and mental health support to enhance engagement, satisfaction, and performance.

5. Data-Driven and Analytics-Oriented:

Organizations harness data analytics and monitoring tools

to optimize operations, predict trends, and support strategic decision-making, often integrating smart office systems for space utilization, energy management, and workflow efficiency.

The workplace of the 21st century is all about being digitally savvy, adaptable, and focused on people. It brings together cutting-edge technologies like IoT and 5G to boost productivity, spark innovation, and enhance employee well-being, while fostering a dynamic, collaborative, and sustainable approach to achieving organizational goals. (World Economic Forum, 2020; OECD, 2021).

Adoption of 5G in Workplace

The adoption of digital technologies has significantly reshaped workplace operations. According to Messenger and Gschwind (2016), the increasing reliance on digital tools has led to more flexible work arrangements, including teleworking and virtual collaboration. However, these arrangements often depend on reliable and high-speed network connectivity. This creates a strong case for 5G adoption, as it directly supports seamless connectivity required for modern work practices. One of the major advantages of 5G technology in workplaces is its ability to provide ultra-fast data transmission and ultra-low latency. International Telecommunication Union (2018) notes that low latency communication enables real-time interaction, which is essential for applications such as video conferencing, cloud computing, and collaborative platforms. This capability addresses one of the major challenges faced by offices using earlier wireless technologies network delays that reduce efficiency and disrupt workflow.

According to Raza et al. (2019) argue that 5G enhances workplace productivity by supporting smart office technologies such as automated systems, intelligent surveillance, and connected office equipment. This serves as evidence that 5G contributes not only to communication improvement but also to automation and operational efficiency within office environments. The enhanced connectivity offered by 5G further allows work activities that were previously limited by time and geographic location to become more flexible. According to Deloitte (2020), 5G supports remote and mobile working by ensuring consistent network performance regardless of location. This supports the view that 5G is a critical enabler of hybrid and remote work models, which have become increasingly important in modern organizations.

Roles of 5G in Enhancing Office Operations

With fast connection speeds come increased opportunities for flexible and remote working. 5G makes it possible for employees to work anytime, anywhere by providing designated virtual spaces where they can interact remotely with team members and clients. Typically time-bound or geographically constrained interactions will become more ad-hoc and flexible through the power of 5G. Thus, the role of fifth-generation (5G) technology on office operations is extensive and multifaceted. Its influence spans communication, productivity, collaboration, automation, and data management (Boccardi et al., 2014; Li et al., 2018). The following roles which are improved remote work capabilities; enhanced business communication and collaboration; immersive and innovative collaborations; boost productivity; promotion of smart

offices and internet of things integration; data management and cyber security and faster data collection and advanced analytics were identified and discussed below:

1. Improved Remote Work Capabilities:

5G technology enhanced remote and hybrid work models by providing stable, high-speed connectivity that allows employees to access organizational systems from anywhere. This shift reduces the need for a physical office presence and enables seamless participation in digital workflows through cloud platforms and virtual workspaces. Research highlights that modern ICT infrastructures, particularly advanced mobile networks, are key to the development of teleworking and distributed work setups (Messenger & Gschwind, 2016). When employees operate from well-equipped remote workspaces supported by reliable 5G connectivity, the distinction between remote work and physical office work becomes less pronounced. This flexibility enhances work life balance while enabling organizations to reduce costs associated with maintaining large physical office spaces.

2. Enhanced Business Communication and Collaboration:

Communication and collaboration within organizations are significantly enhanced by the high reliability and low latency of 5G networks. These features make 5G particularly suitable for real-time applications such as video conferencing, voice calls, and collaborative digital platforms. Evidence suggests that the expansion of 5G networks can

enables small and medium sized enterprises (SMEs) to integrate digital technologies that improve productivity, competitiveness, and innovation, (Olokundun et al.,2022). This indicate that the adoption of 5G not only upgrades communication infrastructure but also serves as a strategic enabler of business transformation for SMEs, improving their competitive position in the market. 5G improves the performance of cloud-based collaboration tools such as Microsoft Teams, Google Workspace, Slack, and project management platforms. This supports efficient digital workflows, real-time project coordination, and seamless collaboration across geographically dispersed teams.

3. Immersive and Innovative Collaborations:

The advent of 5G enables the deployment of sophisticated immersive technologies like augmented reality (AR) and virtual reality (VR), which are becoming integral to workplace training, design, and collaboration systems. These technologies enable employees to engage in simulated environments, enhancing experiential learning and decision-making. The synergy between high-speed connectivity and immersive tools is acknowledged as a key factor in driving the future of workplace innovation (Li et al., 2018). This progress not only fosters creativity within organizations but also promotes more interactive collaboration that transcends traditional physical limitations.

4. Boost in Productivity:

5G is revolutionizing workplace productivity by cutting down latency when accessing cloud-based

systems, speeding up file transfers, and allowing multiple digital processes to run at once. These upgrades help to eliminate operational bottlenecks and boost employee efficiency. Deloitte (2023) highlights that advanced digital infrastructures can significantly enhance organizational productivity by enabling real-time decision-making and automating workflows. In this way, 5G acts as a performance multiplier, reducing system delays and optimizing digital work processes throughout the organization.

5. **Promotion of Smart Offices and Internet of Things (IoT)**

Integration: A smart office refers to a technology-driven workplace designed to enhance operational efficiency, comfort, and overall work experience. 5G is crucial for the advancement of smart office systems, primarily because it can support a vast number of IoT devices without running into network congestion. This capability allows for the smooth integration of smart technologies that handle environmental control, energy management, security, and workspace optimization. Studies have shown that IoT applications can significantly enhance workplace efficiency through automation and real-time monitoring of office environments (Nappi & de Campos Ribeiro, 2020). Moreover, 5G improves the scalability of IoT, enabling the deployment of interconnected systems that can function autonomously and adaptively (Olokundun et al., 2022). 5G is the foundational infrastructure for creating intelligent and adaptive office ecosystems.

6. **Data Management and Cybersecurity:**

5G technology is designed with enhanced security features than earlier generations, including improved encryption and advanced authentication mechanisms. While these features strengthen baseline security, they also require organizations to adopt more sophisticated and adaptive cybersecurity strategies. The increased number of connected devices and decentralized networks expands the potential attack surface, necessitating proactive security measures. The evolution of network security in 5G environments requires adopting adaptive and intelligent security strategies to effectively address new threats (International Telecommunication Union, 2018).

7. **Faster Data Collection and Advanced Analytics:**

The high speed and capacity of 5G enable organizations to collect, transmit, and process large volumes of real-time data from office systems and IoT devices. With 5G, organizations can continuously collect and transmit large volumes of workplace data from IoT systems, enterprise platforms, and digital tools. This seamless flow of information supports advanced analytics, artificial intelligence (AI), and machine learning (ML) applications, enabling predictive decision-making in various organizational settings. Research highlights that robust high-speed connectivity is vital for driving data-driven intelligence and automation (Dangi et al., 2021). 5G revolutionizes workplace data, transforming it from static information into real-time insights that enhance strategic

planning and responsiveness in operations.

Challenges in Implementation of 5G Technology

The introduction of 5G technology in office environment has the potential to enhance connectivity, streamline automation, and boost productivity. However, there are several hurdles that stand in the way of its successful implementation. These includes:

- 1 High Infrastructure and Implementation Costs:** The deployment of 5G requires new base stations, antennas, and enhanced network backhaul to support ultra-low latency and high data rates, which can be prohibitively expensive for organizations (Ekine, Uwaezuoke, & Agumagu, 2024).
- 2. Integration and Adoption Period:** Technical integration with legacy office networks also presents difficulties, particularly in ensuring compatibility with existing 4G, Wi-Fi, and enterprise systems, as well as managing interference and network optimization (Msweli & Kgopa, 2025). As a result, the transition often requires system upgrades, staff training, and process reengineering. Organizations must therefore approach 5G adoption as a long-term strategic transformation rather than a short-term technological upgrade to ensure effective integration and sustainable operational benefits.
- 3. Security and Privacy Concerns:** Security and privacy concerns emerge due to the increased connectivity of office systems and sensitive corporate data, requiring organizations to implement robust

cyber security measures before fully integrating 5G (Msweli & Kgopa, 2025). Without robust cyber security governance, organizations may face increased vulnerability to data breaches, systems disruptions, and unauthorized access.

4. Energy Consumption and Environmental Concerns:

Another critical challenge associated with 5G technology is its high energy consumption. The dense deployment of network infrastructure required to support 5G can lead to increased power usage, raising both operational costs and environmental concerns. Organizations adopting 5G must therefore consider energy-efficient technologies and sustainable practices to mitigate the environmental impact and ensure long-term cost efficiency.

Conclusion

The 21st-century workplace is undergoing rapid technological transformation, with fifth-generation (5G) technology emerging as a critical driver of change in office operations. It is therefore concluded that the successful adoption and implementation of 5G requires not only technological investment but also strategic planning, effective governance, and continuous organizational adaptation. Thus, it is established that 5G represent a foundational technology capable of transforming office operations and enhancing organizational performance when implemented in a deliberate and well-managed environment.

Recommendations

Based on the foregoing, the following recommendations were made:

1. **Administrators:** Investment in Digital Infrastructure, organizations should prioritize investment in modern digital infrastructure to fully leverage the capabilities of 5G technology. Given the capital-intensive nature of 5G deployment, organizations particularly SMEs may collaborate with information technology service providers or telecommunication companies to implement 5G solutions through phased deployment or flexible payment arrangements.
2. **IT Professionals:** Strengthening Cybersecurity Frameworks, Information Technology (IT) professionals should adopt robust cybersecurity frameworks to address emerging threats associated with 5G enabled environments. This includes implementing advanced encryption, access control mechanisms, continuous network monitoring, and employing or consulting cybersecurity specialists to safeguard organizational data and digital assets.
3. **Head of Institutions/ Management Teams:** Continuous employee training and effective change management programmes should accompany implementation of 5G technology. They should ensure that employees are adequately trained to use new digital tools and systems, thereby maximizing productivity and minimizing resistance to technological change.

References

Aina, M. A., & Olawaiye, T. O. (2024). Occupational bias and job

performance of secretaries in today's office environment in Nigeria. TVET-IJORAD International Journal, Vol. 7 No. 1, pp. 62.

Ani, K. (n.d.). Five 5G enterprise use cases. STL Partners. Retrieved June 13, 2026, from <https://stlpartners.com/articles/private-cellular/5g-enterprise-use-cases/>

Armstrong, M. (2014). Armstrong's handbook of human resource management practice (13th ed.). Kogan Page.

Asurion.(2026). 5G vs.4G: Differences. Retrieved June 13, 2026, from <https://www.asurion.com/connect/tech-tips/5g-vs-4g-differences/>

Avnet S. (2021). 5G campus networks: Build your own. Retrieved June 13, 2026, from <https://my.avnet.com/silica/resources/article/5g-campus-networks-build-your-own/>

Boccardi, F., Heath, R. W., Lozano, A., Marzetta, T. L., & Popovski, P. (2014). Five disruptive technology directions for 5G. IEEE Communications Magazine, 52(2), 74–80. <https://doi.org/10.1109/MCOM.2014.6736746>

Dangi, R., Lalwani, P., Choudhary, G., You, I., & Pau, G. (2021). Study and investigation on 5G technology: A systematic review. Sensors, 22(1), 26. <https://doi.org/10.3390/s22010026>

Deloitte. (2023). *Global human capital trends 2023: New fundamentals for*

- a *boundaryless world*. Deloitte Insights. <https://www.deloitte.com>
- Denise, S. (2025). How 5G will benefit business and technology. Retrieved June 13, 2026, from <https://www.appdirect.com/blog/how-5g-will-benefit-business-and-technology/>
- Ekine, E. U., Uwaezuoke, E. C., & Agumagu, E. R. (2024). The impact, opportunities, and rollout challenges of 5G technology. *International Journal of Scientific Research and Modern Technology*, 3(8), 109–121. <https://doi.org/10.38124/ijsrmt.v3i8.901>
- Eric M. (2024). Private 5G use cases. Retrieved June 13, 2026, from <https://nybsys.com/private-5g-use-cases/>
- Ericsson. (2018). *5G business value to industry: BLISK*. Ericsson. <https://www.ericsson.com/en/report-s-and-papers/consumerlab/reports/5g-business-value-to-industry-blisk>
- Gareth, S. (2025). 5G and IoT. Retrieved June 13, 2026, from <https://www.forestrock.co.uk/5g-and-iot/>
- GSMA.(2025). 5G and data privacy: An overview for policymakers. https://www.gsma.com/publicpolicy/wpcontent/uploads/2020/07/GSMA_5G_and_Data_Privacy_July_20.pdf
- Hannah M., Lareina Y., Michael C., & Roger R. (2025). Superagency in the workplace. Retrieved June 13, 2026, from <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/superagency-in-the-workplace-empowering-people-to-unlock-ais-full-potential-at-work>
- Hodge, S. (2025). *Impact of cybersecurity operations efficiency enhancements*. Cyber Risk Insight. <https://www.cyberriskinsight.com/operations/impact-cybersecurity-operations-efficiency-enhancements/>
- Impact of 5G on business communication and collaboration. (2024, February 21). Retrieved June 13, 2026, from <https://yourcommsgroup.com/>
- Inscnet. (2026). How 5G is transforming business networks and the role of MSPs. Retrieved June 13, 2026, from <https://www.inscnet.com/blog/how-5g-is-transforming-business-networks-and-the-role-of-msps-in-implementation/>
- International Telecommunication Union. (2018). Setting the scene for 5G. ITU.
- Juniper Networks. (2021). 5G networks power digital future. Retrieved June 13, 2026, from <https://www.juniper.net/us/en/customers/5g-networks-case-study.html>
- Laudon, K. C., & Laudon, J. P. (2016). *Management information systems*. Pearson Education.
- Li, S., Xu, L. D., & Zhao, S. (2018). 5G Internet of Things: A survey. *Journal of Industrial Information Integration*, 10, 1–9. <https://doi.org/10.1016/j.jii.2018.04.002>

- McKinsey Global Institute. (2021). *The future of work after COVID-19*. McKinsey & Company. <https://www.mckinsey.com>
- Messenger, J. C., & Gschwind, L. (2016). Three generations of telework. *New Technology, Work and Employment*, 31(3), 195–208. <https://doi.org/10.1111/ntwe.12073>
- Mills, A. J. (2006). *Sex, strategy and the stratosphere*. Palgrave Macmillan.
- Msweli, N. T., & Kgopa, A. T. (2025). Immersive technologies in 5G networks. *Journal of Information Systems and Informatics*, 8(2), 1559. <https://doi.org/10.63158/journalisi.v8i2.1559>
- Nappi, I., & de Campos R. G. (2020). IoT applications in workplace. *Journal of Corporate Real Estate*, 22(1), 71–90. <https://doi.org/10.1108/JCRE-03-2019-0016>
- Nicholls, I. (2025). *3G vs 4G vs 5G: All the differences*. UCTEL. <https://www.uctel.co.uk/blog/whats-the-difference-between-3g-4g-and-5g>
- OECD. (2021). *The digital transformation of work*. Organisation for Economic Co-operation and Development. <https://www.oecd.org>
- Olokundun, M. O., Ogbari, M. E., Falola, H., & Ibidunni, A. S. (2022). 5G for SMEs innovation. *Journal of Innovation and Entrepreneurship*, 11, Article 41. <https://doi.org/10.1186/s13731-022-00220-7>
- Pro. (2025). *The future of remote work with 5G: Skills your team needs*. 5G World Pro. <https://www.5gworldpro.com/blog/2025/06/18/the-future-of-remote-work-with-5g-skills-your-team-needs/>
- Qualcomm Technologies, Inc. (2019). *Future of 5G*. <https://www.qualcomm.com>
- Raza, M., Hussain, S., Aslam, N., Le Minh, H., & Nguyen, H. X. (2019). *Industrial wireless sensor networks and 5G*. Wiley.
- Resurgent. (2025). *The 5G-powered hybrid workplace: Overcoming connectivity challenges for remote teams*. <https://resurgent.co.in/blog/the-5g-powered-hybrid-workplace-overcoming-connectivity-challenges-for-remote-teams/>
- Robbins, S. P. (2005). *Organizational behavior*. Pearson Education.
- Singh, K., & Chavan, V. (2025). *Cybersecurity implications of 5G technology*. *Journal of Emerging Technologies and Innovative Research (JETIR)*. <https://www.jetir.org/papers>
- Singh, M., Khuntia, M., & Sahoo, S. (2017). *Impact of Internet of Things (IoT) on 5G*. ResearchGate. <https://www.researchgate.net/publication/343969540>
- Skedda. (n.d.). *Modern workplace technology*.

- <https://www.skedda.com/guides/modern-workplace-technology>
- Ullah, A., & Eryıldız, D. I. (2024). The Effectiveness of 5G Technology for Smart Buildings' Energy Management Journal of Technology in Architecture Design and Planning 1(2):97-105. <https://www.researchgate.net/publication>
- Viet, N. (2025). State of 5G 2025. <https://www.5gamericas.org/the-state-of-5g-growth-challenges-and-opportunities-in-2025/>
- Vinah Chau et al. (2024). 5G adoption challenges. Science Publishing Group.
- World Economic Forum. (2020). *The future of jobs report 2020*. World Economic Forum. <https://www.weforum.org>.

EFFECTS OF CLIMATE CHANGE ON CROP PRODUCTION IN NIGERIA

ADEDOYIN Ayomiposi Kehinde

Vocational and Technical Education, Faculty of Education, Ekiti State University,
Ado-Ekiti

Abstract

Climate change has emerged as one of the most significant challenges to sustainable agricultural production globally, with pronounced effects on crop productivity. This study examines the major factors influencing climate change and their direct and indirect impacts on crop production. Key factors explored include temperature rise and heat stress, rainfall variability and drought, extreme weather events, pests and disease outbreaks, and soil degradation. The analysis highlights how these elements disrupt photosynthesis, alter growing seasons, affect water availability, damage farm infrastructure, reduce soil fertility, and increase crop vulnerability to pests and diseases. The implications for food security are profound, as climate change threatens both national and local food supply, posing risks to economic stability and livelihoods. The study concludes by emphasizing the urgency of adopting climate-resilient farming practices, strengthening early warning systems, and promoting sustainable land and water management strategies to mitigate the adverse effects of climate change on agriculture. The study recommended that farmers should be encouraged to adopt drought-resistant and early-maturing crop varieties, crop rotation and intercropping to enhance productivity despite changing climate conditions. The study further recommended that agricultural extension services that provide farmers with timely and relevant weather forecast should be established and strengthened to aid decision making.

Keywords: Climate change, crop production, temperature rise, rainfall variability, food security, soil degradation.

Introduction

Climate change has emerged as one of the most critical challenges to global agricultural systems, influencing crop productivity through changes in temperature, rainfall patterns, and the frequency of extreme weather events. Its impacts are particularly pronounced in developing countries like Nigeria, where agriculture is largely rain-fed and highly sensitive to climatic variability. According to Alehile et. al., (2025), climate change is a phenomenon arising from human activities that leads to increased temperatures and irregular rainfall patterns, posing a significant threat to

food security. The resulting shifts in weather conditions affect planting seasons, crop yields, and food availability, thereby posing threats to food security and rural livelihoods. Understanding the specific factors influencing climate change's impact on crop production is therefore essential for sustainable agricultural planning in Nigeria. This provides the basis for exploring the interplay between climate variability and crop performance.

Climate variability manifests through unpredictable rainfall patterns, prolonged droughts, and heat stress, all of which directly affect crop growth and

productivity (Giweze, et al., 2024). These changes not only reduce the yield of staple crops such as yam, cassava, and maize but also exacerbate soil degradation and pest outbreaks. With most rural farmers relying on traditional farming methods, limited access to irrigation, and minimal climate adaptation technologies, the vulnerability of the agricultural sector is heightened. This situation calls for a deeper examination of the agricultural systems' adaptive capacity in the face of ongoing climatic shifts.

Climate shifts often disrupt traditional farming practices, alter growing seasons and affects agricultural productivity. These shifts observed specific changes in local or regional weather patterns that are widely as a broader phenomenon of climate change. The implications of climate change on agriculture extend beyond yield reductions to include land degradation, biodiversity loss, and reduced soil fertility. Omokaro, 2025 revealed that environmental degradation, often worsened by unsustainable farming practices, interacts with climate change to intensify production constraints. As a result, crop production systems in Nigeria face multi-dimensional threats that require integrated and sustainable management approaches. This makes it necessary to consider both environmental and socio-economic factors when discussing climate change impacts on agriculture.

Environmental factors refer to the external physical, chemical, and biological conditions or influences that affect the growth, development, and survival of living organisms, as well as the functioning of ecosystems. According to Alehile, et al., (2025), environmental factors influence climate change by extension, crop production. Accordingly,

changes in environmental quality driven by human activities such as deforestation, overgrazing, land degradation, and unsustainable agricultural practices significantly alter local and regional climatic conditions. These activities increase greenhouse gas emissions, disrupt the natural carbon cycle, and reduce vegetation cover, leading to higher surface temperatures and shifts in rainfall patterns. Environmental degradation results in reduced soil fertility, altered hydrological cycles, and increased vulnerability to droughts and floods. For instance, deforestation for agricultural expansion not only eliminates carbon sinks but also exposes soils to erosion, while pollution from industrial and agricultural sources can affect water and air quality essential for healthy crop growth. These environmental changes are often driven by socio-economic factors such as population growth, demand for increased food production, poverty, and the pursuit of economic gains through commercial farming or industrial development. In view of this, farmers in developing countries experiencing environmental degradation are compelled to prioritize survival strategies in order to sustain their livelihood.

Farmers especially in developing regions may prioritize short-term economic survival over long-term environmental sustainability, creating a cycle where environmental degradation and socio-economic pressures reinforce each other. According to Anyoha et al. (2013), socio-economic factors such as farmers' income level, access to credit, educational background, farming experience, and household size significantly influence how farmers perceive and respond to climate change in crop production. These factors determine the capacity of farmers to

adopt adaptive strategies, invest in resilient practices, and mitigate the adverse impacts of changing climatic conditions.

Given these challenges, researchers have increasingly emphasized sustainable and climate-smart agricultural practices as critical responses to these threats (Muoghalu & Akanwa, 2021). Practices such as ecological intensification, biological farming, and the adoption of resilient crop varieties have the potential to reduce the vulnerability of farming systems while maintaining or even improving productivity. However, the adoption of these innovations depends on policy support, farmer education, and investment in agricultural research. This understanding creates a logical foundation for examining the key factors that shape the influence of climate change on crop production.

Concept of Climate Change

Climate change refers to long-term shifts in temperatures and weather patterns, primarily caused by natural processes and increasingly by human activities such as the burning of fossil fuels, deforestation, and intensive agricultural practices. These activities increase the concentration of greenhouse gases (GHGs) in the atmosphere, leading to global warming and altering climatic systems (Alehile, Salami, & Otohinoyi, 2025). The Intergovernmental Panel on Climate Change (IPCC, 2021) defines climate change as a statistically significant variation in the mean state of the climate or its variability that persists for an extended period, typically decades or longer. In Nigeria, climate change has manifested through rising average temperatures, unpredictable rainfall patterns, prolonged droughts, and increased incidences of extreme weather

events, all of which have implications for agriculture and rural livelihoods. According to Alehile et al. (2025), climate change in Nigeria is not only a scientific reality but also a socio-economic challenge, as it directly affects food security, water resources, and public health.

Climate change is interconnected with environmental degradation and biodiversity loss. Unsustainable land use, overgrazing, and urban expansion have exacerbated the vulnerability of ecosystems to climate variability (Reynolds et al., 2015). In agricultural zones, particularly in sub-Saharan Africa, the impact of climate change is amplified by limited access to adaptive technologies and inadequate policy frameworks to support farmers in mitigation and adaptation strategies. Understanding the concept of climate change goes beyond identifying its physical manifestations; it requires recognizing its socio-economic consequences, policy implications, and the urgent need for coordinated global and local actions to address its causes and mitigate its impacts.

Climate Change and Agricultural Systems

Relationship Between Climate and Crop Growth Cycles

Climate is a fundamental determinant of agricultural productivity because it influences every stage of a crop's growth cycle from germination to harvest. Temperature, rainfall patterns, humidity, and solar radiation collectively dictate plant physiological processes such as photosynthesis, nutrient uptake, and flowering (Reynolds et al., 2015). Changes in climatic parameters can alter planting seasons, shorten or lengthen maturation periods, and affect yield quality and quantity. For instance, an

increase in temperature may accelerate crop maturity but reduce grain filling time, thereby lowering yields. Alehile, et al (2025) further noted that shifts in rainfall distribution and the occurrence of prolonged dry spells can disrupt traditional cropping calendars, forcing farmers to adapt through changes in planting dates or crop varieties.

Vulnerability of Agriculture to Climate Variability

Agricultural systems, particularly in developing countries like Nigeria, are highly vulnerable to climate variability due to their dependence on rain-fed farming and limited adaptive capacity. Variability in rainfall, temperature extremes, and increased frequency of extreme weather events such as floods and droughts significantly threaten food production (Ayanlade et al., 2023). Smallholder farmers, who form the backbone of Nigeria's agricultural sector, often lack access to irrigation, climate information services, and financial resources, making them disproportionately affected. Climate variability interacts with other stressors such as soil degradation, pest outbreaks, and market instability, compounding the challenges faced by farmers.

Importance of Climate-Resilient Farming

Building climate-resilient agricultural systems is essential to sustaining crop production under changing climatic conditions. Climate-resilient farming involves adopting practices, technologies, and crop varieties that can withstand climatic shocks and variability (Alehile et al., 2025). This includes strategies such as conservation agriculture, improved irrigation systems, integrated pest management, and the use of drought-tolerant or heat-resistant

crops. Ayanlade et al. (2023) argue that combining traditional knowledge with modern innovations, including precision agriculture and climate forecasting tools, can enhance farmers' adaptive capacity. Resilient systems not only help maintain productivity but also contribute to food security, income stability, and environmental sustainability.

Factors Influencing Climate Change and Their Effects on Crop Production

1. Temperature Rise and Heat Stress

One of the most prominent consequences of climate change is the steady rise in average global temperatures, which has profound implications for crop production. Increased temperatures can impair photosynthesis by causing stomatal closure in plants, reducing carbon dioxide uptake, and ultimately lowering yields (Alehile, Salami, & Otohinoyi, 2025). Heat stress also affects pollination, as high temperatures can cause pollen sterility, particularly in crops such as maize, rice, and wheat (Reynolds, Waddington, & Braun, 2019). Additionally, prolonged periods of high temperatures alter growing seasons, often shortening crop maturity periods and leading to mismatches between crop phenology and favorable climatic windows.

2. Rainfall Variability and Drought

Rainfall variability manifested as unpredictable onset, duration, and intensity of rains has a direct impact on water availability for crops. Inadequate rainfall or prolonged droughts can lead to significant moisture deficits, which impair plant growth and reduce yields (Alehile et al., 2025). Such variability also disrupts

planting schedules, as farmers can no longer rely on traditional seasonal patterns, leading to delayed planting and poor germination. In extreme cases, drought shortens the growth period, making it difficult for crops to reach maturity before water stress sets in.

3. Extreme Weather Events

The frequency and intensity of extreme weather events such as floods, storms, and heatwaves have increased under climate change conditions. According to Alehile et al., (2025), these events cause immediate and severe damage to farmlands, destroying crops and infrastructure. Floods, for example, result in loss of soil fertility through erosion and nutrient leaching, while storms can physically damage crops and disrupt harvests.

4. Pests and Disease Outbreaks

Rising temperatures and altered rainfall patterns have facilitated changes in pest migration patterns and extended breeding seasons for many agricultural pests. This has led to increased crop vulnerability to pests such as fall armyworm and locusts (Alehile et al., 2025). Similarly, warmer and more humid conditions favour the spread of fungal and bacterial diseases, which can devastate yields if left unmanaged.

5. Soil Degradation and Desertification

Climate change contributes significantly to soil degradation, reducing its fertility through processes such as erosion, salinization, and organic matter depletion. Extreme heat and reduced vegetation cover increase desertification risk, particularly in semi-arid regions. These changes are often linked to climate-induced land use changes, where degraded farmlands are abandoned,

forcing agricultural expansion into marginal lands with lower productivity (Alehile et al., 2025).

Implications for Food Security – Threats to National and Local Food Supply

Climate change poses significant risks to food security at both national and local levels, particularly in agrarian economies like Nigeria where agriculture is a major source of livelihood and food production. Food security, as defined by the FAO, entails having consistent physical, social, and economic access to sufficient, safe, and nutritious food to meet dietary needs and preferences for an active and healthy life. However, climate-induced disruptions in agricultural systems threaten all four dimensions of food security availability, access, utilization, and stability. At the national level, climate change affects food availability through its influence on crop yields, harvest quality, and production stability. Rising temperatures and erratic rainfall patterns shorten the growing seasons, reduce photosynthetic efficiency, and contribute to increased pest and disease outbreaks, thereby lowering the total output of staple crops such as maize, rice, and cassava (Alehile, Salami & Otohinoyi, 2025). Additionally, recurrent droughts and floods disrupt large-scale farming, leading to fluctuations in supply that can cause food price inflation and reduce affordability for vulnerable populations.

At the local level, smallholder farmers who dominate rural agricultural production are particularly at risk. Rain-fed farming, which is highly dependent on predictable seasonal patterns, is becoming increasingly unreliable due to shifting rainfall onset and cessation. This unpredictability reduces the ability of rural households to plan planting and

harvesting schedules effectively, resulting in lower yields and food shortages within the community (Reynolds et al., 2015). Moreover, post-harvest losses often increase when extreme weather events damage storage facilities and transportation infrastructure, further undermining local food availability.

The combined impact of reduced production, higher post-harvest losses, and increased production costs threatens not only the quantity but also the nutritional quality of food available in both rural and urban markets. As Sabo et al. (2023) emphasize, climate-induced declines in food supply have long-term implications for public health, economic stability, and social cohesion, potentially increasing the risk of malnutrition, poverty, and migration pressures. Climate change directly undermines food security by disrupting crop production, destabilizing food markets, and limiting both physical and economic access to food. Without climate-resilient agricultural policies and adaptive strategies, the national and local food supply will remain highly vulnerable to climate variability.

Conclusion

Climate change is increasingly shaping the future of agricultural productivity, with significant implications for farmers and society at large. Changes in temperature, rainfall patterns, extreme weather events, pest outbreaks, and soil degradation have disrupted crop growth cycles, altered planting and harvesting periods, and reduced overall yields. These impacts threaten farmers' livelihoods, especially in rural areas, and pose serious risks to food security. Addressing these challenges requires the adoption of climate-resilient farming practices, improved irrigation systems, sustainable soil management, and the

use of accurate weather forecasting in agricultural planning. Without timely and coordinated action, the effects of climate change will continue to intensify, deepening hunger, poverty, and economic instability. Building a more sustainable and resilient agricultural system is therefore essential for safeguarding future food production.

Recommendations

The following recommendations were made

1. Farmers should be encouraged to adopt drought-resistant and early-maturing crop varieties, conservation agriculture, crop rotation, and intercropping systems to enhance productivity despite changing climatic conditions.
2. Government and agricultural agencies should invest in small-scale and large-scale irrigation systems to reduce dependence on unpredictable rainfall and ensure year-round crop production.
3. Establish and strengthen agricultural extension services that provide farmers with timely and reliable weather forecasts, seasonal predictions, and early warning systems to aid decision-making.
4. Policymakers should develop and enforce policies that support climate change adaptation in agriculture, including subsidies for climate-smart inputs, access to credit facilities, and incentives for sustainable farming methods.

References

- Alehile, K. S., Salami, H., & Otohinoyi, K. D. (2025). Climate Change, Environmental Degradation, and Food Security in Nigeria: A

- Machine Learning Analysis. *Intelligent Agriculture*, 1(1), 26-39.
- Anyoha, N. O., Nnadi, F. N., Chikaire, J., Echeta, J. A., Utazi, C. O., & Ihenacho, R. A. (2013). Socio-economic factors influencing climate change adaptation among crop farmers in Umuahia South Area of Abia State, Nigeria.
- Giweze, E., Oyita, G., Ofuoku, A., & Ebeore, S. (2024). Effects of weather variability on yam productivity among farmers in Delta State, Nigeria. *FUDMA Journal of Agriculture and Agricultural Technology*, 10(3), 167-172.
- Muoghalu, L. N., & Akanwa, A. O. (2021). Ecological intensification for sustainable agriculture: the Nigerian perspective. In *Ecological intensification of natural resources for sustainable agriculture* (pp. 521-564). Singapore: Springer Singapore.
- Mushtaq, F., Akram, M. H., Usman, M., Mohsin, M., & Nawaz, M. S. (2024). Global climate change and its influence on crop production. *Journal of Life and Social Sciences*, 2024(1), 27-27.
- Nnoje, A. I., Mbanefo, P. A., & Okolie, F. O. (2025). *Impact of Climate Change on Agricultural Productivity in Nigeria (2000-2023)*.
- Okechi, K. K., & Orakwe, L. C. (2024). Multivariate statistical analysis of climate change variables and land use on crop yields. *UNIZIK Journal of Engineering and Applied Sciences*, 3(4), 1163-1179.
- Omodara, O. D., Ige, O. A., Oluwasola, O., Oyeboji, A. T., & Afape, O. O. (2023). Factors influencing cassava farmers' choice of climate change adaptation practices and its effect on cassava productivity in Nigeria. *Heliyon*, 9(3).
- Omokaro, G. O. (2025). Multi-impacts of climate change and mitigation strategies in Nigeria: agricultural production and food security. *Science in One Health*, 100113.
- Osuji, E. E., Olaolu, M. O., & Tim-Ashama, A. C. (2023). Impacts of climate change on sustainable crop production in Nigeria. In *Climate Change Impacts on Nigeria: Environment and Sustainable Development* (pp. 39-56). Cham: Springer International Publishing.
- Petrychenko, V., Korniychuk, O., & Voronetska, I. (2018). Biological farming in conditions of transformational changes in the agrarian production of Ukraine. *Agricultural Science and Practice*, 5(2), 3-12.
- Reynolds, T. W., Waddington, S. R., Anderson, C. L., Chew, A., True, Z., & Cullen, A. (2015). Environmental impacts and constraints associated with the production of major food crops in Sub-Saharan Africa and South Asia. *Food Security*, 7(4), 795-822.

EXPLORING THE ROLE OF FORMATIVE ASSESSMENT IN THE TEACHING AND LEARNING OF ACCOUNTING IN TERTIARY INSTITUTIONS

ADEDEJI Wemimo Elizabeth and Dr. OLANIYI O.N.

Department of Vocational and Technical Education, Faculty of Education,
Ekiti State University, Ado Ekiti
Email: adedejiwemimo058@gmail.com

Abstract

Formative assessment is an important strategy for improving the teaching and learning of accounting in tertiary institutions because it provides continuous evidence of students' progress during instruction. This paper examines how formative assessment supports accounting education through feedback, diagnosis of learning difficulties, instructional adjustment, student engagement, reflection and improved learning outcomes. The discussion focuses on formative assessment as the independent variable, while the teaching and learning of accounting represents the major outcome of interest. The paper explains that strategies such as oral questioning, quizzes, peer assessment, self-assessment, reflective tasks, class exercises and case-based activities help lecturers identify students' misconceptions in accounting topics and respond with appropriate teaching support. It also shows that formative assessment encourages students to use feedback, correct errors, participate actively and develop confidence in applying accounting principles to practical situations. However, its effective use may be limited by large class sizes, inadequate time, poor feedback culture, limited resources, weak teacher training and students' low commitment to non-graded assessment activities. The paper recommends that formative assessment should be integrated into accounting curricula, lecturers should be trained in feedback-based assessment practices, institutions should provide technological and instructional support, and students should be guided to use feedback for continuous improvement.

Keywords: Formative assessment, Accounting education, Teaching and learning, Feedback, Tertiary institutions.

Introduction

Assessment is a central part of teaching and learning because it provides evidence about what learners know, what they can do and the areas where they still require support. In tertiary institutions, assessment should not be seen only as a means of awarding scores. It also helps lecturers judge whether instructional objectives are being achieved and whether students are developing the competencies required for academic and professional practice. In accounting

education, this is important because students must understand concepts, apply procedures and interpret financial information in practical contexts.

Assessment may be classified according to its purpose and timing. Diagnostic assessment is used before or at the beginning of instruction to identify learners' prior knowledge, misconceptions and readiness for new content. In accounting, it may reveal whether students understand debit and credit, the accounting equation or basic

financial statement items before more advanced topics are introduced. This makes diagnostic assessment a useful starting point for planning instruction.

Formative assessment takes place during instruction and is mainly concerned with improving learning while it is still developing. It is therefore described as assessment for learning because it provides feedback to lecturers and students before final evaluation. Through questioning, short quizzes, class exercises, self-assessment, peer assessment and feedback on assignments, formative assessment helps lecturers identify learning gaps and adjust their teaching. Black and Wiliam (2018) explain that classroom assessment is closely connected to pedagogy because evidence from learners' performance can guide instruction and improve learning.

Summative assessment is usually conducted at the end of a lesson, unit, semester or programme. Its purpose is to judge the extent to which students have achieved stated learning outcomes after instruction. Examples include end-of-semester examinations, final projects and graded practical tasks. Although summative assessment is useful for grading and certification, it often comes too late to help students correct their weaknesses during the learning process. This limitation makes formative assessment particularly relevant in skill-based subjects such as accounting.

Other forms of assessment include criterion-referenced, norm-referenced, self-assessment and peer assessment. Criterion-referenced assessment measures performance against stated standards, while norm-referenced assessment compares one learner's performance with that of others. Self-assessment helps students judge their own work, and peer assessment allows students to review the work of classmates

using agreed criteria. Andrade and Valtcheva (2009) argue that self-assessment can improve learning when students use clear standards to reflect on and revise their work.

Among these forms, formative assessment is the concern of this paper because it directly supports improvement in both teaching and learning. Accounting students often find the subject difficult because it requires numerical accuracy, logical reasoning, procedural steps and interpretation of financial information. Where teaching is dominated by lectures and final examinations, students may memorize rules without understanding how to apply them. Formative assessment addresses this weakness by creating opportunities for timely diagnosis, correction, feedback and active participation.

This paper explores the role of formative assessment in the teaching and learning of accounting in tertiary institutions. It discusses the concept of formative assessment, teaching, accounting education, the conceptual framework, roles, constraints and implications for policy and practice. The paper contributes by presenting formative assessment as a practical link between feedback, instructional adjustment, student engagement and improved accounting learning outcomes.

The discussion is problem-focused because the effective teaching and learning of accounting cannot be separated from how lecturers find out what students understand during instruction. If assessment is delayed until the end of a semester, students may continue to repeat errors without correction. A formative approach therefore becomes necessary because it allows teaching to be adjusted while learning is still in progress and before poor understanding becomes fixed.

Concept of Formative Assessment

Formative assessment is an ongoing process of collecting and using evidence about students' learning to improve teaching and support progress. Unlike assessment that merely records final performance, formative assessment is concerned with what students understand, what they misunderstand and what should be done next to move learning forward. Nicol and Macfarlane-Dick (2006) link formative assessment with self-regulated learning because useful feedback helps students compare their present performance with expected standards and take corrective action.

A major feature of formative assessment is continuous feedback. Feedback helps students recognise strengths, identify errors and know the next step in learning. In accounting, feedback is useful when it explains why a journal entry, classification or financial statement item is wrong and how the error can be corrected. Brookhart (2008) emphasizes that feedback should be clear, specific, constructive and connected to the learning goal, not a general comment that leaves students uncertain about improvement.

Formative assessment also performs a diagnostic function. It enables lecturers to identify students' misunderstandings early and respond before the problem becomes permanent. This is important in accounting because one misunderstood principle, such as the treatment of assets, liabilities or expenses, may affect several later tasks. When lecturers use assessment evidence to reteach, give examples or provide remedial activities, formative assessment becomes part of effective instruction.

Another characteristic is student involvement. Through self-assessment, peer review and reflection, students learn to judge the quality of their work and take

responsibility for improvement. Carless and Boud (2018) describe this ability to understand and use feedback as feedback literacy. In accounting education, feedback literacy helps students develop the habit of checking procedures carefully, learning from errors and applying corrections in later tasks.

Concept of Teaching and Learning

Teaching and learning are related processes in education. Teaching refers to the deliberate guidance given by a teacher to help learners acquire knowledge, skills, values, and attitudes, while learning refers to the process through which students understand, internalize, and apply what has been taught. In accounting education, teaching and learning should not only involve the explanation of accounting concepts but also the practical application of those concepts to real or simulated financial situations.

Effective teaching and learning of accounting require active participation, feedback, practice, and reflection. This is because accounting involves numerical accuracy, logical reasoning, problem-solving, and professional judgment. When lecturers use questioning, worked examples, quizzes, case-based exercises, and feedback, students are better supported to understand and apply accounting principles. Black and Wiliam (2018) maintain that classroom assessment and pedagogy are closely connected because evidence from students' learning can guide teachers in improving instruction.

Accounting Education

Accounting education is the structured process through which learners acquire the knowledge, skills, values and professional attitudes required for understanding and applying accounting

principles. It covers bookkeeping, financial reporting, cost accounting, auditing, taxation, accountability and ethical decision-making. In tertiary institutions, accounting education should prepare students not only to pass examinations but also to interpret financial information and contribute to business and public financial management.

The teaching and learning of accounting require both conceptual understanding and practical competence. Students are expected to understand accounting principles and apply them accurately in recording transactions, preparing financial statements, analysing business performance and making financial decisions. Students' perception of accounting as relevant and professionally useful can influence their motivation and career intentions. Jackling and Calero (2006) found that students' perceptions of accounting studies and the attributes required of professional accountants influenced their intention to become qualified accountants.

Accounting may be perceived as difficult when teaching is too abstract or examination-driven. Lucas and Meyer (2005) show that students' conceptions of and motivations to learn introductory accounting affect their learning experience. More recent work by Mapuya and Rambuda (2022) also supports the need for teaching approaches that respond to students' learning styles and promote active learning. Formative assessment is relevant because it helps lecturers identify difficulties while learning is still taking place and provides students with feedback for improvement.

This means that accounting education should avoid an approach where students only copy procedures without understanding the reasons

behind them. A student may memorise the format of a statement of financial position but still fail to explain why assets, liabilities and equity are classified differently. Formative assessment helps to expose this gap between procedural recall and real understanding.

Conceptual Framework

The conceptual framework illustrates the relationship between formative assessment, instructional practice, student engagement and learning outcomes in accounting education. It assumes that when formative assessment is properly integrated into accounting instruction, lecturers gather evidence of students' progress, adjust teaching and support learning through feedback and reflection.

Components of the framework

Formative assessment strategies represent the starting point of the framework. These include classroom questioning, diagnostic quizzes, self-assessment, peer assessment, feedback on written tasks, exit slips and case-based exercises. These strategies generate evidence about students' understanding and reveal areas where they are progressing or experiencing difficulty.

Instructional adjustment follows from the evidence generated by formative assessment. Lecturers may clarify misunderstood concepts, modify lesson delivery, change the pace of instruction, regroup students for remediation or introduce alternative methods such as worked examples and simulations. Student engagement and reflection occur when learners use feedback, review their own work and participate actively in improving performance. The final outcome is improved accounting learning, shown in better understanding, problem-solving ability, academic performance and readiness for professional application.

Visual Model (Conceptual Diagram)

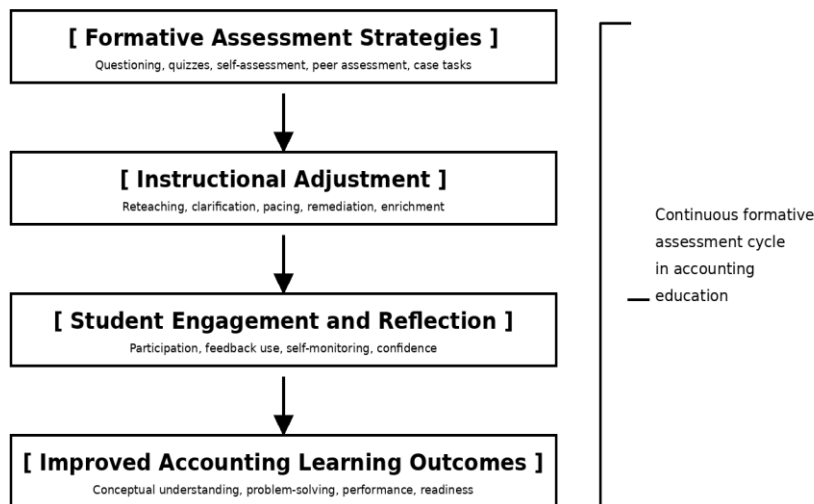


Figure 1. Conceptual model showing formative assessment in the teaching and learning of accounting.

Explanation of the Model

The model shows a flow from formative assessment strategies to instructional adjustment, student engagement and improved learning outcomes. Assessment evidence helps lecturers understand students' learning needs and respond through feedback, clarification and remediation. As teaching becomes more responsive, students become more engaged and reflective, leading to stronger understanding and practical application of accounting knowledge.

The framework also shows that formative assessment is cyclical rather than linear in actual classroom practice. After improved learning outcomes are observed, the lecturer can still return to new assessment evidence, identify fresh learning needs and adjust subsequent instruction. This cycle is important in accounting because topics are interrelated; weakness in one topic may affect later competence in another.

Roles of Formative Assessment in the Teaching and Learning of Accounting

Learning diagnosis: Formative assessment helps accounting lecturers identify students' learning gaps before final examinations. Through quizzes, questioning and class exercises, lecturers can detect errors in journal entries, trial balance preparation and financial statement interpretation, then respond while learning is still taking place. Black and Wiliam (2018) explained that classroom assessment evidence should be used to improve both teaching and learning.

Timely feedback: It provides students with feedback that explains what is wrong, why it is wrong and how improvement can be made. In accounting, this means guiding students to understand the principle behind an error rather than merely marking an answer as incorrect. Brookhart (2008) and Nicol and Macfarlane-Dick (2006) stress that useful feedback should help learners close the gap between present performance and expected performance.

Student engagement and reflection:

Formative assessment encourages students to participate actively in their own learning through peer assessment, self-assessment, group problem-solving and reflective tasks. These activities help accounting students review their work, notice common errors and develop responsibility for improvement. Andrade and Valtcheva (2009) and Carless and Boud (2018) support the view that students learn better when they understand and use feedback to improve their work.

Instructional adjustment: It helps lecturers review and improve their teaching methods. Evidence from students' responses may show whether a topic has been understood or whether the examples, pace or method of delivery should be changed. This makes teaching more responsive and learner-centred, which agrees with Black and Wiliam's (2018) position that assessment should be integrated with pedagogy.

Bridging theory and practice:

Formative assessment connects accounting theories with practical business situations. Case studies, simulations and scenario-based exercises allow students to apply accounting principles to realistic tasks rather than memorise rules in isolation. Johansson, Kanapathippillai, Khan and Dellaportas (2023) found that continuous formative assessment in accounting can support improved academic performance when it is meaningfully designed.

Improved academic performance:

Regular low-stakes assessment gives students repeated opportunities to practise, receive correction and prepare for summative assessment. King (2023) found that online formative assessments in an introductory accounting module were significantly associated with students' examination performance. This

supports the use of continuous practice in accounting education.

Professional readiness: Formative assessment supports professional competence because accounting practice requires accuracy, judgement and the ability to justify financial decisions. When students receive feedback on realistic accounting tasks, they learn to defend procedures and correct mistakes. This strengthens the link between classroom learning and the competence expected of accounting graduates.

Constraints to Formative Assessment

Time pressure: Accounting courses often contain broad content areas that lecturers must cover within a limited academic calendar. This may cause lecturers to rush feedback activities or use assessment only for grading instead of improvement. Johansson et al. (2023) also note that continuous assessment can create workload pressure when it is not carefully designed.

Large class size: Large classes make it difficult for lecturers to give individual feedback, monitor progress and respond to each student's learning needs. Since formative assessment depends on diagnosis, evidence and response, its quality may reduce when one lecturer is responsible for too many learners. Black and Wiliam (2018) show that assessment is most useful when evidence from learners is actively used to guide teaching.

Delayed feedback: Feedback loses value when it is returned too late for students to correct their mistakes. In accounting, delayed feedback may allow students to carry errors from one topic to another, especially in linked topics such as journals, ledgers and financial statements. Brookhart (2008) and Nicol and Macfarlane-Dick (2006) emphasize

that feedback should guide improvement while learning is still active.

Inadequate teacher training: Some lecturers may view assessment mainly as testing and grading rather than as a tool for improving learning. Without training, they may find it difficult to design formative tasks, prepare rubrics, interpret responses and give constructive feedback. Motsoeneng and Moreeng (2024) emphasize feedback as an important assessment-for-learning strategy in accounting education.

Limited resources and technology: Effective formative assessment may require rubrics, worksheets, online quizzes, feedback platforms and record-keeping systems. Where such resources are weak, lecturers may depend only on handwritten tasks, which can slow down feedback and make data management difficult. King (2023) shows that online formative assessment can support accounting students' performance when properly used.

Students' attitude to feedback: Some students may ignore formative tasks because they are not heavily graded. Others may receive feedback without using it to improve their work. Carless and Boud (2018) warn that feedback has limited value if students lack the capacity or willingness to understand and act on it.

Examination-oriented learning: When lecturers and students focus mainly on final examinations, continuous feedback, correction and reflection may be treated as less important. This weakens formative assessment because students may study only for grades rather than for understanding. Johansson et al. (2023) caution that continuous assessment should be purposeful and manageable so that it supports learning rather than becoming an unnecessary burden.

Poor assessment data management:

Formative assessment generates information about students' strengths, weaknesses and common errors. If lecturers do not have a clear system for recording and using this information, assessment becomes another workload instead of a basis for instructional improvement. This problem shows the need for well-planned and manageable formative assessment practices.

Implications for Policy and Practice

The effective use of formative assessment in accounting education has implications for curriculum planning, teacher development, institutional support and classroom instruction. Since formative assessment supports feedback, engagement and learning improvement, it should be built into policy and practice rather than left to individual lecturers alone.

Implications for Educational Policy

Educational policymakers and curriculum planners should integrate formative assessment into accounting course guidelines. Accounting syllabi should specify feedback-based activities such as quizzes, reflective tasks, peer assessment, self-assessment and case-based exercises. This will make formative assessment a recognised part of teaching and learning rather than an optional classroom activity.

Teacher training and professional development should also give serious attention to formative assessment. Accounting lecturers need practical training on designing formative tasks, preparing rubrics, giving constructive feedback and using assessment evidence to adjust instruction. Institutions should also provide digital tools and learning resources that make formative

assessment manageable, especially in large classes.

Professional development should not be limited to general workshops. It should include practical demonstrations using accounting topics, sample rubrics, model feedback comments and examples of how lecturers can track common student errors. Such training will make formative assessment easier to apply in real accounting classrooms.

Assessment policy should create a better balance between formative and summative assessment. If final examinations remain the only major focus, lecturers and students may neglect the learning process that occurs before final assessment. A balanced assessment system should recognise continuous feedback, correction, reflection and improvement as essential parts of accounting education.

Policy support should also define how formative assessment will be monitored without turning it into another rigid examination requirement. The aim should be to promote meaningful feedback, not to multiply marks. Institutions should therefore provide guidance on quality, frequency and use of formative assessment evidence in accounting courses.

Practical Implications for Classroom Instruction

At the classroom level, accounting lecturers should use formative assessment evidence to guide instruction. Information from quizzes, assignments and oral questioning should be used to identify misconceptions and plan appropriate teaching responses. If students repeatedly make errors in ledger posting or financial statement classification, the lecturer should revisit the concept, provide worked examples and allow further practice.

Lecturers should develop a feedback culture in which comments are timely, specific and linked to learning objectives. Classroom instruction should also encourage self-assessment, peer assessment, group tasks and reflection so that students become more responsible for their learning. Differentiated instruction is also necessary because formative assessment reveals that students may need different forms of support.

This feedback culture should make students feel that mistakes are part of learning, especially in technical topics where errors are common. When feedback is respectful and specific, students are more likely to correct misconceptions and attempt difficult accounting tasks again. This can reduce fear of accounting and improve persistence in learning.

Conclusion

This paper has examined the role of formative assessment in the teaching and learning of accounting in tertiary institutions. The discussion shows that formative assessment is not merely a method of testing students but an instructional process that supports continuous feedback, diagnosis of learning difficulties, engagement, reflection and instructional adjustment. In accounting education, where students must understand concepts and apply procedures accurately, formative assessment helps lecturers identify weaknesses early and respond before final evaluation.

The paper also establishes that formative assessment improves teaching by helping lecturers make evidence-based decisions about lesson delivery, pacing, remediation and feedback. For students, it encourages participation, self-regulated learning, confidence and

deeper understanding of accounting principles. However, its effective use may be affected by large class sizes, limited time, inadequate resources, poor teacher training, weak feedback culture and excessive emphasis on summative examinations.

Therefore, formative assessment can transform accounting education from a teacher-centred and examination-oriented process into a learner-centred, practical and competency-driven experience. When properly implemented, it strengthens both teaching and learning by linking assessment evidence with instructional improvement and student progress.

The value of formative assessment therefore lies in its ability to make the learning process visible. When lecturers and students can see evidence of progress, misunderstanding and improvement, accounting education becomes more deliberate and less dependent on guesswork. This makes formative assessment a necessary part of quality teaching and meaningful learning in tertiary institutions.

Recommendations

Based on the discussion, the following are recommended: Educational policymakers should integrate formative assessment into accounting curriculum design by ensuring that course outlines, syllabi and assessment guidelines include feedback-based activities.

1. Teacher education programmes and tertiary institutions should train accounting on designing formative tasks, preparing rubrics, giving feedback and interpreting assessment electurersvidence.
2. Institutional managers should provide supportive learning environments through manageable class arrangements, instructional resources

and digital tools for quizzes, feedback and record keeping.

3. Accounting lecturers should make formative assessment a routine part of instruction through questioning, short tests, worked examples, peer review, reflective tasks and feedback sessions.
4. Students should be guided to take formative assessment seriously by using feedback, correcting errors, participating in self and peer assessment, and taking responsibility for learning progress.
5. Tertiary institutions should balance formative and summative assessment so that continuous feedback, correction and reflection are recognised as important parts of accounting education.

References

- Andrade, H., & Valtcheva, A. (2009). Promoting learning and achievement through self-assessment. *Theory into Practice*, 48(1), 12-19. doi:10.1080/00405840802577544
- Black, P., & Wiliam, D. (2018). Classroom assessment and pedagogy. *Assessment in Education: Principles, Policy & Practice*, 25(6), 551-575. doi:10.1080/0969594X.2018.1441807
- Brookhart, S. M. (2008). Feedback that fits. *Educational Leadership*, 65(4), 54-59. Retrieved from <https://www.ascd.org/el/articles/feedback-that-fits>
- Carless, D., & Boud, D. (2018). The development of student feedback literacy: Enabling uptake of feedback. *Assessment & Evaluation*

- in *Higher Education*, 43(8), 1315-1325.
doi:10.1080/02602938.2018.1463354
- Jackling, B., & Calero, C. (2006). Influences on undergraduate students' intentions to become qualified accountants: Evidence from Australia. *Accounting Education*, 15(4), 419-438.
doi:10.1080/09639280601011115
- Johansson, E., Kanapathippillai, S., Khan, A., & Dellaportas, S. (2023). Formative assessment in accounting: Student perceptions and implications of continuous assessment. *Accounting Education*, 32(6), 597-625.
doi:10.1080/09639284.2022.2091411
- King, D. (2023). Assessing the benefits of online formative assessments on student performance. *Journal of Learning Development in Higher Education*, (27), 1-15. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1447309.pdf>
- Lucas, U., & Meyer, J. H. F. (2005). Towards a mapping of the student world: The identification of variation in students' conceptions of, and motivations to learn, introductory accounting. *The British Accounting Review*, 37(2), 177-204.
doi:10.1016/j.bar.2004.10.002
- Mapuya, M., & Rambuda, A. M. (2022). Teaching approaches compatible with first-year accounting student teachers' learning styles: Theoretical and phenomenological perspectives. *International Journal of Higher Education*, 11(2), 120-134.
- Motsoeneng, T. J., & Moreeng, B. B. (2024). Evaluation of feedback as an assessment for learning strategy in accounting education. *Interdisciplinary Journal of Education Research*, 6, 1-16.
Doi:10.38140/ijer-2024.vol6.17
- Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education*, 31(2), 199-218.

ROLE OF AGRICULTURAL EDUCATION PROGRAMMES IN ENHANCING FOOD SECURITY AND YOUTH EMPLOYMENT AMONG AGRICULTURAL EDUCATION STUDENTS IN EKITI STATE UNIVERSITY

¹OGUNDELE Kehinde Wisdom; ²Prof. Jonathan O. OKE and ³OGUNNIYI Yinka Funmilayo

^{1,2&3}Department of Vocational and Technical Education, Faculty of Education, Ekiti State University, Ado-Ekiti.

¹ogundelekehindewisdom@gmail.com

Abstract

This study examined the role of agricultural education programmes in enhancing food security and youth employment among final-year Agricultural Education students in Ekiti State University, Ado-Ekiti. The descriptive survey research design was adopted. The population consist of 157 agricultural education students in 400 level in Ekiti State University. The total population was used as the sample through a census approach. A structured questionnaire, validated by experts, was used to collect data from the respondents. A pilot study was conducted using 20 respondents outside the study area but having the same characteristics, data collected was analyzed using Cronbach Alpha method and reliability ($r = 0.82$) was obtained. The instrument was administered to the respondents. Data collected were analyzed using descriptive statistics to answer the research questions and Pearson Product Moment Correlation analysis to test the hypotheses at 0.05 level of significance. Findings revealed that agricultural education programmes significantly equip youth with practical skills in farming and agribusiness, thereby enhancing their employability and income-generating potential. The study also established a positive correlation between participation in agricultural education and improved food security outcomes. The study concluded that strengthening agricultural education is both a strategic and sustainable pathway for addressing food insecurity and unemployment challenges in Nigeria. Based on these findings, the study recommends strengthening the integration of experiential learning into agricultural curricula, and introducing incentive schemes which will encourage the young graduates to take up farming as a profession. These measures are essential to harness agricultural education's potential to drive sustainable food systems and youth employment in Nigeria

Keywords: Agricultural education, food security, youth employment, experiential learning, agribusiness.

Introduction

Agricultural education equips individuals, particularly youths, with the skills and knowledge necessary to actively participate in agricultural production, agribusiness, and value chain development. According to Adeyanju, et al (2021), agricultural education refers to

the formal and informal training programmes designed to equip youths and aspiring agripreneurs with the necessary practical skills, technical knowledge, and entrepreneurial competencies required to improve agricultural productivity and performance. A well-structured

agricultural training programme significantly improves the performance and productivity of youth agripreneurs, enabling them to adopt innovative farming practices and business models. These educational initiatives provide both technical competencies and entrepreneurial mindsets, which are critical in addressing unemployment and food insecurity. The programme equips youth with practical skills essential for farming and agribusiness. Njura et al. (2021) highlight that teaching agriculture at the psychomotor domain fosters the development of hands-on competencies such as crop production techniques, livestock management, and farm resource planning.

These skills are directly transferable to real-life agricultural ventures, enabling youths to transition from theoretical understanding to productive engagement in the sector. Saina et al. (2012) further observe that capacity building through structured agricultural education strengthens the ability of young farmers to adopt modern farming methods, improve yield quality, and manage agribusiness enterprises effectively. The views of these authors suggest that the acquisition of practical agricultural skills and entrepreneurial competencies is essential for enhancing agricultural productivity and creating employment opportunities among youths. Such competencies are often developed through agricultural education programmes, including crop production training, livestock production training, farm practical experiences, agricultural entrepreneurship education, agribusiness development, and agricultural extension activities. These programmes provide students with opportunities to apply agricultural knowledge in practical settings, thereby contributing to

improved food security and increased prospects for youth employment.

Agricultural education programmes are structured learning activities designed to equip students with the knowledge, skills, attitudes, and practical experiences required for successful participation in agricultural production and agribusiness. These programmes include areas such as crop production, livestock production, agricultural entrepreneurship, agricultural extension, farm practical training, agribusiness education, and supervised agricultural experiences. According to Jones et al. (2020), agricultural education programmes provide learners with opportunities to acquire agricultural knowledge, practical skills, leadership abilities, and career-related competencies necessary for productive engagement in the agricultural sector. Through participation in these programmes, students develop the capacity to adopt improved agricultural practices, increase agricultural productivity, and contribute to sustainable food production. The competencies acquired through agricultural education programmes are therefore essential for enhancing food security by improving the quantity, quality, and sustainability of food production. Participation in these programmes enables students to establish agricultural enterprises, engage in value-added agricultural activities, and access emerging opportunities within the agricultural value chain. As a result, agricultural education programmes contribute to job creation, income generation, and increased food production, making them a viable strategy for enhancing food security and youth employment among agricultural education students.

Combining classroom instruction with experiential learning, these

programmes not only prepare students for self-employment in farming but also open opportunities for participation in the broader agricultural value chain. This synergy of knowledge and practice ensures that agricultural education students are well-positioned to contribute meaningfully to both food security and rural economic development. Consequently, the link between agricultural education and enhanced food security forms the bedrock for sustainable economic growth and societal development, creating an intersection between youth empowerment and national food security. It is therefore essential to understand how such programmes influence both employment outcomes and food security levels.

Food security, defined as the availability, accessibility, and affordability of nutritious food for all people at all times, remains a pressing challenge in many developing countries. Osabohien and Al-Faryan (2025) view food security as the state in which all individuals, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Accordingly, youth engagement in agriculture is a strategic approach to ensuring food security, as young people are more adaptable to modern technologies and innovative farming practices. Benson (2024) highlights that youth-focused agricultural education programmes have shown measurable impacts in improving food security systems and building resilience against shocks such as climate change and economic instability. However, this position is not universally supported. Osabohien and Al-Faryan (2024), found that although youth participation in agriculture is important, it had no significant impact on food security,

suggesting that structural constraints such as limited access to land, finance, and social protection may weaken the contribution of youth engagement to food security. Despite the growing recognition of agriculture as a solution to hunger, youth participation remains low due to inadequate skills, lack of incentives, and negative perceptions of farming. Addressing these challenges through targeted agricultural education can strengthen the link between youth engagement and sustained food availability. This connection between agricultural education and active youth participation becomes even more significant when viewed through the lens of employment creation and economic empowerment.

Youth employment, another critical concern, is closely tied to agricultural development. Bello et al. (2021) note that youth-in-agribusiness programmes have been instrumental in creating employment opportunities in rural and peri-urban areas, reducing poverty and migration to urban centers. Accordingly, youth employment is the engagement of young people in productive economic activities, whether self-employed or wage-employed, that provide sustainable income, improve their livelihoods, and contribute to national economic growth. In agribusiness, youth employment encompasses opportunities within the agricultural value chain, including production, processing, marketing, and service provision, aimed at reducing unemployment and underemployment among young people. The agricultural sector presents diverse employment prospects along its value chain, from primary production to processing and marketing. Geza et al. (2022) further assert that empowering young people through agricultural education not only

generates direct employment but also fosters self-reliance and reduces dependency on public sector jobs. In contrast, a recent study by Oyinbo et al. (2025) found that a substantial proportion of vocational agricultural education graduates eventually entered non-agricultural occupations because their training did not adequately match labour market demands, indicating that agricultural education alone may not guarantee sustainable employment outcomes without curriculum reforms and stronger industry linkages. By fostering entrepreneurship and agribusiness skills, agricultural education becomes a strategic driver of youth employment, directly influencing livelihood sustainability.

Despite its potential, youth involvement in agriculture faces challenges that hinder its contributions to food security and youth employment. These challenges include inadequate skill acquisition, poor programme implementation, unemployment among graduates, and low participation in agriculture. Haruna et al. (2019) identify challenges such as poor access to credit, inadequate infrastructure, and the perception of agriculture as a low-status occupation. These limitations suggest that without addressing both the financial and social image of farming, youth interest will remain low. Similarly, S. Adjognon et al. (2017) reported that limited access to productive resources, finance, and agricultural support services significantly constrains youth participation in agriculture across Sub-Saharan Africa, despite the sector's employment potential. Building on this concern, Giwu et al. (2024) emphasize that enhancing youth participation in agricultural enterprises requires interventions that combine skill development with enabling

environments, such as access to markets and modern technology. This view reinforces the idea that youth engagement cannot thrive in isolation from supportive systems and resources. In the same vein, Kote et al. (2024) note that fostering youth participation in agriculture is essential for achieving sustainable development, food security, and economic growth. However, a contrasting perspective was presented by Osabohien and Al-Faryan (2024), who found that youth participation in agriculture did not significantly improve food security in Nigeria, arguing that broader structural issues such as insecure land tenure, weak institutions, and inadequate social protection may limit the effectiveness of youth participation alone. Collectively, these findings suggest that the success of agricultural education programmes hinges on their ability to make agriculture appealing, profitable, and accessible to the younger generation.

Enhancing effective agricultural education programmes therefore requires not only classroom-based instruction but also experiential learning. Njura et al. (2021) propose that teaching agriculture at the psychomotor domain enhances practical skills that directly translate into productivity and income generation. This means that when students engage in activities such as crop cultivation, animal husbandry, and farm management, they gain confidence and competence that can be applied in real agricultural settings, thus improving their employability. Saina et al. (2012) support this by demonstrating that building farmers' capacity through agricultural education positively impacts food security outcomes in rural communities. Such outcomes are achieved because trained individuals are better equipped to adopt improved farming practices, manage resources efficiently, and

increase yields, ultimately contributing to community resilience. By integrating hands-on training with theoretical knowledge, youth can better connect agricultural education with tangible opportunities in farming and agribusiness. This integration of skills, employment, and food security outcomes underscores the central argument of this paper: that enhancing food security and youth employment through agricultural education programmes is not only possible but necessary for sustainable development in Nigeria and beyond.

Statement of the Problem

In many parts of Ekiti State, food insecurity remains a pressing challenge, with communities struggling to meet the nutritional needs of their growing populations. At the same time, youth unemployment rates continue to rise, leaving many youths without sustainable livelihoods. Despite the recognized potential of agriculture as a driver of both food security and employment, participation of youth in agricultural ventures appears to be limited. This situation raises concerns about whether existing agricultural education programmes are effectively equipping youths with the skills, knowledge, and motivation required to engage in farming and agro-business. Despite the increasing concerns about youth unemployment and food insecurity, limited empirical evidence exists on the contribution of agricultural programmes to address these challenges in Ekiti State. These uncertainties underscore the need to examine the role of agricultural education programmes in addressing food insecurity and unemployment among youth in Ekiti State.

Purpose of the Study:

The main purpose of this study is to find out the role of Agricultural Education programmes in enhancing food security and youth employment among Agricultural Education students in Ekiti State University, in Ekiti. Specifically, the study aims to:

1. Find out how Agricultural Education programmes equip Agricultural Education students with practical skills for farming and agro-business.
2. Examine how Agricultural Education programmes influence Agricultural Education students' involvement in agriculture.
3. Find out whether Agricultural Education programmes contribute to increased food security in local communities.

Research Questions

The following research questions were raised to guide the study.

1. How do agricultural education programmes equip Agricultural Education students with practical skills for farming and agro-business?
2. In what way do agricultural education programmes impact students participation in agricultural activities?
3. To what extent do agricultural education programmes contribute to increased food security in local communities?

Research Hypotheses

The following hypotheses were formulated and will be tested at 0.05 level of significance

1. There is no significant relationship between Agricultural Education programmes and the acquisition of practical skills for farming and

agribusiness among Agricultural Education students.

2. There is no significant influence of Agricultural Education programmes on students' involvement in agriculture.

Methodology

This study adopted the descriptive survey research design, which is considered appropriate for obtaining the opinions of respondents on the subject matter without manipulating any variables. The population for the study comprised all 157 final-year (400 level) students of Agricultural Education in Ekiti State University, Ado-Ekiti, as obtained from the departmental records for the 2024/2025 academic session. Due to the manageable size of the population, the entire 157 students were included in the study through a census approach, thereby eliminating the need for sampling. The instrument for data collection was a structured questionnaire developed by the researcher, divided into sections that addressed the research questions of the study. The questionnaire contained Likert-scale items (SD for Strongly Disagree, D for Disagree, A for Agree and SA for Strongly Agree). To ensure face and content validity, the instrument was reviewed by two experts from the Department of Vocational and Technical Education and one expert from the Department of Tests and Measurement in Ekiti State University. This was to ensure that the instrument measures what it purports to measure.

A pilot test of the questionnaire was conducted among 20 students of Agricultural Education from Bamidele Olumilu University of Science and Technology (BOUSTI) Ekiti State who were not part of the main study but have the same characteristics. The reliability of the instrument was established using the test-retest method, which yielded a coefficient of 0.82, indicating that the instrument was reliable for data collection. Data collection was carried out by the researcher with the assistance of two trained research assistants. The data collected were analysed using descriptive statistics such as percentages and means to answer the research questions, while Pearson Moment Correlation statistics were used to test the hypotheses at 0.05 level of significance. A decision rule was applied in which a mean score of 2.50 and above was taken as agreement, while mean scores below 2.50 were taken as disagreement.

Results

This section presents the results of the study based on the responses obtained from the administered questionnaire. The analysis is organised according to the three research questions. For each research question, the results are summarised in tabular form, followed by interpretation of the findings.

Research Question 1: How do agricultural education programmes equip students with practical skills for farming and agro-business?

Table 1: Agricultural Education programme and practical skills

S/N	Items	SA	A	D	SD	Mean	Decision
1	Agricultural education have improved my practical farming skills.	80	50	15	12	3.26	Agree
2	I have learned modern farming techniques through agricultural education	75	55	18	9	3.25	Agree
3	The programmes included cultural farming activities like planting, harvesting, or animal husbandry	70	60	15	12	3.20	Agree
4	I feel confident to start my own farming or agribusiness because of the training received	78	52	17	10	3.26	Agree
5	I can apply business principles in managing a farm or agro-business.	82	50	15	10	3.29	Agree

The results in Table 1 show that all the items had mean scores ranging from 3.20 to 3.29, which are above the decision mean value of 2.50. This indicates that respondents agreed that agricultural education programmes in Ekiti State University provide practical training in modern farming techniques, equip students with agribusiness management skills, and build their capacity to establish and manage

agricultural enterprises. The high mean values suggest strong agreement that these programmes significantly enhance hands-on competence in farming and agribusiness.

Research Question 2: In what way do agricultural education programmes impact students participation in agricultural activities?

Table 2: Agricultural Education programme and youth participation

S/N	Items	SA	A	D	SD	Mean	Decision
1	Agricultural education programmes have increased my interest in farming.	85	48	14	10	3.32	Agree
2	Agricultural education has increased my interest in pursuing agriculture as a career.	80	50	15	12	3.26	Agree
3	I plan to work in the agricultural sector after completing my education.	75	52	20	10	3.22	Agree
4	My peers have shown increased interest in agriculture after participating in the programme.	78	50	18	11	3.24	Agree
5	Agricultural education has exposed me to profitable opportunities in the agricultural sector	90	45	12	10	3.36	Agree

As shown in Table 2, the mean scores ranged from 3.22 to 3.36, all of which are above the 2.50 benchmark. This means that respondents agreed that agricultural education has positively influenced youth participation in agriculture by raising interest levels, improving attitudes toward farming as a

career, exposed them to profitable opportunities and motivating graduates to venture into agricultural-related activities. The consistently high mean values indicate that the programme serves as an effective motivator for youth engagement in agriculture.

Research Question 3: To what extent do agricultural education programmes contribute to increased food security in local communities?

Table 3: Contribution to food production

S/N	Items	SA	A	D	SD	Mean	Decision
1	Agricultural education programmes have helped increase food security in my community.	82	50	15	10	3.29	Agree
2	Agricultural education has increased my awareness of modern farming technologies that boost food supply.	80	52	15	10	3.28	Agree
3	Participation in agricultural education programmes has improved my capacity to manage soil fertility for better yields.	78	55	14	10	3.27	Agree
4	Agricultural education programmes have enhanced my ability to reduce post-harvest losses.	85	48	14	10	3.32	Agree
5	Agricultural education has improved my knowledge of sustainable farming practices	75	52	20	10	3.22	Agree

The results presented in Table 3 reveal mean scores between 3.22 and 3.32 all exceeding the decision mean value of 2.50. This indicates agreement that agricultural education contributes to increased food security by producing graduates who engage in farming, improve capacity to manage soil fertility for better yield, reduce post-harvest losses, and help improve knowledge of sustainable farming practices. The high mean scores reflect respondents' strong

perception that these programmes play a vital role in strengthening food security.

Test of Hypotheses

Hypothesis 1: There is no significant relationship between Agricultural Education programmes and the acquisition of practical skills for farming and agribusiness among Agricultural Education students.

Table 4: Pearson Moment Correlation analysis of Agricultural Education programmes and practical skills

Variables	N	Mean	SD	r_cal	r_tab(0.05, df=155)	Sig.	Decision
Agricultural Education Programmes & Practical Skills	157	3.84	0.52	0.682	0.159	0.000	Reject

The calculated correlation coefficient ($r_{cal} = 0.682$) is greater than the critical r value ($r_{tab} = 0.159$) at 0.05 level of significance with 155 degrees of freedom, indicating a significant positive relationship between Agricultural Education programmes and acquisition

of practical skills. Therefore, the null hypothesis that there is no significant relationship between Agricultural Education programmes and the acquisition of practical skills among Agricultural Education students is rejected. Hence, there is significant

relationship between Agricultural Education students and practical skills acquisition.

Hypothesis 2: There is no significant influence of Agricultural Education programmes on students involvement in agriculture.

Table 5: Pearson Moment Correlation analysis of Agricultural Education programmes and youth involvement

Variables	N	Mean	SD	r_cal	r_tab(0.05, df=155)	Sig.	Decision
Agricultural Education Programmes & Youth Involvement	157	3.76	0.49	0.654	0.159	0.000	Reject

The calculated correlation coefficient ($r_{cal} = 0.654$) is greater than the critical r value ($r_{tab} = 0.159$) at 0.05 level of significance with 155 degrees of freedom. This means agricultural education programmes have a significant influence on youth involvement in agriculture. Hence, the null hypothesis there is no significant influence of Agricultural Education programmes on students involvement in agriculture is rejected.

Discussion of Findings

The findings of this study revealed that agricultural education programmes significantly equip youth with practical skills for farming and agro-business. This supports the assertion of Njura, et. al (2021), who argued that teaching agriculture at the psychomotor domain facilitates skill acquisition, particularly in crop and livestock management, thereby enhancing food security. In line with this, the results of the present study showed that respondents demonstrated competence in farm planning, modern cultivation techniques, and small-scale agro-processing after participating in structured agricultural education activities. The study also found that practical exposure through school-based farms and agro-enterprises provided learners with hands-on experiences,

preparing them for self-reliance in agriculture. This aligns with Adeyanju et. al (2021), who reported that youth agricultural training programmes improve participants' technical knowledge, entrepreneurial capacity, and productivity. Similarly, Bello et al. (2021) observed that youth-in-agribusiness initiatives create employment opportunities by enabling participants to start and manage profitable agricultural ventures.

The results indicate that agricultural education does not only impact farming skills but also builds entrepreneurial competencies, such as record-keeping, marketing, and value addition. This corroborates the findings of Giwu et al. (2024), who emphasised that factors such as skill training, market linkages, and access to resources are key drivers of youth participation in agribusiness. The present study's findings suggest that when agricultural education programmes are well-structured, they promote both agricultural productivity and business development.

The findings also reveal that despite the positive outcomes, certain challenges such as inadequate funding, limited access to modern farming equipment, and insufficient linkage with agro-industries still hinder optimal skill transfer. This resonates with the

observations of Haruna et al (2019), who noted that poor infrastructure and lack of institutional support remain significant barriers to youth participation in agriculture. Importantly, the results align with Saina et al. (2012), who found that building rural farmers' capacity through secondary school agricultural education significantly improves food production and community resilience. This study extends that finding by showing that such programmes also foster occupational interest in agro-business among youths, positioning agriculture as a viable career choice. Moreover, Kote et al. (2024) highlighted that engaging young people in agriculture contributes to sustainable development goals related to poverty reduction, food security, and economic growth objectives that this study's results also support.

The discussion affirms that agricultural education programmes are instrumental in equipping youth with the practical and entrepreneurial skills necessary for farming and agro-business success. These findings not only validate the proposed hypotheses but also strengthen the argument for sustained investment in school-based agricultural initiatives to prepare the next generation of agripreneurs.

Conclusion

The findings of this study underscore the critical role of agricultural education programmes in equipping young people with the practical skills necessary for productive engagement in farming and agribusiness. The integration of theoretical knowledge with hands-on training in crop production, livestock management, and agro-enterprise skills significantly enhances graduates' readiness for self-employment and sustainable livelihoods. The results also reveal that such programmes contribute

meaningfully to food security by increasing the capacity of young people to adopt modern farming techniques, improve yields, and engage in value-adding agricultural ventures. Furthermore, agricultural education fosters entrepreneurial mindsets that enable graduates to create employment opportunities, not only for themselves but also for others, thereby reducing youth unemployment. The study concludes that strengthening agricultural education is both a strategic and sustainable pathway for addressing food insecurity and unemployment challenges in Nigeria.

Recommendations

Based on the findings, the following recommendations are proposed:

1. Agricultural curricula should allocate more time and resources to experiential learning activities, such as school farms, demonstration plots, and agribusiness simulations by establishing partnerships between universities, agricultural extension services, and agribusiness firms to provide students with supervised industrial training and field exposure.
2. Courses on agribusiness management, marketing, and value addition should be integrated into agricultural programmes to prepare students for self-employment. This can be achieved by organizing entrepreneurship boot camps, business plan competitions, and mentorship schemes in collaboration with industry experts.
3. There should be deliberate efforts to connect graduates with financing, input suppliers, and market outlets to enable them to start viable agribusinesses by creating university-led agribusiness

incubation centres that provide start-up grants, low-interest loans, and access to cooperative marketing systems.

4. Governments should introduce incentive schemes, such as tax holidays, land allocation, and subsidised inputs, to encourage young graduates to take up farming as a profession.

References

- Adeyanju, D., Mburu, J., & Mignouna, D. (2021). Youth agricultural entrepreneurship: Assessing the impact of agricultural training programmes on performance. *Sustainability*, 13(4), 1697.
- Adjognon, G. S., Liverpool-Tasie, L. S. O., & Reardon, T. (2017). Agricultural input credit in Sub-Saharan Africa: Telling myth from facts. *Food Policy*, 67, 93–105.
- Bello, L. O., Baiyegunhi, L. J. S., Mignouna, D., Adeoti, R., Dontsop-Nguezet, P. M., Abdoulaye, T., ... & Awotide, B. A. (2021). Impact of youth-in-agribusiness program on employment creation in Nigeria. *Sustainability*, 13(14), 7801.
- Benson, C. N. (2024). A State-of-the-Evidence Review: *Impacts of Youth Agricultural Education Programs on Global Poverty, Resilience, and Food Security Results* (Doctoral dissertation).
- Geza, W., Ngidi, M. S. C., Slotow, R., & Mabhaudhi, T. (2022). The dynamics of youth employment and empowerment in agriculture and rural development in South Africa: A scoping review. *Sustainability*, 14(9), 5041.
- Giwu, O., Mdoda, L., Ntlanga, S. S., & Loki, O. (2024). Evaluating factors influencing youth participation in agricultural enterprises: Implications for food security and agribusiness. *The Southern African Journal of Entrepreneurship and Small Business Management*, 16(1), 903.
- Haruna, O. I., Asogwa, V. C., & Ezhim, I. A. (2019). Challenges and Enhancement of Youth Participation in Agricultural Education for Sustainable Food Security. *African Educational Research Journal*, 7(4), 174-182.
- Jones, S., Doss, W., & Rayfield, J. (2020). Examining the status of middle school agricultural education programs in the United States. *Journal of Agricultural Education*, 61(2), 41-56.
- Kote, P., Yallapa, M., Jabeen, A., Srinatha, T. N., Prabhavathi, S. J., Ramasamy, M., ... & Malathi, G. (2024). A scoping review on youth participation in agriculture: sustainable development, food security, and economic growth. *J Sci Res Reports*, 30(5), 947-58.
- Njura, H. J., Kaberia, I. K., & Taaliu, S. T. (2021). Teaching secondary school agriculture at the psychomotor domain: a conceptual framework for enhanced skills development for food security. *The Journal of Agricultural Education and Extension*, 27(2), 111-131.

- Ojo, T. O., Bello, A., Mizik, T., et al. (2025). Rural non-agricultural employment: Implications on food and nutrition security among youth households in Nigeria. *Frontiers in Sustainable Food Systems*, 9, Article 1691586.
- Osabohien, R., & Al-Faryan, M. A. S. (2025). Youth in agriculture and food security in Nigeria. *International Journal of Social Economics*, 52(4), 501-514.
- Saina, E. K., Rono, P. K., Kipsat, M. J., Sulo, T., & Kathuri, N. J. (2012). Food security in Kenya: the impact of building rural farmers' capacity through agricultural education in secondary school. *Journal of Emerging Trends in Educational Research and Policy Studies*, 3(3), 338-345.
- Ugwaka, K. A. (2025). Integrating digital agriculture into the undergraduate agricultural education programmes in Nigerian universities for vocational development. *Unizik Journal of Educational Research, Science and Vocational Studies*, 2(1).

FUNDING OF BUSINESS EDUCATION PROGRAMME FOR ECONOMIC EMPOWERMENT IN DEVELOPING NATIONS

Taiwo Esther ARIBATISE and Dr. Matthew Adebayo AINA

Department of Vocational and Technical Education, Ekiti State University, Ado Ekiti

Email: taiwoaribatise75@gmail.com

Abstract

This study examined funding of business education programme for economic empowerment in developing nations. Business education in developing nations has resulted in obsolete curricula, inadequate facilities, and a shortage of qualified personnel, thereby limiting the programme's proven capacity to drive entrepreneurship and economic empowerment. As a Technical and Vocational Education and Training (TVET) component, business education provides systematic training in business theory and practice including accounting, marketing, and entrepreneurship. TVET develops employable graduates, fosters job creation, and updates skills for digital/global economies. Economic empowerment expands access to resources, financial decision-making, and skills for sustainable livelihoods and self-sufficiency. This type of programme requires income opportunities, asset control, and financial literacy. In developing nations, underfunding of business education limits equipment and personnel, reducing graduates' capacity for economic independence and job creation. Business education empowers economies by building entrepreneurial skills, professionalizing businesses, enhancing financial literacy, and driving technology adoption. Adequate funding provides facilities, competent faculty, and industry ties that foster entrepreneurship and economic empowerment. The study revealed that business education requires funding for competent staff, computer systems, reliable power, software-based labs, student tuck shops, and model offices to enhance practical skills, employability, and economic empowerment. Inadequate funding from government, TETFund, IGR, and fees compromises business education infrastructure, delivery, and economic empowerment outcomes. The study concluded that funding remains the single most decisive factor determining whether Business Education can fulfil its economic empowerment mandate in developing nations, since quality instruction, modern facilities, and competent faculty are all ultimately dependent on the availability of adequate financial resources. It was therefore recommended that governments should progressively increase budgetary allocations to business education, establish dedicated funding mechanisms, pursue structured public-private partnerships and invest in modern instructional technology.

Keywords: Business Education, Economic Empowerment, Developing Nation, Entrepreneurship

Introduction

Business education is one of the programmes under Technical and Vocational Educational Training (TVET) aimed at equipping recipients with business skills that are expected to enhance ones participation in business environment. It is a programme that is

expected to develop human with essential entrepreneurial skills, financial literacy, and management competencies necessary for navigating the complexities of modern economies. In developing nations, such as Nigeria, Ghana, Togo, Sierra Leone where unemployment rates remain persistently high and economic

opportunities are often limited, business education is expected not to be merely an academic pursuit but a programme for national development. The programme encompass a wide spectrum of learning experiences, from vocational training in basic business operations to advanced studies in business related disciplines such as accounting, marketing and office technology and management, all designed to produce graduates who can either create employment through entrepreneurship or contribute meaningfully to existing enterprises (Ubulom & Enyekit, 2022). The transformative potential of business education lies in its dual capacity to foster individual economic independence while simultaneously strengthening the broader economic infrastructure through the creation of skilled workforces.

This may enhance economic empowerment of individual beneficiaries and the nation as a whole. In the context of developing nations like Nigeria, where informal economic activities dominate and access to formal employment remains limited, business education provides the knowledge and skills necessary for individuals to formalize their economic activities, scale their operations, and contribute more effectively to gross domestic product (Mfor, Uke, & Umo, 2016). Business Education programme's emphasis on practical skills such as bookkeeping, marketing, business planning, office technology and management and financial management directly addresses the capacity gaps that often prevent small-scale entrepreneurs in developing economies from transitioning to sustainable, growth-oriented enterprises (Amesi & Nnadi, 2015). The potential of business education programme to drive economic empowerment seems to remain largely unrealized in many

developing nations due to chronic underfunding and resource constraints that compromise the quality and of this programme.

In developing nations across Sub-Saharan Africa, South Asia, and Latin America, where unemployment rates remain persistently high and economic opportunities are often limited, business education programme is expected to represent a strategic intervention for national development. Business Education programme encompasses learning experiences in vocational training, basic business operations and advanced studies in business-related disciplines, designed to produce graduates who can either create employment through entrepreneurship or contribute meaningfully to existing enterprises. Evidence from multiple developing economies demonstrates that nations investing substantially in quality business education programmes consistently show higher rates of entrepreneurship, innovation, and sustainable economic growth, with countries like Rwanda, Vietnam, and Costa Rica serving as notable examples of how strategic educational investments can catalyze economic transformation (Ndofirepi, Farinloye, & Mogaji, 2023; Obeta, 2024). Report from these countries suggest that business education be viewed not as an expense but as a high-return investment in national economic infrastructure.

The relationship between business education and economic empowerment extends beyond national borders, representing a global development priority recognized by international organizations including the United Nations, World Bank, and International Labour Organization. Economic empowerment through business education has the enablement to create a

multiplier effect across developing economies, where educated individuals establish enterprises that generate employment, stimulate local economies, and contribute to the tax base that funds further development initiatives (Ahmad, Ahmad, & Mushtaq, 2023). The programme's emphasis on practical skills such as bookkeeping, marketing, business planning, digital literacy, and financial management directly addresses capacity gaps that prevent small-scale entrepreneurs from transitioning to sustainable, growth-oriented enterprises, with evidence from Ghana, Uganda, Indonesia, and Brazil confirming that targeted business education interventions lead to measurable improvements in business performance and household income levels (Baporikar, 2022; Tende, Aube, & Shu, 2023). From the foregoing, one will observed that there is a close relationship with business education programme and economic empowerment. The relationship between business education and economic empowerment is both direct and profound, as nations that invest substantially in quality business education programmes consistently demonstrate higher rates of entrepreneurship, innovation, and sustainable economic growth which may only be achievable through adequate funding.

Adequate funding is essential for maintaining current curricula that reflect contemporary business practices, providing modern instructional facilities and technology, attracting and retaining qualified educators, and ensuring quality programme for students from diverse socioeconomic backgrounds. Without sufficient financial investment, business education discipline will continue to struggle to bridge the gap between theoretical instruction and practical

application, often producing graduates whose skills will not align with market demands or who may lack the entrepreneurial confidence to establish viable enterprises of their own. The funding challenge is noticeable in developing nations where competing priorities for limited public resources often result in education sectors receiving inadequate budgetary allocations, creating a vicious cycle where poor educational outcomes perpetuate economic underdevelopment, which in turn may limit the resources available for educational development.

Concept of Business Education

Business education refers to the systematic instruction and training designed to impart knowledge, skills, attitudes, and competencies necessary for effective participation in commercial and entrepreneurial activities. As a component of Vocational and Technical Education and Training (TVET), Business Education forms an essential element of comprehensive education systems, providing learners with commercially-focused competencies, practical operational abilities, financial management expertise, and sales proficiency that enable graduates to effectively function within their economic contexts (Aina & Onajite, 2023). Business Education encompasses both the theoretical understanding of business principles and the practical application of these principles in real-world economic contexts. According to Business Education is essentially the deliberate cultivation of a practical, problem-solving mindset around how money, organizations, and opportunity actually work in the real world. Business education programme typically covers diverse areas including accounting, marketing, management,

entrepreneurship, economics, finance, and information technology as applied to business operations. The primary objective is to develop individuals who can function effectively as employees, managers, entrepreneurs, or business owners in various economic sectors.

Business education serves multiple purposes within an educational system and the broader economy. The National Policy on Education (NPE) (2013) state that, it prepares individuals for gainful employment in the business sector by providing them with specific technical skills and general business acumen. It inculcates entrepreneurial mindsets and capabilities, encouraging graduates to create their own employment opportunities rather than solely seeking positions in existing organizations. Furthermore, business education promotes economic literacy among citizens, enabling them to make informed financial decisions, understand market dynamics, and participate more effectively in economic activities. This educational approach therefore bridges the gap between academic learning and workplace requirements, emphasizing hands-on experiences, case studies, internships, and practical projects that simulate real business environments.

Globally, business education has evolved beyond traditional bookkeeping and secretarial skills to embrace technological innovation like digital marketing, e-commerce, data analytics, and sustainable business practices (Atah, & Alabi, 2025). The current business education programme curriculum by National Universities Commission (2024/2025) under the Core Curriculum and Minimum Academic Standards for Education recognizes the importance of adaptability, critical thinking, ethical decision-making, and cross-cultural competence in preparing graduates for

increasingly complex and interconnected markets. Business education curriculum planners are expected to respond dynamically to changing economic conditions, emerging industries, and evolving business practices, with the aim of ensuring that graduates possess competencies that remain relevant to the demands of today's world. For developing nations, this kind of adaptability can be particularly crucial, as it may enable business education to address specific local economic challenges while also preparing students to compete in global markets.

Concept of Economic Empowerment

Economic empowerment is the process of enhancing ones' access to economic resources, making financial decisions, and also securing sustainable livelihoods. Economic empowerment is a multidimensional process of enhancing individuals' and communities' capacity to participate effectively in economic activities, make informed financial decisions, and achieve sustained improvement in their economic well-being and quality of life (Reinhart, Trebesch & Christoph, 2016). It encompasses several interconnected dimensions including access to income-generating opportunities, ownership and control of assets, financial literacy and management capabilities, decision-making power over economic resources, and the ability to participate in markets as producers, consumers, or entrepreneurs. Economic empowerment involves qualitative transformation of individuals' economic capabilities, enabling them to access and control economic resources, develop marketable skills, and participate meaningfully in productive economic activities (World Bank, 2023). Thus, it encompasses the expansion of economic

opportunities, the enhancement of entrepreneurial capabilities, the improvement of financial literacy, and the creation of an enabling environment for individuals to achieve economic independence and contribute to collective prosperity. Economic empowerment is fundamentally concerned with how individuals and communities transform from positions of economic vulnerability and dependence to states of economic self-sufficiency, productivity, and active participation in wealth creation.

The concept of economic empowerment goes beyond mere income generation, but also the agency, knowledge, and structural opportunities to use available resources effectively for sustainable advancement. Economic empowerment also requires the development of confidence and self-efficacy that motivates individuals to pursue economic opportunities, the cultivation of networks and social capital that facilitate business development, and the acquisition of technological capabilities that enhance productivity and competitiveness (Onuigbo, 2021). For individuals in developing nations, achieving economic empowerment means breaking cycles of poverty, moving from subsistence activities to productive entrepreneurship, building personal economic assets, and creating sustainable livelihoods for themselves and their families.

In a bid to improve per capital of individuals through the production of employable business education graduates, skills were inculcated in the areas of accounting, marketing, OTM and entrepreneurship. The process of acquiring these skills requires provision of learning equipments such as computer sets, office technology and management laboratories model offices, tuck shops,

among others. This will enable the recipients of the programme to be self-reliant and even become employers of labour instead of searching for scanty white-collar jobs. Experience has shown that most of the expected instructional equipment seems not to be readily available in their institutions to deliver the appropriate saleable skills due to insufficient fund in installing the programmes.

This persistent funding shortfall has, in turn, drawn the attention of scholars who have examined funding as a critical determinant of how effectively business education can fulfil its economic empowerment mandate. Different business education scholars such as Adegoke and Musa (2022), Chukwuemeka and Ibrahim (2024), and Eze and Nwaokolo (2023) concurred that funding is a decisive factor in using business education to drive economic empowerment across developing countries. They maintained that diversifying revenue streams through alumni giving, endowment investments, public-private partnerships, and internally generated revenue strengthens business education delivery. According to them, such financing approaches equip graduates with entrepreneurial competencies for self-employment and SME growth while creating a stable funding base that is less affected by government budget changes.

Expected Roles of Business Education Programme for Economic Empowerment

Business education programmes is expected to play an important role in national economic empowerment by producing graduates equipped with business entrepreneurial skills that are necessary to achieve economic independence and contribute to the

nation's evolving economy. Nigeria, as Africa's most populous country and largest economy, faces significant challenges including high unemployment rates, particularly among youth, widespread economic vulnerability, and limited access to formal employment opportunities. Business education programme suppose to address these challenges by empowering individuals to establish and manage their own enterprises across diverse sectors, from agriculture and manufacturing to services and technology (Mohammed & Adamu, 2019). The programme's emphasis on entrepreneurship has become increasingly critical as traditional employment opportunities in the public and formal private sectors fail to absorb the growing number of graduates entering the labor market annually (Oladunjoye, 2016). By fostering self-employment capabilities and entrepreneurial confidence, business education will transform economically dependent individuals into economically independent entrepreneurs, thereby multiplying the empowerment impact of educational investment.

The contribution of business education to Nigerian economic empowerment extends beyond individual entrepreneurship to encompass the professionalization of existing businesses and the enhancement of economic capabilities across communities (Okoye, 2016). Nigeria's economy is characterized by a large informal sector where individuals often operate businesses with limited business knowledge, inadequate record-keeping, and minimal understanding of growth strategies and financial management. Business education promotes financial literacy and economic awareness among citizens, enabling better personal financial decisions, improved business

management, and more effective participation in economic activities, which collectively strengthen individual and community economic empowerment (Onajite & Fadumiye, 2016). Furthermore, business education graduates bring professional management practices to family businesses and small enterprises, introducing systematic approaches to financial management, marketing, human resources, and strategic planning. This professionalization enhances business sustainability, improves income generation, facilitates economic growth, and enables individuals to achieve greater economic security and prosperity.

Business education also serves as a vehicle for technological adoption and innovation in Nigeria's economy, particularly as the curriculum increasingly incorporates digital tools, e-commerce, and technology-enabled business models that create new pathways for economic empowerment (Olori & Olori, 2018). Nigerian business education graduates are at the forefront of the nation's growing technology sector, establishing startups that leverage digital platforms to address local challenges in financial services. These technology-driven enterprises not only empower founders economically but also create employment opportunities that empower others, expand economic participation, and improve service delivery across sectors. Additionally, business education programmes is expected to contribute to the development of an empowered entrepreneurial class capable of accessing investment opportunities, implementing best practices, and positioning their enterprises to compete in regional and global markets. The programme's focus on ethics and responsible business practices may also contributes to building sustainable enterprises that generate

long-term economic empowerment for entrepreneurs, their employees, and their communities.

Importance of Funding on Business Education Programmes for Economic Empowerment

Adequate funding of business education programmes is fundamentally important to Nigeria's economic empowerment because it directly influences the quality, relevance, and impact of graduates who will achieve economic independence, establish enterprises, and facilitate community economic transformation (Nwokocha & Nnaka, 2019). When business education programmes receive sufficient funding, they can maintain current curricula that reflect contemporary business practices, emerging technologies, and evolving market demands, ensuring that graduates possess skills that are immediately applicable in real-world business contexts and enable them to pursue economic empowerment effectively.

Proper funding enables the acquisition and maintenance of modern instructional facilities, computer laboratories with current business software, practical training equipment, and well-stocked libraries with access to current business literature and research databases (Amesi, 2018). These resources transform business education from theoretical instruction to experiential learning where students engage with the tools, technologies, and methodologies they will encounter in their entrepreneurial pursuits and professional lives. The quality advantage that adequate funding provides translates directly into graduate employability and entrepreneurial success, as well-funded programmes produce graduates who are confident, competent, and capable of achieving economic independence and

empowering others through employment creation in domestic and international markets.

The importance of funding extends to faculty development and retention, which are critical determinants of educational quality in business programmes (Amalu & Umeano-Enemuoh, 2016). Adequate funding enables institutions to offer competitive salaries that attract and retain experienced business professionals and accomplished academics who bring both theoretical expertise and practical industry experience to the classroom. When properly funded, business education programmes can invest in faculty professional development through conference attendance, industry attachments, research opportunities, and advanced training in specialized areas such as digital marketing, data analytics, fintech, and international business (Salau, Worlu, Osibanjo, Adeniji, Atolagbe & Salau, 2020). Well-compensated and continuously developed faculty members are more motivated, deliver higher quality instruction, engage in relevant research, and maintain stronger connections with the business community, all of which enhance the educational experience and empower students with the knowledge and skills necessary for economic success. The retention of quality tutors also provides institutional continuity and enables the development of specialized expertise within departments, creating centers of excellence that can address specific economic empowerment challenges facing Nigerian citizens and communities.

Adequate funding enables business education programmes to establish and maintain critical linkages with the business community through internship programmes, industry

advisory boards, guest lectures from business practitioners, collaborative research projects, and business incubation centers that support graduate entrepreneurship and economic empowerment (Abasilim, 2017). These connections ensure that business education remains responsive to empowerment needs and that graduates develop professional networks that facilitate their transition from education to economic independence through employment or entrepreneurship.

Well-funded programmes can also provide financial support for student entrepreneurial ventures through seed funding, mentorship programmes, and access to business development services, directly converting educational investment into economic empowerment, wealth creation, and employment generation. The establishment of business incubators and entrepreneurship centers within educational institutions, which requires substantial funding, creates ecosystems that support graduate enterprises beyond the classroom, providing ongoing technical assistance, networking opportunities, and access to potential investors (Iyortsuun, 2017). This comprehensive approach to business education, enabled by adequate funding, maximizes the economic empowerment impact of educational investment by ensuring that graduates not only possess knowledge but also have the practical support necessary to apply that knowledge in economically productive ways that transform their lives and communities.

Financial Needs in Business Education Programme

• Employment of Adequate and Qualified Personnel (Academic Staff and Non-Academic Staff/Technologists)

The availability of qualified academic staff and technical personnel is fundamental to delivering quality business education programmes. Business education requires instructors who possess both theoretical knowledge and practical industry experience to effectively bridge the gap between classroom learning and real-world business applications. However, many institutions in developing nations struggle to attract and retain qualified business educators due to inadequate remuneration, poor working conditions, and limited professional development opportunities (Ezeani & Oladele, 2013). The shortage is particularly acute in specialized areas such as accounting, entrepreneurship, and office technology management, where qualified professionals often prefer higher-paying positions in the private sector. Without sufficient investment in competitive salaries and continuous professional development programmes, business education institutions cannot build the human resource capacity necessary to produce competent graduates capable of driving economic empowerment.

• Acquisition of Computer Sets

In business environment, digital literacy and computer proficiency are non-negotiable competencies for any business education graduate. Computer systems are essential for teaching practical skills in areas such as computerized accounting, digital marketing, data analysis, and e-commerce, yet many business education programmes operate with grossly

inadequate computer-to-student ratios (Eze, Chinedu-Eze, & Bello, 2018). The challenge extends beyond initial acquisition costs to include ongoing expenses for software licenses, hardware upgrades, maintenance, and replacement of obsolete equipment. Many institutions rely on outdated computer systems that cannot run current business software applications, thereby limiting students' exposure to industry-standard tools and technologies. Adequate investment in modern computer infrastructure is essential for ensuring that business education graduates possess the technological competencies required in today's digitalized economy.

- **Provision of Stable Source of Power**

Reliable electricity supply is a critical requirement for effective business education delivery, particularly in developing nations where power infrastructure remains unreliable. Consistent power supply is essential for operating computer laboratories, maintaining internet connectivity, running office equipment, and creating conducive learning environments (Akuegwu, Nwi-ue, & Anijaobi-Idem, 2012). Frequent power outages disrupt practical sessions, damage expensive equipment, and reduce the overall quality of instructional delivery. Without dependable power supply, investments in computers and laboratory equipment cannot yield their intended benefits. Establishing stable power infrastructure through grid connections, backup systems, or renewable energy solutions requires substantial capital investment but is indispensable for maintaining functional business education programmes.

- **Provision of Laboratories with Different Software Packages**

Specialized business education laboratories equipped with current software packages are essential for providing students with hands-on experience in various business functions. These laboratories should include accounting software such as QuickBooks and Sage, Microsoft Office Suite, digital marketing tools, and business planning applications (Okwuanaso & Nwazor, 2013). However, the establishment and maintenance of such laboratories require significant financial investment for software acquisition, licensing fees, regular updates, and technical support. Many business education programmes operate without adequate laboratory facilities or rely on outdated software versions that do not reflect current industry practices. Adequate funding for establishing well-equipped laboratories with industry-standard software is crucial for ensuring that graduates possess practical competencies that enhance their employability and entrepreneurial capabilities.

- **Establishment of Tuck Shop**

A tuck shop or student-run store serves as a practical training facility where business education students can apply theoretical knowledge in real business settings, developing entrepreneurial skills, customer service capabilities, inventory management competencies, and financial management practices (Amesi & Nnadi, 2015). This experiential learning environment allows students to understand business operations firsthand, including purchasing, pricing, sales transactions, and record-keeping in authentic contexts. The establishment of a functional tuck shop requires initial capital for infrastructure development, inventory procurement, and equipment

acquisition. Investment in establishing tuck shops as integral components of business education programmes represents a relatively modest expenditure that yields substantial educational benefits and practical skill development.

- **Acquisition of Model Office**

A model office is an essential instructional facility that simulates real office environments, enabling business education students to practice office procedures, administrative tasks, business communications, and office technology applications in realistic settings. This facility should be equipped with standard office furniture, communication equipment, filing systems, and modern office technology tools that replicate contemporary workplace environments (Ubulom & Enyekit, 2022). Model offices provide students with opportunities to develop professional workplace behaviors and apply office management principles in contexts that mirror actual employment situations. Many business education programmes operate without adequate model office facilities or utilize outdated office equipment that does not reflect current workplace standards. Funding for establishing realistic model office environments is crucial for bridging the gap between classroom instruction and workplace readiness.

Regular Sources of Funding Business Education Programme

The funding of business education programmes in Nigeria operates through a multi-source framework that includes government budgetary allocations, internally generated revenue by educational institutions, private sector contributions, international donor support, and student fees, though the

adequacy and reliability of these sources remain subjects of ongoing concern (Njoku, 2014). While this multi-source arrangement looks comprehensive, it appears that the actual flow of funds from most of these sources is neither consistent nor sufficient to meet the practical demands of a skills-based programme like business education, which depends heavily on functional equipment, model offices, and up-to-date technology rather than classroom instruction alone.

Government funding, channeled through federal and state ministries of education to tertiary institutions, polytechnics, and colleges of education, constitutes the primary source for public institutions offering business education programmes. The Tertiary Education Trust Fund (TETFund), charged with imposing, managing, and disbursing a 2% education tax from the assessable profit of companies registered in Nigeria, represents another government mechanism for funding educational development, including business education facilities and programmes (TETFund, 2011). However, this public funding has historically been inadequate and inconsistent, often falling short of budgetary benchmarks such as the UNESCO recommendation of allocating 15-20 percent of national budgets to education, which Nigeria has rarely achieved in recent decades, with allocations typically between 6-10 percent (Odigwe & Owan, 2019).

Internally generated revenue from tertiary institutions has become an increasingly important funding source for business education programmes as institutions seek to supplement insufficient government allocations (Amoor, 2010). Universities and polytechnics generate funds through student fees, consultancy services, commercial ventures, facility rentals, and

continuing education programmes. Many business education departments particularly benefit from executive education programmes, professional certification courses, and consultancy services provided to private and public sector organizations, leveraging faculty expertise to generate income while maintaining relevance to industry needs (Anioke, 2013).

Despite the funding sources, Business Education programmes in Nigeria face chronic resource constraints that manifest in inadequate infrastructure, outdated teaching equipment, insufficient library resources, limited access to current business software and technology, and challenges in attracting and retaining qualified faculty who are often lured to the private sector by higher remuneration (Adedeji, 2019). The funding gap has widened as student enrollments have increased without corresponding increases in resources, resulting in overcrowded classrooms, high student-to-teacher ratios, and limited opportunities for the practical, hands-on learning experiences that are essential for effective business education. Research and innovation within business education departments suffer particularly from funding shortfalls, as resources for faculty research, conference participation, industry engagement, and curriculum development remain scarce. This funding observed inadequacy has create a disconnect between business education outcomes and empowerment objectives, because the programme lacks the required resources to update curricula, acquire modern teaching aids, establish business incubators, and maintain industry partnerships that would ensure graduates possess the competencies necessary for economic empowerment.

Alternative Sources of Funding Business Education Programme

Beyond the traditional government allocations and internally generated revenue, business education programmes in Nigeria require diversified funding streams to address persistent resource gaps and enhance programme quality for economic empowerment (Adeyemi & Sanni, 2021). Alternative funding sources represent innovative approaches that can supplement conventional financing mechanisms and ensure sustainability of business education delivery.

Public-Private Partnership (PPP)

arrangements: PPP offer significant potential for funding business education infrastructure and programme development. Through structured partnerships, private sector organizations can adopt specific business education departments, sponsor laboratory facilities, provide modern equipment, or fund curriculum development initiatives in exchange for priority access to skilled graduates and collaborative research opportunities (Abasilim, 2017). Technology companies, financial institutions, manufacturing firms, and service organizations benefit from contributing to business education as it creates a pipeline of qualified professionals while simultaneously fulfilling corporate social responsibility objectives. These partnerships can take various forms including endowment of professorships, establishment of research chairs, sponsorship of entrepreneurship competitions, provision of internship stipends, and funding of specialized training programmes that align with industry needs.

Alumni contributions and endowment funds: This represents another viable alternative funding option

that is still underutilized in Nigeria's business education programmes. Graduates who achieve economic stability through entrepreneurship or career growth can be engaged via alumni networks to financially support their institutions. Funds raised can be placed in endowment accounts that yield returns to finance programme operations, offer scholarships, upgrade infrastructure, and strengthen faculty development (Adeyemi & Sanni, 2021). Creating organized alumni engagement initiatives, acknowledging major contributors, and maintaining transparency in fund management can encourage consistent alumni backing. This approach builds a reliable long-term funding stream that is less affected by government budget changes.

International development agencies and philanthropic foundations: This may offer grant funding opportunities specifically targeting educational development in developing nations. Organizations such as the World Bank, African Development Bank, USAID, British Council, and various international foundations regularly provide competitive grants for educational innovation, capacity building, technology integration, and entrepreneurship education initiatives. Business education programmes can access these resources by developing compelling proposals that demonstrate alignment with donor priorities such as youth empowerment, women's economic participation, digital skills development, and sustainable entrepreneurship. Successful grant acquisition requires institutional capacity for proposal writing, project management, monitoring and evaluation, and compliance with donor requirements—capabilities that many business education departments need to develop.

Revenue-generating commercial activities: The business education departments can provide supplementary funding while offering practical learning opportunities for students. Departments can establish consultancy units that provide business advisory services, market research, accounting services, and management training to small and medium enterprises, generating income while giving students real-world experience. The operation of student-managed enterprises such as production units, service centers, and digital marketing agencies can simultaneously serve pedagogical purposes and income generation. Executive education programmes, professional certification courses, and continuing education offerings targeted at working professionals represent additional revenue streams that leverage faculty expertise and institutional facilities during off-peak periods. These commercial activities require initial investment and professional management but can provide sustainable funding that reduces dependence on government allocations (Anioke, 2013). This approach seems to hold particular promise for business education precisely because, unlike many other disciplines, its curriculum already mirrors the commercial activities being proposed, making the transition from classroom theory to income-generating practice a fairly natural one.

Crowdfunding and digital fundraising platforms: This represents emerging alternative funding mechanisms particularly suited to specific projects with clear deliverables and community appeal. Business education programme can use online platforms to raise funds for specific needs such as computer laboratory establishment, library resources acquisition, entrepreneurship center development, or

student venture capital funds. Successful crowdfunding requires compelling storytelling, transparent accountability, regular communication with donors, and demonstration of tangible impact. This approach is particularly effective for mobilizing small contributions from large numbers of supporters including alumni, parents, community members, and socially conscious individuals who value educational development and economic empowerment.

Corporate sponsorships and equipment donations: This may provide alternative means of acquiring necessary resources without direct cash outlays. Technology companies regularly upgrade their systems and may donate functional but replaced computers and office equipment to educational institutions. Financial institutions can sponsor student scholarships, software companies can provide educational licenses at reduced costs, and telecommunications companies can support internet connectivity. Establishing a dedicated resource mobilization unit within business education departments or institutions can systematically identify, approach, and manage corporate partners willing to contribute resources in various forms beyond direct financial contributions (Amesi & Nnadi, 2015). This strategy is worth taking seriously precisely because it does not rely on hard cash at all. Instead of competing for a small share of an already tight government budget, institutions are simply making use of equipment and resources that companies would otherwise throw away or no longer need.

The effective utilization of these alternative funding sources requires strategic planning, professional grant writing capabilities, transparent financial management, strong stakeholder

relationships, and demonstrated impact measurement that convinces potential funders of the value and effectiveness of their contributions to business education and economic empowerment.

Conclusion

The funding of business education programmes emerges as a critical strategy for economic empowerment and sustainable prosperity in Nigeria and other developing nations, representing not merely an educational expenditure but a fundamental investment in individual economic transformation and collective prosperity. The critical role that business education plays in developing entrepreneurial capacity, enhancing individual economic capabilities, fostering innovation, and creating pathways to economic independence establishes it as a cornerstone of economic empowerment strategy, particularly in contexts where traditional employment opportunities remain limited and individual economic empowerment is urgently needed. However, the transformative potential of business education for economic empowerment can only be realized through sustained, adequate funding that ensures programme quality, relevance, and accessibility.

Recommendations

The following recommendations were proposed from the study:

1. Government should progressively increase budgetary allocations to education in general and to business education in particular.
2. A dedicated, independently managed funding mechanism should be created for business education, supported by contributions from government, the

- private sector, and development partners.
3. Structured partnerships should be developed with private sector organizations to support business education through equipment donations, sponsored research, internships, and direct funding in exchange for access to skilled graduates.
 4. Government should fund the acquisition and maintenance of modern instructional technology, computer laboratories, business softwares, and digital learning platforms.
 5. Well-funded scholarship and student loan schemes should be established to ensure that students from low-income backgrounds are not denied access to quality business education.
 6. Robust monitoring and evaluation frameworks should be put in place to track funding use, programme quality, and graduate outcomes, justifying continued investment.
 7. Active partnerships should be pursued with international development agencies, foreign universities, and multilateral organisations to provide funding, technical assistance, and capacity-building support for business education in Nigeria.

References

- Abasilim, U. D. (2017). Industry-academia collaboration and quality assurance in Nigerian universities: Issues and prospects. *International Journal of Academic Research in Business and Social Sciences*, 7(8), 496-505.
- Adedeji, E. O. (2019). An antidote of the falling standards in business education in Nigerian tertiary institutions. *Book Reading of Association of Business Educators of Nigeria*, 1(9), 160-179.
- Adegoke, K. A., & Musa, S. (2022). Alternative funding models and business education programme effectiveness for youth economic empowerment in sub-Saharan Africa. *African Journal of Vocational Education*, 11(1), 88-103.
- Adeyemi, T. O., & Sanni, K. E. (2021). Alternative funding strategies for tertiary education in Nigeria: Exploring alumni and endowment potentials. *Journal of Educational Management and Policy*, 6(1), 45-58.
- Ahmad, S., Ahmad, N., & Mushtaq, H. (2023). Role of business education in economic development and entrepreneurship: Evidence from developing countries. *Journal of Business and Social Review in Emerging Economies*, 9(1), 11-22.
- Aina, M. A. & Onajite, G. O. (2023). Effectiveness of the use of technology in teaching for promoting economic growth among business education graduates in Ekiti State, *International Journal of Education and Social Science Research (IJESSR)* 6 (3), 173-182.
- Akuegwu, B. A., Nwi-ue, F. D., & Anijaobi-Idem, F. N. (2012). Adequate funding: A panacea for qualitative business education in Cross River State, Nigeria. *Global*

- Journal of Educational Research*, 11(2), 99-106.
- Amalu, R. N., & Umeano-Enemuoh, J. C. (2016). Faculty recruitment and retention in Nigerian business schools: Issues and strategies. *Journal of Education and Practice*, 7(4), 81-86.
- Amesi, J. (2018). Quality assurance in business education programmes and skill acquisition among business education students in tertiary institutions in Rivers State. *Nigerian Journal of Business Education (NIGJBED)*, 5(1), 64-78.
- Amesi, J., & Nnadi, M. (2015). Funding business education programmes for sustainable development in the Niger Delta. *Research on Humanities and Social Sciences*, 5(24), 26-33.
- Amoor, S. S. (2010). The need to improve teacher quality in business education in Nigerian universities. *International Journal of Education Research*, 11(1), 1-11.
- Anioke, B. O. (2013). Towards the changing role of the contemporary office: Challenges of quality assurance in skills development in colleges of education. *Nigerian Journal of Business Education*, 1(2), 57-67.
- Atah, C. A. & Alabi, B. E. (2025). Assessing the preparedness of business education graduates for success in a digitally-driven economy in the 21st century. *IIARD International Journal of Economics and Business Management*, 11(3), 267-277.
- Baporikar, N. (2022). Business education for entrepreneurship in developing nations. In N. Baporikar (Ed.), *Handbook of research on promoting business process improvement through inventory control techniques* (pp. 298-318). IGI Global.
- Chukwuemeka, J. N., & Ibrahim, L. (2024). Funding business education for economic development: A developing nation's perspective. *International Journal of Educational Development*, 98, 102972.
- Edokpolor, J., & Owenvbiugie, R. (2017). Business education in Nigeria: Issues, challenges and way forward for national development. *Journal of Educational Research and Development*, 5(2), 45-58.
- Eze, S. C., Chinedu-Eze, V. C., & Bello, A. O. (2018). The utilisation of e-learning facilities in the educational delivery system of Nigeria: A study of M-University. *International Journal of Educational Technology in Higher Education*, 15(1), 1-20.
- Eze, T. I., & Nwaokolo, P. O. (2023). Financing strategies for business education and graduate economic empowerment in developing economies. *Journal of Business Education and Entrepreneurship*, 8(2), 34-49.
- Ezeani, N. S., & Oladele, R. (2013). Implications of training and development programmes on accountants' productivity in selected business organizations in Onitsha, Anambra State, Nigeria. *International Journal of Asian Social Science*, 3(1), 266-281.

- FGN (2013). *National Policy on Education*. 6th edition, Yaba, Lagos: NERDC Press.
- Iyortsuun, A. S. (2017). An empirical analysis of the effect of business incubation process on firm performance in Nigeria. *Journal of Small Business and Entrepreneurship*, 29(6), 433-459.
- Mfor, T. U., Uke, A. F. & Edo, D.U. (2016). Business education skills: A necessity for self-reliance in Nigeria. *Journal of Education*, 9(2).
- Mohammed B. A. & Adamu, M. (2019). Business education: Its roles towards development in Nigeria. *ABEN Conference Proceedings*, 6(1), 47-50.
- National Policy on Education (2013). *National policy on education*. Lagos: Federal government press.
- Ndofirepi, E., Farinloye, T., & Mogaji, E. (2023). Marketing mix in higher education institutions in Africa. In E. Mogaji, F. Maringe, & R. E. Hinson (Eds.), *Higher education marketing in Africa: Explorations into student choice* (pp. 171-192). Routledge.
- Njoku, C. U. (2014). Critical incidents in the Nigerian educational system: Challenges to business educators. Lead paper presented at 26th Annual National Conference of Association of Business Educators of Nigeria, Kwara.
- Nwokocha, U., & Nnaka, C. (2019). Quality assurance in business education in Nigerian universities: A critical analysis. *Journal of Education and Practice*, 10(14), 53-62.
- Obeta, A. O. (2024). Business education curriculum and sustainable entrepreneurship development in South-East Nigeria. *International Journal of Innovative Research and Development*, 13(1), 89-97.
- Odigwe, F. N., & Owan, V. J. (2019). Trend analysis of the Nigerian budgetary allocation to education with reference to UNESCO's 26% benchmark. *International Journal of Educational Benchmark*, 13(1), 1-14.
- Okoye, A. C. (2016). Business education as a tool for socio-economic growth in Nigeria: Challenges and a way forward. *Global Journal of Applied, Management and Social Sciences*, 11, 212-216.
- Okwuanaso, S. I., & Nwazor, J. C. (2013). Effective teaching and learning of business education: The role of information and communication technology (ICT). *Information and Knowledge Management*, 3(11), 66-70.
- Oladunjoye, G. T. (2016). Optimizing business education for national development. *Nigerian Journal of Business Education (NIGJBED)*, 3(1), 1-16.
- Olori, G. I. & Olori, C. N. (2018). Promoting economic diversification through business education for achievement of sustainable development goal eight in Rivers State. *Nigerian Journal of Business Education (NIGJBED)*, 5(1), 274-282.

- Onajite, G. O. & Fadumiye, T. O. (2016). Preparing quality graduates for economic security through business education: Challenges and way forward. *International Journal of Education Benchmark, (IJEB)*, 5 (4) 51 – 62.
- Onuigbo, F. N. (2021). Human capital development and economic development in Nigeria- An analysis of the role of government. *International Journal of Innovative Social Sciences & Humanities Research*, 9(4), 181-190
- Osiesi, M. P., Adegboyega, S. M., Fadiya, A., & Blignaut, S. E. (2024). Assessment of entrepreneurial digital skills, knowledge, and use among business education undergraduates in the Federal University Oye-Ekiti, Nigeria. *Journal of African Education*, 5(1), 267-286.
- Reinhart, C. Trebesch, M & Christoph. (2016). "The International Monetary Fund: 70 Years of Reinvention". *Journal of Economic Perspectives*. 30 (1): 3–28. doi:10.1257/jep.30.1.3. ISSN 0895-3309.
- Salau, O., Worlu, R., Osibanjo, A., Adeniji, A., Atolagbe, T., & Salau, J. (2020). Determinants of retention strategies and sustainable performance of academic staff of government-owned universities in Nigeria. *F1000Research*, 9(902), 1-20.
- Tende, S. B. A., Aube, T. B., & Shu, V. M. (2023). Business education and youth empowerment in Cameroon. *African Journal of Business and Economic Research*, 18(2), 115-132.
- Tertiary Education Trust Fund [TETFund]. (2011). *Tertiary Education Trust Fund (Establishment, etc.) Act, 2011*. Federal Republic of Nigeria Official Gazette.
- Ubulom, W. J. & Enyekit, K. E. O. (2022). Appraisal of collaborative funding strategies of undergraduate business education programmes in tertiary institutions in Rivers State. *International Journal of Multidisciplinary Research and Growth Evaluation*, 3(3), 152-158.
- Ubulom, W. J., & Enyekit, E. O. (2022). Business education programme and entrepreneurship development in Nigeria. *International Journal of Innovative Science and Research Technology*, 7(6), 985-991.
- Wokele, R. P. (2018). The nature and future of tertiary education: The role of non-governmental agencies. *Journal of Education and Applied Management*, 2(2), 56-61.
- World Bank. (2023). *Economic empowerment*. World Bank Group. <https://www.worldbank.org>

AGRICULTURAL TECHNOLOGY ADOPTION AND CROP PRODUCTIVITY IN IKOLE LOCAL GOVERNMENT AREA OF EKITI STATE

LAWAL Funmilayo Tolu

Department of Vocational and Technical Education, Faculty of Education,
Ekiti State University, Ado-Ekiti.

Abstract

This study investigated the influence of agricultural technology adoption on crop production among food crop farmers in Ikole Local Government Area of Ekiti State, Nigeria. The study adopted a descriptive survey design, with a population of 262 registered food crop farmers as obtained from the Agricultural Development Programmes (ADP) 2024 records. A sample size of 158 farmers was selected through simple random sampling. Data were collected using a validated questionnaire titled Technological Advancement and Crop Production Questionnaire (TACPQ), with a reliability coefficient of 0.86 obtained via the test-retest method. Descriptive statistics (mean, percentages and standard deviation) were used to answer the research questions. Findings revealed that several technological advancements, including mechanized equipment, improved seed varieties, irrigation facilities, and mobile-based agricultural information systems, were available to farmers in the area. These technologies had a positive impact on crop yield, farm efficiency, and income generation. Challenges such as high costs of equipment, inadequate technical knowledge, and limited access to credit facilities hindered optimal adoption. The study concluded that agricultural technology improves seed varieties, saves time and reduces post-harvest loss, however adoption is constrained by high cost, lack of credit, inadequate training and weak extension services. The study recommended that the government and private sector should encourage agricultural technologies through subsidies, capacity-building programmes, and improved rural infrastructure to enhance technology adoption among farmers.

Keywords: Agricultural Technology, crop production, food crop farmers, Technology Adoption, Farm Productivity

Introduction

Agriculture remains a backbone of Nigeria's economy, accounting for a significant portion of employment, rural livelihoods, and food security. Despite its relevance, crop productivity continues to lag behind global standards due to limited mechanization, low adoption of modern farming practices, and climate-related challenges. Crop production being referred to as the process of cultivating plants such as cereals, vegetables, legumes, fruits, and cash crops on farms or agricultural land for human

consumption, animal feed, or industrial use, involves a series of agricultural activities including land preparation, planting, irrigation, fertilization, pest and disease control, harvesting, and post-harvest management. Thus, crop production is the entire process of growing and harvesting crops to provide food, raw materials, and income for farmers and society. Gavrilova and Denisova (2020) opined that crop production is a critical contributor to national food security and rural. Accordingly, its potential is hindered by

structural and operational challenges, such as limited access to agricultural innovations, poor financing, weak infrastructure, and low use of information technologies. In response to these constraints, technological advancement in agriculture has gained prominence as a strategic means of increasing productivity, ensuring sustainability, and enhancing the livelihoods of smallholder farmers.

The adoption of technology is the process of developing and applying new tools, systems, methods, or innovations that improve efficiency, productivity, and problem-solving capabilities across various fields. According to Sunday (2024), technological advancement is referred to as the strategic application of modern innovations to solve long-standing agricultural problems such as low productivity, inefficiency, and unsustainable practices in Nigeria's farming system. These adoption aimed to enhance yield, reduce production costs, and improve access to markets and agricultural information, though their effectiveness is often limited by factors such as high costs, poor internet access, and lack of technical know-how. As Okpeke (2024) affirmed technological advancement in agriculture through tools like mechanized farming equipment, improved seed varieties, and precision technologies has become essential for addressing traditional agricultural challenges in Nigeria. These innovations directly enhance crop production by improving efficiency in planting, reducing post-harvest losses, and increasing yield per hectare. For instance, mechanized equipment speeds up land preparation and planting, while improved seed varieties are more resistant to pests and diseases, ultimately resulting in better harvest outcomes, these impacts brought about efficiency in crop production.

Mechanized farming involves the use of machines and mechanical equipment such as tractors, planters, harvesters, threshers and power tillers to perform agricultural operations that were traditionally carried out manually. Olatunji et al. (2022), reported that agricultural mechanization significantly improved agricultural production and farmers' economic well-being by enhancing operational efficiency and increasing farm productivity in Nigeria. The adoption of mechanized farming has become an important strategy for improving agricultural productivity because it reduces labour requirements, shortens production time and increases the efficiency of farm operations. For smallholder farmers, mechanization facilitates timely land preparation, planting, weeding and harvesting, thereby minimizing production delays and reducing post-harvest losses. In farming communities such as the Ikole Local Government Area of Ekiti State, where labour shortages and high labour costs often limit agricultural production, mechanization has the potential to improve crop output and farm profitability.

Improved seed varieties on the other hand are genetically enhanced or selectively bred crop varieties developed to produce higher yields, resist pests and diseases, tolerate adverse climatic conditions and mature within shorter periods than conventional seed varieties. Olasehinde et al. (2023), found that improved maize varieties significantly enhanced production efficiency among Nigerian farmers by reducing technological gaps and increasing overall farm productivity. Their adoption enables farmers to maximize the productive potential of available farmland while improving the quality and quantity of harvested crops. Farmers who adopt

improved seeds are more likely to obtain higher yields because these varieties utilize available nutrients more efficiently and respond better to improved agronomic practices. This position is supported by

Irrigation systems involve the artificial application of water to crops to supplement rainfall and ensure adequate soil moisture throughout the growing season. The adoption of irrigation technology has become increasingly important in improving agricultural productivity, particularly in regions where rainfall is seasonal or unpredictable. Irrigation enables farmers to cultivate crops during the dry season, reduces the risks associated with climate variability and promotes multiple cropping, thereby increasing annual crop output and farm income. Improved irrigation systems can enhance production continuity and reduce dependence on rain-fed agriculture. Recent technological innovations have further improved irrigation efficiency through the integration of artificial intelligence and renewable energy, enabling farmers to optimize water use and reduce production costs. In support of this, Akanbi et al. (2024) reported that AI-powered smart irrigation systems integrated with solar energy provide a sustainable approach to enhancing agricultural productivity in Nigeria by improving water management efficiency, conserving resources and increasing crop yields.

Technological adoption in farming has contributed to increased crop yield through the use of improved planting materials and mechanization. Afodu et al. (2021) revealed that among plantain farmers in Nigeria, the adoption of technologies such as improved suckers, fertilizer application, and mechanized land clearing led to a notable increase in

productivity. This finding is echoed by Yu et al. (2024), who emphasized that innovations in crop breeding and automated irrigation systems contribute to yield improvements and reduced input wastage. Both studies highlight how integrating modern tools into traditional farming systems can substantially raise output levels, suggesting that similar benefits could be achieved in Ikole LGA if such technologies are effectively adopted. Integrating technology in farming system enhances decision-making and farm management through integrating technological advancements in crop production. Chandio et al. (2023) demonstrated that integrating ICT tools empower farmers to make informed decisions, thereby improving cereal production across ASEAN countries. These insights are relevant for rural communities in Nigeria, like those in Ikole LGA, where the growing availability of ICT tools may not yet be matched by active or informed usage in crop production. Added to these, the adoption of technology plays a critical role in climate adaptation, which is increasingly important due to the unpredictability of weather patterns. Baig et al. (2024) analyzed wheat farming in India and found that adaptive technologies such as drought-resistant seed varieties and smart irrigation help mitigate the negative effects of climate variability. Given the reliance on rain-fed farming in Ikole LGA, the application of these adaptive technologies could offer local farmers a way to stabilize their crop production despite climatic challenges.

Crop productivity is a key indicator of agricultural performance and a major determinant of food security, rural livelihoods and economic development, particularly in developing countries where smallholder farming predominates. In Nigeria, increasing crop

productivity remains a priority due to the growing demand for food and the need to improve farmers' incomes. However, crop yields remain below their potential because of challenges such as declining soil fertility, limited access to improved technologies and inadequate agricultural support services. In Ekiti State, where crops such as cassava, maize, yam and rice are widely cultivated, improving crop productivity is essential for sustainable agricultural development. Okonji and Awolu (2021) reported that the adoption of improved agricultural technologies significantly enhanced maize production among farmers in Ekiti State, while Banji et al. (2025) found that effective farm systems and soil fertility management practices contributed significantly to higher crop yields among smallholder farmers in the state.

Agricultural technologies such as improved crop varieties, mechanization, fertilizer application and information and communication technologies have become important tools for enhancing crop productivity by improving farmers' production efficiency and decision-making. In particular, mobile phone technologies have facilitated access to extension services, weather information, input availability and market opportunities, thereby supporting increased agricultural output. Filusi et al. (2026) observed that the utilization of mobile phone technologies improved cassava production among farmers in Ekiti State by enhancing access to agricultural information, although challenges such as poor network coverage, limited digital literacy and financial constraints affected their utilization. These findings underscore the importance of promoting agricultural technology adoption as a means of improving crop productivity among farmers in Ikole Local Government Area

of Ekiti State. In Ikole Local Government Area of Ekiti State, crop production constitutes the major economic activity and the primary source of livelihood for most rural households. Farmers in the area cultivate crops such as cassava, maize, yam and vegetables; however, crop productivity remains constrained by the continued use of traditional farming practices, declining soil fertility, unpredictable rainfall and limited access to modern agricultural technologies. These challenges reduce production efficiency and prevent farmers from achieving optimum yields. Consequently, the adoption of technologies such as improved seed varieties, mechanized farming operations, irrigation facilities and digital agricultural information systems has become increasingly important for improving crop output, enhancing resource use efficiency and reducing production losses.

The relationship between agricultural technology adoption and crop productivity has received considerable attention in agricultural research. Farmers who embrace improved production technologies generally achieve higher crop yields because these technologies improve farm management practices, enhance input efficiency and minimize production constraints. This pattern was observed by Afodu et al. (2021), who found that the adoption of improved production technologies significantly increased the productivity and crop output of plantain farmers in Nigeria. Similarly, the ability of modern agricultural technologies to cushion the adverse effects of climate variability has been recognized as an important factor in sustaining agricultural production. In agreement with this position, Amankwah (2023) reported that the adoption of agricultural technologies enhanced crop productivity among rural

farmers by strengthening their resilience to climate variability. Furthermore, improved irrigation technology enables farmers to cultivate crops beyond the rainy season, thereby increasing production intensity and overall farm output. This corroborates the findings of Adebayo et al. (2018), who established that the use of irrigation technology significantly improved crop yield, crop income and household food security among Nigerian farmers. Collectively, these studies suggest that increasing the adoption of appropriate agricultural technologies could substantially improve crop productivity among farmers in Ikole Local Government Area of Ekiti State.

The adoption of these technologies has the potential to reduce production inefficiencies, minimize post-harvest losses and improve overall farm performance. This position is supported by Onomu and Aliber (2024), who argued that increased technology use is fundamental to transforming Nigeria's agricultural sector through improved production efficiency, although its adoption is still constrained by structural and institutional challenges. Similarly, Oyekunle (2025) emphasized that precision agriculture technologies enhance food production by enabling farmers to make timely and efficient management decisions, thereby improving production efficiency and resource utilization.

Beyond improving production efficiency, agricultural technology adoption contributes significantly to increased crop production and farm income generation. Higher crop yields resulting from improved technologies provide farmers with larger marketable surpluses, increased household earnings and greater financial capacity to reinvest in agricultural production. In addition, technological innovations improve

production sustainability by enabling farmers to cope with changing climatic and economic conditions while maintaining agricultural output. Adeyemo et al. (2024) observed that technological innovation exerts a positive influence on agricultural productivity in Nigeria by stimulating higher agricultural output and supporting long-term sectoral growth. Likewise, Abraham and Jankowska (2025) noted that improving agricultural productivity through technology adoption is essential for unlocking Nigeria's agricultural potential and achieving sustainable food production. Furthermore, increased agricultural productivity translates into better income-generating opportunities for farming households, as higher yields often result in increased farm revenue and improved livelihoods. This aligns with the findings of Kayode et al. (2026), who reported that effective agricultural extension services enhanced income-generating activities among crop farmers by facilitating the adoption of improved agricultural practices and technologies. This implies that the adoption of technology in farming system has significantly influenced crop productivity.

Despite these benefits, several challenges hinder the effective use of technology in crop production, especially in rural areas. Afodu et al. (2021) noted that limited access to credit, training, and infrastructure can discourage the adoption of farm technologies, even when they are available. Similarly, Yu et al. (2024) observed that affordability and lack of awareness remain major barriers to utilizing advanced systems like real-time monitoring and precision farming. These findings suggest that while technology holds promise for improving agricultural outcomes in Ikole LGA, significant investments in farmer education, infrastructure, and policy

support are needed to bridge the gap between innovation and implementation. In light of these studies, it becomes imperative to assess how technological advancement ranging from physical inputs to digital innovations has impacted crop production in Ikoe LGA of Ekiti State. This assessment will provide evidence-based insights into the effectiveness, challenges, and level of adoption of agricultural technologies within the area, which in turn can guide future policy and extension strategies for sustainable rural development.

Statement of the Problem

Crop productivity remains a major concern in agricultural development because it determines the ability of the agricultural sector to meet the increasing demand for food, improve farmers' incomes and contribute to national economic growth. In Nigeria, the continuous increase in population has intensified the demand for food, thereby placing greater pressure on farmers to increase agricultural output. However, despite the vast agricultural potential of the country and various interventions aimed at improving agricultural production, crop productivity among many smallholder farmers appears to remain below expectation. This situation may contribute to inadequate food supply, rising food prices, reduced farm income and increasing concerns about household food security, particularly in rural communities where agriculture serves as the primary source of livelihood.

In Ekiti State, and particularly in Ikole Local Government Area, crop farming remains the dominant agricultural enterprise, with farmers cultivating crops such as cassava, maize, yam and vegetables. Nevertheless, many farmers still depend largely on traditional production practices, which may limit

production efficiency and reduce crop output. Although agricultural technologies such as mechanized farming, improved seed varieties and irrigation systems have been introduced to enhance agricultural productivity, their adoption among farmers may not be widespread or sufficiently effective to produce the desired improvements in crop production. Consequently, farmers may continue to experience low production efficiency, limited marketable surplus, reduced income and difficulties in meeting the increasing demand for agricultural produce. While previous studies have examined agricultural technology adoption and productivity in different parts of Nigeria, there is limited empirical evidence on how the adoption of specific agricultural technologies relates to crop productivity among farmers in Ikole Local Government Area of Ekiti State. This gap in knowledge underscores the need for the present study to examine the influence of agricultural technology adoption on crop productivity in the study area.

Purpose of the Study

The purpose of this study is to examine the influence of agricultural technology adoption on crop productivity in Ikole Local Government Area of Ekiti State. The study specifically seeks to:

1. identify the types of agricultural technology adopted by farmers
2. determine the influence of agricultural technology adoption on crop production among farmers in Ikole

Research Questions

The following research questions were raised to guide the study

1. What types of agricultural technology are currently available to

farmers in Ikole Local Government Area of Ekiti State?

2. How do these agricultural technology adoption influence crop production in Ikole LGA?

Methodology

This study employed a descriptive survey design to examine the impact of technological advancement on crop production in Ikole Local Government Area of Ekiti State. The population comprised all 262 registered food crop farmers in the area, as recorded by the Agricultural Development Programmes (ADP) in 2024. A sample size of 158 farmers was determined. Simple random sampling was adopted to ensure equal representation. Data were collected using a structured questionnaire titled Technological Advancement and Crop Production Questionnaire (TACPQ), comprising three sections: demographic information, availability and use of technological advancements, and their perceived impact on crop yield and productivity. Items were rated on a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). A decision rule was set using a cut-off mean of 2.50, which is the midpoint of the scale. Any item with a mean score of 2.50 or above was

interpreted as “Agree,” while items with a mean score below 2.50 were interpreted as “Disagree.” This decision rule was applied in the “Decision” column of the results tables to summarize respondents’ general position on each statement

The instrument’s validity was established through expert review by two lecturers from the Department of Vocational and Technical Education and one from the Department of Test and Measurement in Ekiti State University. Reliability was determined using the test-retest method on 20 farmers from a neighbouring local government area, with the Pearson Product Moment Correlation producing a coefficient of 0.86. The researcher, assisted by two trained field workers, administered the questionnaires directly to respondents, providing clarification where necessary, and retrieved all copies immediately after completion. Data analysis using descriptive statistics (such as mean, percentages and standard deviation) were used to answer the research questions.

Results

Research Question1: What types of agricultural technology are currently available to farmers in Ikole Local Government Area of Ekiti State?

Table 1: Technological Advancement Available to farmers in Ikole Local Government Area

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Std. Dev.	Decision
1	Access to improved seed varieties	78 (49.4)	60 (38.0)	12 (7.6)	8 (5.1)	3.32	0.81	Agree
2	Use of mechanized tools (tractors, planters)	52 (32.9)	46 (29.1)	40 (25.3)	20 (12.7)	2.82	1.02	Agree
3	Application of modern irrigation systems	28 (17.7)	38 (24.1)	52 (32.9)	40 (25.3)	2.34	1.05	Disagree
4	Use of fertilizers/pesticides from tech recommendations	88 (55.7)	54 (34.2)	10 (6.3)	6 (3.8)	3.42	0.78	Agree
5	Access to agricultural information via phone/internet	66 (41.8)	50 (31.6)	28 (17.7)	14 (8.9)	3.07	0.97	Agree
6	Participation in training on new technologies	48 (30.4)	56 (35.4)	36 (22.8)	18 (11.4)	2.85	0.99	Agree

The results in Table 1 show that improved seed varieties (Mean = 3.32), fertilizer/pesticide use from technology recommendations (Mean = 3.42), and access to agricultural information via phones or the internet (Mean = 3.07) were rated as the most available agricultural technologies among farmers in Ikole LGA. Mechanized tools (Mean = 2.82) and participation in training on new agricultural technologies (Mean = 2.85) were also reported as available, but to a lesser extent. Modern irrigation systems had the lowest availability rating (Mean = 2.34), suggesting that water

management technology is still underutilized in the area. The overall pattern indicates that while crop input technologies and information access are relatively widespread, infrastructure-heavy innovations such as mechanization and irrigation are less prevalent, possibly due to high costs and limited technical support.

Research Question 2: How do these agricultural technology adoption influence crop production in Ikole LGA

Table 2: Influence of Agricultural technology on crop production

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Std. Dev.	Decision
1	Improved seeds increase yield	94 (59.5)	52 (32.9)	8 (5.1)	4 (2.5)	3.49	0.72	Agree
2	Mechanization saves time/energy	70 (44.3)	60 (38.0)	20 (12.7)	8 (5.1)	3.22	0.86	Agree
3	Technology reduces post-harvest loss	62 (39.2)	54 (34.2)	28 (17.7)	14 (8.9)	3.04	0.97	Agree
4	Fertilizers/pesticides enhance quality	86 (54.4)	58 (36.7)	10 (6.3)	4 (2.5)	3.43	0.76	Agree
5	Access to tech info improves decisions	80 (50.6)	52 (32.9)	16 (10.1)	10 (6.3)	3.28	0.88	Agree
6	Technology improves overall productivity	92 (58.2)	50 (31.6)	10 (6.3)	6 (3.8)	3.44	0.79	Agree

From Table 2, respondents agreed across all items that technological advancements have a positive influence on crop production. The strongest impacts were seen in the use of improved seeds to increase yield (Mean = 3.49), the use of fertilizers and pesticides to enhance crop quality (Mean = 3.43), and overall improvement in productivity (Mean = 3.44). Farmers also reported that mechanization helps save time and energy (Mean = 3.22) and that access to technological information improves farming decisions (Mean = 3.28). Reduction of post-harvest losses (Mean = 3.04) was also acknowledged, though with slightly lower agreement, possibly

indicating that post-harvest technologies are not as effectively adopted as production-enhancing ones. These results suggest that the technologies in use are perceived to be beneficial, especially in yield and quality improvement.

Discussion of Findings

The findings of this study show that agricultural technology such as improved seed varieties, fertilizer/pesticide recommendations, and mobile-based agricultural information services are widely accessible in Ikole LGA, while infrastructure-dependent technologies like mechanized tools and

modern irrigation systems are less common. This aligns with the observation of Afodu et al. (2021), who reported that Nigerian farmers tend to adopt low-cost, input-based technologies more readily than capital-intensive machinery due to financial and infrastructural constraints. Similarly, Gavrilova and Denisova (2020) highlighted that the diffusion of innovation in Nigerian smallholder agriculture often follows a gradual path, with simpler technologies spreading faster than those requiring high investment.

The positive influence of technology on crop yield, productivity, and decision-making reported in this study supports the findings of Okpeke (2024) and Sunday (2024), both of whom emphasized that adoption of improved agricultural technologies leads to measurable gains in output and efficiency in Nigerian farming systems. These findings are consistent with Yu et al. (2024), who found that modern agricultural technologies enhance food production by improving crop quality, resource efficiency, and farm management practices. The challenges identified particularly high costs, limited training, and inadequate infrastructure mirror the constraints reported in Chandio et al. (2023), who noted that access to information and physical infrastructure remains a bottleneck in agricultural technology adoption in many developing regions. Baig et al. (2024) also observed that without addressing cost and accessibility barriers, the potential of technological innovations to improve crop production may remain underutilized, particularly in rural areas.

Conclusion

Based on the findings, it was concluded that while certain agricultural

technologies, particularly improved seed varieties and fertilizer application tools, are widely available in Ikole LGA, other critical technologies such as irrigation systems and mechanized equipment remain less accessible. Farmers perceive significant benefits in yield improvement, time savings, and post-harvest loss reduction from technology use. However, adoption is constrained by high costs, lack of credit, inadequate training, and weak extension services.

Recommendations

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

1. Government and non-governmental organizations should encourage agricultural technologies by providing subsidies or low-interest credit schemes to make agricultural technologies more affordable to farmers.
2. Since farmers perceive significant benefits of agricultural technologies, regular training workshops and demonstrations should be organized by stakeholders to equip farmers with technical skills for effective technology use.
3. Agricultural extension agents should be adequately trained, motivated, and deployed to rural communities to provide hands-on guidance on technology adoption by offering incentives for motivation and fostering community engagement for effective technology transfer.

References

- Abraham, A. J., & Jankowska, A. (2025). The potential and productivity of agriculture in Nigeria. *Preprint Series on Agricultural Policy*, 1, 38.

- Adebayo, O., Bolarin, O., Oyewale, A., & Kehinde, O. (2018). Impact of irrigation technology use on crop yield, crop income and household food security in Nigeria: A treatment effect approach.
- Adeyemo, J. T., Ahmed, A., Abaver, D. T., Riyadh, H. A., Tabash, M. I., & Lawal, A. I. (2024). Technological innovation and agricultural productivity in Nigeria amidst oil transition: *ARDL analysis. Economies*, 12(9), 253.
- Afodu, O. J., Akinboye, O. E., Akintunde, A. O., Ndubuisi-Ogbonna, L. C., Shobo, B. A., & Oyewumi, O. S. (2021). Assessing the impact of technology adoption on productivity of plantain farmers in Nigeria. *Agricultural Socio-Economics Journal*, 21(4), 319-324.
- Akanbi, M. B., Banjoko, I. K., Adedotun, K. J., & Raji, A. K. (2024). AI-Powered Smart Irrigation Systems and Solar Energy Integration: A Sustainable Approach to Enhancing Agricultural Productivity in Nigeria. *Journal of Renewable Agricultural Technology Research*.
- Amankwah, A. (2023). Climate variability, agricultural technologies adoption, and productivity in rural Nigeria: a plot-level analysis. *Agriculture & Food Security*, 12(1), 7.
- Baig, I. A., Mohammad, S., Akram, V., Chandio, A. A., & Gupta, Y. (2024). Examining the impacts of climatological factors and technological advancement on wheat production: A road framework for sustainable grain production in India. *Environment, Development and Sustainability*, 26(5), 12193-12217.
- Banji, O. M., Itunnu, W. F., Jonathan, A. A., Ejiola, M. T., Bello, S. S., & Ayeni, M. J. (2025). Farm systems and soil fertility management methods in relation to crop yield of smallholders in Ekiti State, Nigeria. *Am J Agric For*, 13(2), 136-143.
- Chandio, A. A., Gokmenoglu, K. K., Sethi, N., Ozdemir, D., & Jiang, Y. (2023). Examining the impacts of technological advancement on cereal production in ASEAN countries: Does information and communication technology matter? *European Journal of Agronomy*, 144, 126747.
- Filusi, O. J., Ayinde, J. O., Ogungbemi, O. I., Arayombo, T. J., & Kolapo, A. (2026). Utilization of mobile phone technologies for cassava production in Ekiti State, Nigeria: Exploring socio-economic drivers and barriers. *Social Sciences & Humanities Open*, 13, 102738.
- Gavrilova, N. G., & Denisova, T. S. (2020). Smallholder crop production in Nigeria: pitfalls and paths to innovation. *Research on Crops*, 21(2), 435-440.
- Kayode, A. O., Adesiji, G. B., Oladele, E. O., Ajibaye, O. E., & Samuel, F. (2026). Perceived Effectiveness of Agricultural Extension Agents in Enhancing Income-Generating Activities Among Crop Farmers in Kwara State, Nigeria. *Nigerian Journal of Agriculture and Agricultural Technology*, 6(2A), 24-31.

- Okonji, C. J., & Awolu, O. T. (2021). Factors influencing adoption of improved technology among maize farmers in Ekiti State Nigeria. *Agrosearch*, 20(2), 102-112.
- Okpeke, A. S. (2024). Technological Advancement in Agriculture and it's importance: The Nigerian perspective: *Akwapoly Journal of Communication & Scientific Research*, 8(1).
- Olatunji, K. O., Ogunkunle, O., Adisa, O. A., & Taiwo, A. (2022). Effect of agricultural mechanization on production and farmers economy in Nigeria: A case study of Lagos State. *International Journal of Engineering Research in Africa*, 60, 211-231.
- Olasehinde, T. S., Qiao, F., & Mao, S. (2023). Impact of improved maize varieties on production efficiency in Nigeria: *Separating technology from managerial gaps. Agriculture*, 13(3), 611.
- Onomu, A. R., & Aliber, M. (2024). Nigeria's Agriculture and Technology Use: Current Structure and Challenges. *Path of Science*, 10(11), 1001-1023.
- Oyekunle, R. A. (2025). Factors influencing the adoption of precision agriculture technologies for food production at the international institute of tropical agriculture (IITA) Nigeria. *Science and Development*, 9(2), 71-71.
- Sunday, O. A. (2024). Technological Advancement in Agriculture and it's importance: The Nigerian perspective: *Akwapoly Journal of Communication and Scientific Research (APJOCASR). Akwapoly Journal of Communication & Scientific Research*, 8(1), 113-132.
- Yu, K., Zhao, S., Sun, B., Jiang, H., Hu, L., Xu, C., ... & Qi, Z. (2024). *Enhancing food production through modern agricultural technology. Plant, Cell & Environment*.

EMERGING TECHNOLOGIES AS CATALYSTS FOR ADVANCING ELECTRICAL AND ELECTRONIC TECHNOLOGY EDUCATION IN EKITI STATE UNIVERSITIES.

¹FANIBUYAN, Victoria Ereola and ²OLAOYE, Ajiboye Ojo

¹Department of Vocational and Industrial Technology Education

Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti

²Department of Vocational and Technical Education, Ekiti State University, Ado- Ekiti

¹fanibtimvic03@gmail.com & ²ajiboyeolaoye@gmail.com

Abstract

This study examined the emerging technologies as catalysts for advancing Electrical and Electronic Technology Education. Three research questions were raised to guide the study. A descriptive survey research design was adopted for the study. The research was carried out in Ekiti State owned universities, Ekiti State. The population of the study comprised 28 lecturers, technical staff and students of electrical and electronics technology education in the Ekiti State-owned universities, Ekiti State. Questionnaire was used to collect data from the respondents. Research questions were answered using mean and standard deviation. Data were analyzed with SPSS version 27. Findings revealed among others that some of the emerging technologies such as Artificial Intelligence, Virtual /Remote laboratory, Internet of Things, Simulation Software, Mobile Learning, Cloud Computing were utilized while, Virtual Reality, Augmented Reality, 3D Printing, Gamification and Robotics &Automation were not utilized. The study concluded that emerging technology have the potential to revolutionize Electrical and Electronic Technology Education and their effectiveness depends on proper and fully utilization of them Based on the findings of the study, it was recommended among others that, Ekiti State universities should fully integrate emerging technologies and enforce its utilizations.

Key words: Emerging Technologies, Electrical and electronic technology education.

Introduction

Emerging technologies are transforming educational systems globally, particularly in technical and vocational disciplines. The global education system is undergoing a profound transformation driven by the rapid emergence of new technologies, which continue to reshape how knowledge is produced, transmitted, and consumed in university settings, especially within engineering and applied science disciplines (Schwab, 2016). This transformation reflects broader changes associated with the Fourth Industrial Revolution, where technological

advancements are redefining skills development and knowledge systems. The increasing adoption of digital tools, artificial intelligence, and smart learning environments has significantly influenced curriculum design and instructional delivery in higher education (Selwyn, 2017). These developments are reshaping teaching practices and redefining pedagogy toward more flexible, learner-centered approaches. The integration of emerging technologies into engineering and technology education remains uneven and constrained by systemic challenges within Nigeria. These challenges include

inadequate funding, weak policy implementation, insufficient infrastructure, and limited digital competencies among educators. Such constraints hinder the effective adoption of Fourth Industrial Revolution Technologies in higher education and underscore the need for strategic reforms tailored to the local context (National Academies of Sciences, Engineering, and Medicine, 2017).

Addressing these issues requires targeted investment in digital infrastructure, capacity building for educators, and the development of context-specific policies that support innovation in teaching and learning. The emerging technologies such as Artificial Intelligence, Virtual/Remote Laboratory, Augmented Reality, Internet of Things, Simulation Software, 3D Printing, Gamification, Mobile Learning, Cloud Computing, and Robotics and Automation can be integrated into teaching of electrical and electronic technology for advancement.

Electrical and Electronic Technology (EET) education occupies a pivotal position at the intersection of theory and practice. The discipline focuses on the study and application of electricity, electronics, and electromagnetism, and it plays a critical role in advancing industries such as transportation, healthcare, construction, and robotics. In recent years, EET education has increasingly been influenced by emerging technologies such as artificial intelligence, the Internet of Things (IoT), virtual and augmented reality, and simulation tools (Bo Xing & Marwala, 2017). As industries continue to integrate automation, smart systems, and intelligent networks into their operations, universities are under growing pressure to align their curricula and pedagogical approaches with these technological

realities. These technologies support interactive and experiential learning environments that promote collaboration and real-time problem-solving. However, despite their potential, many universities particularly state-owned institutions still rely heavily on traditional teaching methods that limit innovation and practical exposure, especially in Ekiti State Universities.

Ekiti State, often known as the “Fountain of Knowledge,” presents a unique case within this national landscape. The state has demonstrated relatively high literacy levels and a strong commitment to educational development. Despite these advantages, challenges persist in terms of technological infrastructure and readiness for advanced digital integration, particularly in areas such as artificial intelligence and smart learning systems. Bridging this gap requires sustained investment and strategic policy direction.

The State Universities in Ekiti State, including Ekiti State University and Bamidele Olumilua University of Education, Science and Technology, face the dual responsibility of maintaining academic standards while modernizing their engineering and technology programmes. Although efforts have been made to improve infrastructure, research capacity, and digital learning systems, the integration of emerging technologies into Electrical and Electronic Technology education remains limited and under-researched. This highlights the need for focused scholarly inquiry into how these technologies can be effectively adopted to enhance teaching, learning, and skill acquisition.

Despite the growing body of literature, significant gaps remain. Many international studies focus on technologically advanced environments,

while studies in developing contexts often emphasize challenges without adequately examining the impact of emerging technologies on learning outcomes. More importantly, there is limited research specifically addressing the integration of these technologies within Electrical and Electronic Technology education in state-owned universities in Southwest Nigeria. This study, therefore, seeks to bridge this gap by investigating how emerging technologies can serve as catalysts for improving EET education in Ekiti State universities, with implications for policy formulation, curriculum development, and institutional strategy.

Statement of the Problem

It is expected for all engineering and technology education programmes especially electrical and electronic technology education should be integrated with emerging technologies such as: Artificial Intelligence (AI), Virtual Reality (VR), Augmented Reality (AR), Internet of Things (IoT), e-library, Simulation Software, Gamification, Mobile Learning among others. The integration and utilization of the above-mentioned emerging technologies is critical and important because of the nature and important place of electrical/electronic technology education in the world.

Despite the increasing availability of emerging technologies, their integration into Electrical and Electronic Technology Education remains inadequate. Many universities still emphasize theoretical instruction with limited practical engagement, resulting in graduates who lack industry-relevant skills. There seems to be a disconnect between educational outcomes and labour market demands, leading to unemployment and underemployment among graduates. Additionally,

insufficient pedagogical frameworks and weak strategic planning hinder effective technology adoption. This study addresses the need for a comprehensive approach that integrates emerging technologies, instructional innovations, and strategic directions to enhance educational outcomes in Ekiti State Universities.

Purpose of the Study

The study purposely examined emerging technologies as catalysts for advancing electrical and electronic technology education in Ekiti State Universities. Specifically, the study

1. assessed the emerging technology utilized by Electrical and Electronic Technology education in Ekiti-State Universities
2. examined the extent of emerging technology utilization by Electrical and Electronic Technology education in Ekiti State Universities.
3. determined the impact of emerging technology utilization on Electrical and Electronic Technology education in Ekiti State Universities.

Research Questions

The following research questions are raised to guide this study.

1. What are the emerging technology utilized by Electrical and Electronic Technology education in Ekiti State Universities?
2. To what extent of emerging technology utilized by Electrical and Electronic Technology education in Ekiti State Universities?
3. What is the impact of emerging technology utilization on Electrical and Electronic Technology education in Ekiti State Universities?

Methodology

This study adopted a descriptive survey research design to examine emerging technologies as catalysts for advancing Electrical and Electronic Technology education in Ekiti State Universities. The descriptive survey design is appropriate for this study because it enables the researcher to collect data from respondents and describe existing conditions, and experiences relating to the emerging technologies.

The population of the study is 28 which consist 5 Lecturers, 18(300 and 400level) students, and 5 technologists in Electrical and Electronic Technology of the department of Vocational and Technical Education in the Ekiti State Universities. These universities are: Ekiti

State University, Ado Ekiti and Bamidele Olumilua University of Education, Science and Technology, Ikere Ekiti. Since the population was of a manageable size, there was no sampling technique. Structured questionnaire was used as a sole instrument used to collect data. It was developed on a 4point Likert type rating scale of Strongly Disagree (SD) = 1, Disagree (D) = 2, Agree (A) = 3, strongly Agree (SA) = 4. Twenty-eight (28) copies of the questionnaire were administered to the respondents; however, the retrieval rate was 100%.

The data collected was analyzed using both descriptive and inferential statistics. Frequency counts, percentages were used to answer the research questions, regression analysis and thematic analysis were used to test the hypotheses at 0.05 level of significance.

Result and Discussion

Table 1: Responses of the respondents on the assessment of the emerging technologies utilized by Electrical and Electronic technology education in Ekiti State universities.

S/N	ITEM	$\bar{X}$	S. D	R
1	Artificial Intelligence (AI) tools	2.82	1.12	U
2	Virtual Reality (VR)	2.23	1.10	NU
3	Augmented Reality (AR)	2.31	1.17	NU
4	Virtual/Remote Laboratories	2.68	1.22	U
5	Internet of Things (IoT)	2.89	1.07	NU
6	Simulation Software	2.81	1.05	U
7	3D Printing	2.00	.98	U
8	Gamification	2.04	.99	NU
9	Mobile Learning	2.82	1.06	U
10	Cloud Computing	2.86	1.08	U
11	Robotics and Automation	2.07	1.05	NU

Key $\bar{X}$ = mean, SD= Standard deviation, R= Remark, Utilized (U), Not Utilized(NU)

Analysis table1, shows that items 1,4, 5, 6 ,9 and 10 with the mean ranges from 2.68-2.89 indicated utilized. Meaning the respondents agreed that the items were utilized by electrical and electronic technology education in Ekiti

State Universities. The table also, revealed that items 2, 3, 7, 8 and 11 with the mean ranges between 2.00-2.31 indicated not utilized. Meaning that the respondents disagreed with the items to be utilized by electrical and electronic

technology education in Ekiti- State Universities. The table shows that the standard deviation range between 0.98-1.22 which is a positive and less than the

normal deviate of 1.96, thereby indicated that respondents were not too far from the mean and from one another in their responses.

Table 2: Responses of the respondents on the extent of emerging technology utilized by electrical and electronic technology education in Ekiti State Universities.

S/N	ITEM	$\bar{X}$	S. D	R
1	Artificial Intelligence (AI) tools	2.82	1.12	FU
2	Virtual Reality (VR)	2.23	1.10	UU
3	Augmented Reality (AR)	2.31	1.17	UU
4	Virtual/Remote Laboratories	2.68	1.22	AU
5	Internet of Things (IoT)	2.89	1.07	FU
6	Simulation Software	2.81	1.05	FU
7	3D Printing	2.00	.98	NU
8	Gamification	2.04	.99	NU
9	Mobile Learning	2.82	1.06	FU
10	Cloud Computing	2.86	1.08	FU
11	Robotics and Automation	2.07	1.05	NU

Keys: $\bar{X}$ = Mean, SD= Standard Deviation, R= Remark, Fully Utilized (FU), Adequately Utilized (AU), Under Utilized (UU) and Not Utilized (NU)

Analysis table 1 shows that items 1, 5, 6, 9, and 10 with the mean ranges from 2.81 - 2.89 indicated fully utilized and item 4 is adequately utilized with range of 2.68. Meaning the respondents agreed that the items were utilized by electrical and electronic technology education in Ekiti State Universities. The table also, revealed that items 2 and 3 indicated underutilized with range between 2.23-2.31. Meaning the respondents disagreed with the items to be utilized Items 7, 8 and 11 with the

mean ranges between 2.00 - 2.31 indicated not utilized. Meaning that the respondents disagreed with the items to be utilized by electrical and electronics technology education in Ekiti State Universities. The table shows that the standard deviation ranges between 0.98 – 1.22 which is a positive and less than the normal deviate of 1.96, thereby indicated that respondents were not too far from the mean and from one another in their responses.

Table 3: the responses of the respondents on the impact of emerging technology utilization on Electrical and Electronic Technology education in Ekiti State Universities.

S/N	N	$\bar{X}$	S. D	R
1	The use of simulation software improves students' understanding of complex EET concepts	2.82	1.12	A
2	Virtual laboratories provide a safe and effective alternative to physical laboratory experiments in EET	2.25	1.11	D
3	Augmented Reality (AR) tools enhance students' visualisation and comprehension of electronic circuits and systems	2.14	1.08	D
4	The integration of AI-based tutoring systems helps to personalise learning for EET students	3.21	.79	A
5	IoT-based projects improve students' practical skills and problem-solving abilities in EET	3.00	1.05	A
6	The use of gamification and game-based learning tools increases student engagement and motivation in EET courses	1.86	.97	D
7	Mobile learning technologies make EET learning resources more accessible outside the classroom	3.00	.94	A
8	The use of emerging technologies improves overall student academic performance in EET programmes	3.04	1.03	A
9	Emerging technologies make it easier for students to understand power systems and renewable energy concepts	3.00	.98	A
10	The flipped classroom model (supported by technology) enhances active participation of students in EET	3.07	1.05	A

Keys: $\bar{X}$ = Mean, SD= Standard Deviation, R= Remark, A= Agree, D=Disagree

Table 3 shows that items 1, 4, 5, 7, 8, 9, and 10 with the mean range between 2.83 – 3.21 indicated agreed. Meaning the respondents agreed that those emerging technology utilization have positive impacts on Electrical and Electronic Technology education in Ekiti State Universities. The table again, revealed that items 2, 3, and 6 with the mean ranges between 1.86 - 2.25 indicated disagreed. Meaning the respondent agreed that those emerging technology utilization have no positive impacts on electrical and electronic technology education in Ekiti State Universities. The table shows that the standard deviation ranges between 0.79 – 1.12 which is a positive and less than the normal deviate of 1.96, thereby indicated that respondents were not too far from the mean and from one another in their response

Discussion of Findings

The finding revealed on research question one that seek to assess the emergent technologies utilized in electrical and electronic technology education in Ekiti State Universities. It was revealed that: Artificial Intelligence (AI) tools, Virtual/Remote Laboratories, Internet of Things (IoT), Mobile Learning are utilized. This study is in agreement with the study of Abubakar (2024) who found out that lecturers are aware and uses mobile learning. It was revealed also, that some of the emergent technologies were not utilized by electrical and electronic technology education in Ekiti State universities. Such technologies are: Virtual Reality (VR), Augmented Reality (AR), Gamification among others. This study disagreed with the study of Asoodar et al, (2025) who revealed that Virtual Reality (VR),

Augmented Reality (AR) are utilized in universities. These technologies are revolving therefore; there is need for every fields of the study to embrace its application and full integration.

Based on the finding of research question two. It was revealed that the extent at which some of the emerging technology has been utilized, it was revealed that some of the emerging technology were fully utilized such as Artificial Intelligence, Internet of Things, Simulation Software, Mobile Learning and Cloud Computing were fully utilized. The emerging technology such as Virtual Reality, Augmented Reality were under utilized while emerging technology such as 3D Printing, Gamification and Robotic and Automation were not utilized.

Based on the finding of research question three. It was revealed that the used emergent technologies have positive impact on electrical and electronic technology education in Ekiti State Universities. The emergent technologies and its impact are: The use of simulation software improves students' understanding of complex EET conepts, the integration of AI-based tutoring systems helps to personalise learning for EET students, IoT-based projects improve students' practical skills and problem-solving abilities in EET. The significant relationship between technology use and educational outcomes aligns with constructivist and experiential learning theories of González-Pérez & Ramírez-Montoya, (2022) which emphasize active engagement.

Conclusion

Emerging technologies have the potential to revolutionize Electrical and Electronic Technology Education. However, their effectiveness depends on proper and fully utilization of them. It was

revealed that some of the emerging technologies were utilized by electrical and electronic technology education. While, some of these emerging technologies are not utilized by them. In line with this, it was revealed that those emerging technologies utilized by Electrical and Electronic Technology education in Ekiti State Universities have positive impact on them.

Recommendations

From the findings of the study, it therefore recommends that:

1. The emerging technologies should be made available in Ekiti- State Universities for utilization by Government and the school Administration by providing internet in the schools.
2. Ekiti State Universities should fully integrate emerging technologies and enforce its utilizations by investing in digital laboratories and smart learning infrastructure, by Workshop and seminars should be organized by the university managements for fully awareness and integration of the emerging technologies and enforce its utilizations by Electrical and Electronic Technology education.

References

- Abubakar, U. (2024). Mobile pedagogy in higher education: a comprehensive analysis of mobile learning practices for classroom management in Usmanu Danfodiyo University, Sokoto State, Nigeria. *Eduscape: Journal of Education Insight*, 2(2), 99-110.
- Asoodar, M., Janesarvatan, F., Yu, H., & de Jong, N. (2024). Theoretical foundations and implications of augmented reality, virtual reality,

- and mixed reality for immersive learning in health professions education. *Advances in Simulation*, 9(1), 36.
- González-Pérez, L. I., & Ramírez-Montoya, M. S. (2022). Education 4.0 and 21st-century skills. *Sustainability*, 14(3), 1493.
- National Academies of Sciences, Engineering, and Medicine. (2017). *The fourth industrial revolution: Proceedings of a workshop—in brief*. Washington, DC: National Academies Press.
- Schwab, K. (2016). *The fourth industrial revolution*. Geneva: World Economic Forum.
- Selwyn, N. (2017). *Education and technology: Key issues and debates* (2nd ed.). London: Bloomsbury Academic.
- Swargiary, K. (2024). *Emerging technologies in education*. Research Gate Preprint.
- Xing, B., & Marwala, T. (2017). *Implications of the Fourth Industrial Age on higher education*. arXiv preprint.

ORGANIC TREATMENT: AN ALTERNATIVE TO SYNTHETIC TREATMENT IN POULTRY PRODUCTION

¹Mokolade B. ENIAFE and ²Jonathan O. OKE

¹Department of Vocational and Industrial Technology Education, Bamidele Olumilua University of Education Science and Technology, Ikere-Ekiti, Nigeria

² Department of Vocational and technical Education, Ekiti state University, Ado Ekiti, Nigeria.

eniafe.mokolade@bouesti.edu.ng

Abstract

This study examined organic treatment as an alternative to synthetic treatment in poultry production, with a focus on improving poultry health, productivity, and sustainability in Nigeria. A scoping review design was adopted to systematically map and synthesize existing literature published between 2020 and 2025. Relevant studies were sourced from databases such as Google Scholar, PubMed, Scopus, and Web of Science using predefined keywords and inclusion criteria. A total of 14 studies met the eligibility criteria, comprising 5 studies on synthetic treatments and 9 on organic treatments. Data were extracted and analyzed thematically based on poultry health, productivity, and safety outcomes. The findings revealed that synthetic treatments, including antibiotics, vaccines, and chemical agents, are highly effective for rapid disease control and productivity improvement for a short period of time. However, their use is associated with challenges such as antimicrobial resistance, chemical residues, and high costs. In contrast, organic treatments such as herbs (garlic, ginger, neem, turmeric, papaya), probiotics, prebiotics, essential oils, aloe vera, and moringa revealed gradual improvements in immunity, growth performance, and product quality, with minimal health and environmental risks. The study concluded that organic treatments provide a safer and more sustainable alternative to synthetic treatments in poultry production. The following recommendations were made. Increased adoption of organic interventions, Poultry farmers' education by government and Agricultural agencies, policy regulation by regulatory bodies to promote the safe use of organic treatments and regulate the use of antibiotics and chemical agents in poultry production to protect animal and human health and further research to enhance standardization and large-scale application.

Keywords: Nigeria; Organic treatments; Poultry health; Poultry production; Sustainability; Synthetic treatments.

Introduction

Poultry production occupies a strategic position within Nigeria's agricultural sector, contributing significantly to national food security, nutritional improvement, and economic development. It is widely regarded as one of the most commercialized and rapidly expanding livestock sub-sectors in the

country due to its short production cycle, high feed conversion efficiency, and relatively low capital requirement compared to other forms of livestock production (Central Bank of Nigeria, 2024). These characteristics make poultry farming an attractive enterprise for both smallholder and commercial farmers. From a nutritional perspective, poultry

products, particularly eggs and chicken meat, represent vital sources of high-quality animal protein for the Nigerian population. They are rich in essential amino acids, vitamins, and minerals necessary for human growth and development. The importance of poultry in addressing protein deficiency cannot be overstated, especially in developing countries like Nigeria, where access to affordable animal protein remains limited (Awosanmi, 2023). Consequently, increased poultry production is closely linked to improved dietary quality and overall public health outcomes.

In addition to its nutritional contributions, the poultry industry plays a crucial role in employment generation and income creation. The sector supports a wide range of economic activities along its value chain, including feed milling, hatchery operations, farming, processing, distribution, and marketing. It has been reported that the poultry industry contributes billions of dollars to the Nigerian economy and provides livelihoods for millions of people, particularly rural households and small-scale entrepreneurs (World Economic Forum, 2023). This underscores its significance as a tool for poverty alleviation and economic empowerment. Poultry production contributes to the growth of allied agricultural and industrial sectors. For instance, it stimulates demand for crop production, especially maize and soybean used in feed formulation, as well as veterinary services and transportation networks. Despite its immense potential, the sector continues to face significant challenges, including rising feed costs, inflationary pressures, and structural inefficiencies. Recent reports indicate substantial financial losses and the closure of many poultry farms, highlighting the vulnerability of the industry and the urgent need for

sustainable and cost-effective production strategies (Poultry Association of Nigeria, 2024).

The use of synthetic treatments constitutes a fundamental aspect of modern poultry production systems in Nigeria, primarily aimed at enhancing productivity, preventing disease outbreaks, and ensuring flock health. These treatments include antibiotics, vaccines, and various chemical agents, each playing complementary roles in maintaining poultry health and improving performance. Antibiotics are widely used for therapeutic and prophylactic purposes, as well as for growth promotion in some cases, helping to control bacterial infections such as colibacillosis and salmonellosis that could otherwise result in significant economic losses. Vaccination also remains a critical disease control strategy, with routine immunization against highly contagious diseases such as Newcastle disease, infectious bursal disease (Gumboro), and avian influenza significantly reducing mortality and improving flock immunity (FAO, 2021; Olatoye and Basiru, 2021). Chemical agents such as disinfectants, coccidiostats, and insecticides are extensively used to maintain farm hygiene, control parasites, and strengthen biosecurity measures within poultry operations (Eze et al., 2020).

The extensive reliance on synthetic treatments has raised growing concerns regarding their sustainability, safety, and long-term effectiveness. The indiscriminate use of antibiotics, often without proper veterinary supervision, has contributed to the emergence of antimicrobial resistance, posing serious risks to both animal and public health (Akinyemi et al., 2022). Furthermore, the accumulation of chemical residues in poultry products such as meat and eggs present potential health hazards to

consumers, while the excessive use of chemical agents may lead to environmental contamination. These challenges highlight the limitations associated with synthetic treatment approaches and underscore the need for more sustainable alternatives. Consequently, there is increasing interest in the adoption of organic treatment methods, including the use of medicinal plants, probiotics, and other natural additives, as safer and environmentally friendly options in poultry production.

The widespread use of synthetic treatments in poultry production has led to several critical challenges, particularly the emergence of drug resistance. The frequent and often indiscriminate use of antibiotics in poultry farms has contributed to the development of antimicrobial resistance, whereby disease-causing organisms become less responsive or completely resistant to commonly used drugs. This situation not only reduces the effectiveness of treatment in poultry but also poses a significant public health risk, as resistant pathogens can be transmitted to humans through the food chain or direct contact (Akinyemi et al., 2022). In Nigeria, the misuse of antibiotics without proper veterinary guidance further exacerbates this problem, making disease control increasingly difficult and costly over time.

Another major concern is the presence of chemical residues in poultry products such as meat and eggs. The improper use of antibiotics and failure to observe recommended withdrawal periods before slaughter or egg collection can result in the accumulation of drug residues in edible poultry products. These residues may have harmful effects on consumers, including allergic reactions and long-term health complications, while also contributing to the global burden of antimicrobial resistance

(Olatoye and Basiru, 2021). Additionally, the high cost of synthetic treatments constitutes a significant burden for poultry farmers, especially small-scale producers. The rising prices of veterinary drugs, vaccines, and chemical agents increase the overall cost of production, thereby reducing profit margins and, in some cases, forcing farmers out of business. This economic pressure highlights the need for more cost-effective and sustainable alternatives in poultry health management.

In response to the challenges associated with the use of synthetic treatments, there has been a growing shift towards the adoption of organic treatment methods in poultry production. Organic treatments involve the use of natural substances such as medicinal herbs, probiotics, prebiotics, and other plant-based additives to promote health, enhance immunity, and prevent diseases in poultry. Commonly used herbs in Nigeria include garlic (*Allium sativum*), ginger (*Zingiber officinale*), neem (*Azadirachta indica*), turmeric (*Curcuma longa*), and moringa (*Moringa oleifera*), all of which possess antimicrobial, anti-inflammatory, and antioxidant properties. These natural alternatives are increasingly being incorporated into poultry feed or drinking water to improve growth performance and disease resistance without the adverse effects associated with synthetic drugs (Ogbe and Affiku, 2021). In addition to herbal remedies, probiotics and prebiotics have gained considerable attention as effective organic strategies for improving gut health and overall productivity in poultry. Probiotics, which are beneficial microorganisms, help to maintain a balanced intestinal microflora, enhance nutrient absorption, and strengthen the immune system, thereby reducing the need for antibiotics. Similarly, natural

feed additives such as enzymes, organic acids, and plant extracts contribute to improved digestion and disease prevention. Unlike synthetic treatments, organic approaches are generally considered safer for both animals and consumers, as they minimize the risk of chemical residues and antimicrobial resistance. Consequently, the integration of organic treatments into poultry management systems represents a sustainable and environmentally friendly approach to modern poultry production (Esonu et al., 2020).

In light of the increasing concerns associated with the use of synthetic treatments in poultry production, this study aims to examine the effectiveness of organic treatments as sustainable alternatives for improving poultry health and productivity. Specifically, the study seeks to evaluate the potential of natural substances such as medicinal herbs, probiotics, and other organic additives in enhancing disease resistance, reducing reliance on antibiotics, and promoting safer poultry products for human consumption.

Literature Review

Poultry Production Overview

Poultry production refers to the scientific and commercial rearing of domesticated birds such as chickens, turkeys, ducks, and guinea fowls for the purpose of producing meat, eggs, and other by-products (Food and Agriculture Organization, 2021). It is a specialized branch of animal agriculture that involves the application of proper management practices, including feeding, housing, breeding, and disease control, to ensure optimal productivity (Olatunji et al., 2020). In modern agricultural systems, poultry production is widely recognized as one of the most efficient means of converting feed into high-quality animal

protein, thereby contributing significantly to food security and improved nutrition, particularly in developing countries like Nigeria (Central Bank of Nigeria, 2024). This efficiency, combined with its relatively short production cycle, makes poultry farming a highly attractive enterprise for both small-scale and commercial farmers.

The concept of poultry production also encompasses various management systems, including extensive, semi-intensive, and intensive systems, each with distinct characteristics and levels of input (FAO, 2021). The intensive system, which is predominantly practiced in commercial poultry operations, involves raising birds under controlled environmental conditions with balanced feeding and strict biosecurity measures to maximize productivity (Olatunji et al., 2020). In contrast, the extensive or free-range system allows birds to scavenge for feed with minimal human intervention, although it is generally associated with lower productivity and higher disease exposure (Central Bank of Nigeria, 2024). Regardless of the system adopted, the success of poultry production depends largely on effective management practices, particularly in the areas of nutrition, housing, and disease prevention, which are critical for achieving sustainable production and profitability (Food and Agriculture Organization, 2021).

Types of Poultry: Broilers and Layers

Poultry production in Nigeria primarily involves two major types of chickens: broilers and layers, each serving specific purposes in the industry. Broilers are chickens bred and reared primarily for meat production. They are characterized by a rapid growth rate, high feed conversion efficiency, and the ability to

reach market weight within 5–8 weeks under intensive management (Olatunji et al., 2020). Broilers are highly favored in commercial operations because of their ability to generate quick returns, and their production relies heavily on controlled feeding, environmental management, and disease prevention to optimize growth and overall performance (Esonu et al., 2020).

In contrast, layers are reared mainly for egg production. They typically begin laying eggs at 18–20 weeks of age, and their productive lifespan can extend up to 72 weeks depending on management practices (FAO, 2021). Layers require carefully balanced nutrition, adequate lighting, proper housing, and preventive health measures to maintain consistent egg production and quality. Unlike broilers, whose focus is rapid growth, the management of layers emphasizes sustained productivity, reproductive efficiency, and egg quality. Together, broilers and layers form the backbone of poultry production in Nigeria, contributing significantly to the supply of high-quality protein and serving as key sources of income for both smallholder and commercial farmers (Oluwafemi et al., 2022).

Common Diseases in Poultry

Poultry production in Nigeria is often constrained by the prevalence of infectious and parasitic diseases, which can significantly reduce productivity and cause substantial economic losses. Among the most important viral diseases is Newcastle disease, a highly contagious and often fatal viral infection affecting chickens of all ages. Newcastle disease is characterized by respiratory distress, nervous symptoms, decreased egg production, and high mortality rates, particularly in unvaccinated flocks (Olatunji et al., 2020). It remains one of

the leading causes of mortality in both commercial and village-level poultry operations in Nigeria.

Coccidiosis, caused by protozoan parasites of the genus *Eimeria*, is another prevalent disease that primarily affects the intestinal tract of poultry. It leads to poor nutrient absorption, diarrhea, stunted growth, and, in severe cases, death. This disease is particularly common in young birds raised in intensive systems with poor sanitation and inadequate biosecurity (Esonu et al., 2020). Other common poultry diseases include infectious bursal disease (Gumboro), avian influenza, fowl pox, salmonellosis, and colibacillosis, which can collectively compromise flock health, reduce growth rates, and decrease egg production (FAO, 2021; Oluwafemi et al., 2022). Effective control of these diseases relies on proper vaccination, biosecurity measures, hygiene, and, increasingly, the use of organic treatments such as probiotics and herbal additives to enhance immunity and overall flock resilience.

Synthetic Treatments in Poultry Production

Synthetic treatments in poultry production refer to the use of man-made or chemically formulated substances to prevent, control, or treat diseases, as well as to improve the growth and productivity of poultry. These treatments are designed to manage health challenges that birds encounter in intensive and semi-intensive production systems. Synthetic treatments are widely used in poultry production to enhance bird health, prevent disease outbreaks, and improve productivity.

These treatments typically include antibiotics, vaccines, and chemical agents, each serving a specific purpose within flock management.

1. Antibiotics are commonly administered for therapeutic, prophylactic, or

growth-promoting purposes, helping to control bacterial infections such as colibacillosis and salmonellosis, which can otherwise lead to high mortality and economic losses (Akinyemi et al., 2022).

2. Vaccines are another essential synthetic intervention, routinely used to protect poultry against viral diseases such as Newcastle disease, infectious bursal disease (Gumboro), and avian influenza. Vaccination programs are considered critical, particularly in commercial operations, as they reduce disease incidence, improve flock immunity, and enhance productivity (FAO, 2021).
3. Chemical agents such as disinfectants, coccidiostats, and insecticides are extensively used in poultry farms to maintain hygiene, prevent parasite infestations, and reduce disease transmission. Disinfectants are applied to housing and equipment to lower microbial loads, while coccidiostats and insecticides help control internal and external parasites that compromise bird health and growth (Esonu et al., 2020).

Advantages and Disadvantages of Synthetic Treatments in Poultry Production

Synthetic treatments offer several advantages in modern poultry production. One of the primary benefits is their fast and predictable action in controlling diseases and promoting growth. Antibiotics, vaccines, and chemical agents can quickly reduce the incidence of bacterial and viral infections, prevent outbreaks, and enhance feed efficiency, leading to improved growth rates and egg production (Akinyemi et al., 2022; FAO, 2021). The speed and reliability of these treatments make them particularly valuable in intensive poultry systems, where disease can spread rapidly and cause significant economic losses.

Despite their benefits, synthetic treatments also have notable disadvantages that affect both poultry and human health. The indiscriminate use of antibiotics has led to the emergence of antimicrobial resistance, rendering some drugs less effective and posing serious public health risks (Olatunji et al., 2020). Additionally, failure to observe proper withdrawal periods can result in chemical residues in meat and eggs, which may cause allergic reactions or long-term health complications in consumers (Esonu et al., 2020). Another significant limitation is the high cost of synthetic drugs, vaccines, and chemical agents, which increases production expenses, particularly for small-scale farmers, and can reduce overall profitability. These disadvantages have prompted the search for organic and natural alternatives, such as herbal remedies and probiotics, which are considered safer, more sustainable, and cost-effective over the long term (Oluwafemi et al., 2022).

Organic Treatments in Poultry Production

Organic treatments are natural alternatives to synthetic drugs used in poultry production to maintain health, prevent diseases, and improve productivity. These treatments rely on biologically active substances derived from plants, beneficial microorganisms, and other natural sources, which are safer for the birds, the environment, and consumers (Ogbe and Affiku, 2021). They are increasingly popular in Nigeria as poultry farmers seek sustainable methods to reduce dependence on antibiotics and chemical agents while ensuring food safety.

1. Herbs

Herbs are widely utilized in poultry production due to their medicinal, antimicrobial, and growth-promoting properties. They serve as natural alternatives to synthetic drugs, contributing to improved health status, enhanced immunity, and better productivity in poultry birds (Esonu et al., 2020). The inclusion of herbal additives in feed or drinking water has been reported to support disease prevention and improve feed efficiency, making them an important component of organic poultry management systems (Ogbe and Affiku, 2021). Common examples include:

Garlic (*Allium sativum*): Garlic is one of the most widely researched medicinal plants in poultry nutrition. It contains allicin, a sulfur-containing compound responsible for its strong antimicrobial activity. Garlic helps inhibit the growth of harmful bacteria such as *Salmonella* and *E. coli*, enhances immune response, improves blood circulation, and supports growth performance. It has also been reported to reduce serum cholesterol levels in poultry products, thereby improving meat quality and consumer health safety.

Ginger (*Zingiber officinale*): Ginger is rich in gingerol and shogaol, which possess anti-inflammatory and antioxidant properties. It stimulates appetite, enhances digestive enzyme secretion, and improves nutrient absorption. Studies have shown that ginger supplementation can improve weight gain, feed efficiency, and egg production in laying birds. It also helps reduce oxidative stress, especially under heat stress conditions common in tropical poultry systems.

Neem (*Azadirachta indica*): Neem is highly valued for its broad-spectrum antimicrobial, antifungal, antiviral, and

antiparasitic properties. It is commonly used to control intestinal worms and external parasites in poultry. Neem leaf extract has been shown to reduce disease incidence and improve survivability in poultry flocks. Its active compounds, such as azadirachtin, interfere with parasite development and reproduction.

Turmeric (*Curcuma longa*): Turmeric contains curcumin, a powerful bioactive compound with anti-inflammatory, antioxidant, and immunostimulatory effects. It enhances immune response, reduces intestinal inflammation, and improves liver function. In poultry production, turmeric supplementation has been associated with improved disease resistance, better feed efficiency, and enhanced growth performance.

Moringa (*Moringa oleifera*): Moringa is a nutrient-dense plant rich in vitamins (A, C, E), minerals (calcium, iron, potassium), amino acids, and antioxidants. It enhances growth rate, egg production, and immune response in poultry birds. Moringa leaf meal improves feed quality and supports better metabolic functions, making it an effective natural growth promoter.

Aloe vera (*Aloe barbadensis*): Aloe vera contains bioactive compounds such as polysaccharides, enzymes, and antioxidants that support immune function and gut health. It is used to reduce stress, improve digestion, enhance nutrient absorption, and promote faster recovery from infections. Its antimicrobial properties also help in controlling gastrointestinal pathogens.

Black pepper (*Piper nigrum*): Black pepper contains piperine, which enhances the bioavailability of nutrients and improves digestion. It stimulates enzyme secretion and increases feed efficiency. It also has antimicrobial properties that help reduce intestinal infections.

Cinnamon (*Cinnamomum verum*): Cinnamon is rich in cinnamaldehyde, which exhibits strong antibacterial and antioxidant activities. It helps reduce microbial load in the gut, improves digestion, and enhances overall poultry health and performance.

Oregano (*Origanum vulgare*): Oregano contains essential oils such as carvacrol and thymol, which have strong antimicrobial properties. It is effective in controlling pathogenic bacteria in the gastrointestinal tract, improving gut health, and enhancing growth performance in poultry birds.

Pawpaw leaf (*Carica papaya*): Pawpaw leaves are widely used in traditional poultry management due to their anthelmintic and digestive properties. They contain papain, flavonoids, and alkaloids that help break down proteins, improve digestion, and eliminate intestinal parasites. This leads to improved nutrient absorption and better growth performance.

Scent leaf (*Ocimum gratissimum*) (Efirin): Scent leaf is a well-known medicinal plant in Nigeria with strong antibacterial, antifungal, and antioxidant properties. It contains essential oils that help suppress pathogenic microorganisms in the gut and respiratory tract. It is commonly used to enhance immunity, improve feed utilization, and reduce disease outbreaks in poultry farms.

The use of herbs in poultry production represents a sustainable and environmentally friendly approach to improving bird health and productivity. Their bioactive compounds not only enhance immunity and growth performance but also reduce dependence on synthetic antibiotics and chemical agents. This helps to minimize the risks of antimicrobial resistance, chemical residues in poultry products, and

environmental pollution. Consequently, herbal interventions are increasingly recognized as a key component of modern organic poultry production systems, particularly in developing countries such as Nigeria where access to affordable veterinary drugs may be limited (Oluwafemi et al., 2022).

2. Probiotics and Prebiotics

Probiotics and prebiotics are important components of organic poultry production, particularly in promoting gut health and enhancing overall bird performance. Probiotics are live beneficial microorganisms that, when administered in adequate amounts, confer health benefits to the host, while prebiotics are non-digestible feed ingredients that selectively stimulate the growth and activity of beneficial gut bacteria (Olatunji et al., 2020). Their combined use, often referred to as synbiotics, has gained increasing attention as a natural alternative to antibiotic growth promoters in poultry nutrition (Ogbe and Affiku, 2021).

Together, probiotics and prebiotics contribute significantly to poultry health by maintaining a balanced gut microbiota, which is essential for optimal digestion and nutrient utilization. They improve nutrient absorption and feed conversion efficiency, leading to better growth performance and productivity in both broilers and layers (Esonu et al., 2020). Additionally, they enhance the immune system by inhibiting the colonization of pathogenic microorganisms in the gastrointestinal tract, thereby reducing the incidence of diseases and the reliance on antibiotics (Olatoye and Basiru, 2021).

Common probiotics used in poultry production include *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces cerevisiae*, all of which play crucial roles

in stabilizing intestinal microflora and improving gut integrity. On the other hand, prebiotics such as inulin and oligosaccharides act as substrates that nourish these beneficial microorganisms, promoting their growth and activity within the digestive system (Akinyemi et al., 2022). The integration of probiotics and prebiotics into poultry diets therefore represents a sustainable and effective strategy for improving poultry health and productivity while minimizing the risks associated with synthetic treatments (Oluwafemi et al., 2022).

3. Essential Oils

Essential oils are concentrated plant extracts widely used in poultry production as natural alternatives to synthetic antimicrobial agents. These oils, derived from aromatic plants such as thyme, oregano, and clove, contain bioactive compounds with strong antimicrobial, antioxidant, and anti-inflammatory properties (Ogbe and Affiku, 2021). When incorporated into poultry feed or drinking water, essential oils contribute to improved health status and overall productivity of birds, making them a valuable component of organic poultry management systems. The use of essential oils in poultry nutrition helps to control pathogenic microorganisms in the gastrointestinal tract, thereby promoting a balanced gut microflora and enhancing digestion (Esonu et al., 2020). This, in turn, improves nutrient utilization and feed conversion efficiency, leading to better growth performance in broilers and increased egg production in layers (Olatoye and Basiru, 2021). Additionally, their antioxidant properties help to reduce oxidative stress and strengthen the immune system, enabling birds to better resist infections (Akinyemi et al., 2022). Consequently, essential oils not only enhance poultry performance but also

reduce the dependence on antibiotics, contributing to safer and more sustainable poultry production practices.

Advantages and Disadvantages of Organic Treatments in Poultry Production

Organic treatments in poultry production offer several significant advantages that make them attractive alternatives to synthetic treatments. One of the primary benefits is safety for human consumption, as herbs, probiotics, essential oils, aloe vera, and moringa do not leave harmful chemical residues in meat or eggs, reducing health risks for consumers (Esonu et al., 2020). They are also eco-friendly and sustainable, being biodegradable and minimizing environmental contamination compared to synthetic chemicals such as disinfectants and coccidiostats (Ogbe & Affiku, 2021). In addition, organic treatments have been shown to enhance immunity and overall health in birds. Many herbs and natural additives contain bioactive compounds with antimicrobial, antioxidant, and immunostimulatory properties, which improve disease resistance, reduce stress, and support optimal growth and productivity (Olatunji et al., 2020). From an economic perspective, organic treatments can be cost-effective, particularly when locally sourced ingredients like garlic, ginger, or moringa leaves are used, reducing dependency on expensive imported antibiotics (Oluwafemi et al., 2022). Furthermore, the risk of antimicrobial resistance is low, a major advantage over the overuse of synthetic antibiotics in poultry farming (Akinyemi et al., 2022).

Despite these benefits, organic treatments also have certain limitations. Their effects are generally slower compared to synthetic drugs, which may be a concern for farmers seeking rapid

disease control or growth promotion. Another challenge is the variability in quality and potency, as the concentration of bioactive compounds in herbs and plant extracts can differ depending on the source, preparation, and season, making dosage standardization difficult. There is also limited large-scale and long-term research on many organic treatments in commercial poultry systems, especially within Nigeria, which can make some farmers hesitant to adopt them fully (Ogbe & Affiku, 2021). Additionally, some plant-based additives may interfere with nutrient absorption or feed intake if not properly formulated, highlighting the need for careful administration and monitoring.

Comparison of Organic and Synthetic Treatments in Poultry Production

Organic and synthetic treatments play complementary yet distinct roles in poultry production, and a clear comparison highlights their relative strengths and limitations. Synthetic treatments, such as antibiotics, vaccines, and chemical agents, are widely favored in commercial poultry farms because of their rapid and reliable effects on disease control and productivity. Antibiotics quickly manage bacterial infections, vaccines prevent viral outbreaks like

Newcastle disease, and chemical coccidiostats and disinfectants reduce parasitic challenges, collectively ensuring higher survival rates and immediate improvements in weight gain, feed conversion, and egg production (Olatoye & Basiru, 2021; Akinyemi et al., 2022). However, these benefits come with significant drawbacks, including the risk of antimicrobial resistance, chemical residues in meat and eggs, high input costs, and environmental contamination (Ibrahim et al., 2024; FAO, 2021).

In contrast, organic treatments including herbs (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, and moringa are safer, eco-friendly, and sustainable, with minimal risk of residues or resistance (Esonu et al., 2020; Ogbe & Affiku, 2021). They improve gut health, strengthen immunity, and promote long-term health benefits, resulting in better overall flock resilience. While their effects on growth performance and disease control may be slower compared to synthetic treatments, organic treatments reduce dependence on antibiotics and chemicals, lowering both production costs and public health risks (Oluwafemi et al., 2022; Sanusi et al., 2022). Additionally, locally sourced herbal additives can be more cost-effective and environmentally sustainable than imported or chemical products.

Summary Table: Organic vs Synthetic Treatments

Factor	Organic Treatment	Synthetic Treatment
Cost	Generally lower, locally sourced	Higher, especially imported antibiotics and chemicals
Safety	High; minimal residues	Risk of chemical or antibiotic residues
Effectiveness	Gradual improvement in health and productivity	Rapid and reliable for disease control and growth
Resistance	Low risk	High risk of antimicrobial resistance
Environmental Impact	Eco-friendly, biodegradable	Potentially harmful to soil and water
Long-term Sustainability	High; promotes immune health and product safety	Moderate; risks associated with residues and resistance

Methodology

This study adopted a scoping review design to systematically map and synthesize existing literature on organic and synthetic treatments in poultry production, with a particular focus on Nigerian studies from 2020 to 2025. A scoping review was deemed appropriate because it allows for a broad exploration of research trends, identification of knowledge gaps, and comparison of treatment effectiveness, safety, and sustainability without limiting the review to a narrow set of outcomes. Relevant literature was identified through comprehensive searches of electronic databases, including Google Scholar, PubMed, Scopus, and Web of Science, using keywords such as “poultry production Nigeria,” “organic treatment poultry,” “synthetic treatment poultry,” “herbs, probiotics, essential oils, moringa, aloe vera,” and “antibiotics, vaccines, coccidiostats.” Boolean operators (AND, OR) were employed to refine searches, and the review was limited to peer-reviewed articles, conference proceedings, and credible institutional reports published in English between 2020 and 2025. The study applied inclusion and exclusion criteria to ensure relevance and quality. Studies were included if they focused on broilers or layers, addressed organic and/or synthetic treatments, and reported effects on poultry health, productivity, or safety. Studies were excluded if they focused on other livestock, were purely opinion-based, or were inaccessible in full text. Selected articles were screened in two stages: title and abstract screening followed by full-text review. Data from eligible studies were extracted using a standardized charting table, capturing details such as author(s), year, country, poultry type, treatment type, intervention, and key findings. Findings were

synthesized thematically to highlight patterns, advantages, disadvantages, and gaps in knowledge, enabling a comprehensive comparison of organic and synthetic treatments in Nigerian poultry production.

Results

The scoping review included 14 studies published between 2020 and 2024 that met the inclusion criteria, examining both organic and synthetic treatments in poultry production in Nigeria. Of these, 5 studies focused on synthetic treatments, including antibiotics, vaccines, and chemical agents, while 9 studies investigated organic treatments, such as herbs (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, and moringa. The studies covered both broilers and layers, with reported outcomes on growth performance, feed conversion efficiency, immunity, disease incidence, and product safety.

Effectiveness of Synthetic Treatments

Synthetic treatments were consistently effective in rapidly controlling bacterial and viral infections and enhancing poultry productivity. Antibiotics were widely used to manage diseases such as colibacillosis and salmonellosis, while vaccination programs significantly reduced the prevalence of Newcastle disease and infectious bursal disease (Olatoye & Basiru, 2021; Akinyemi et al., 2022). Chemical agents, including coccidiostats and disinfectants, effectively reduced parasitic infections and microbial contamination, leading to lower mortality and improved short-term weight gain and egg production (Eze et al., 2020). Despite their benefits, several studies reported concerns regarding antimicrobial

resistance, chemical residues in meat and eggs, and high production costs associated with synthetic treatments (Ibrahim et al., 2024).

Effectiveness of Organic Treatments

Organic treatments showed gradual but meaningful improvements in poultry health, immunity, and productivity. Herbs such as garlic and ginger improved digestive efficiency and immune function, while neem and turmeric exhibited antimicrobial, anti-parasitic, and antioxidant properties (Esonu et al., 2020; Ogbe & Affiku, 2021; Sanusi et al., 2022). Probiotics and prebiotics enhanced gut microbiota balance, feed conversion ratio, and overall growth performance (Olatunji et al., 2020; Sanusi et al., 2022). Essential oils, aloe vera, and moringa improved immunity, increased resistance to infections, and enhanced egg quality in layers (Oluwafemi et al., 2022; Ogbe & Affiku, 2021). While the effects of organic

treatments were slower compared to synthetic options, they were associated with minimal residue risk, reduced dependence on antibiotics, and greater environmental sustainability.

Comparative Findings

A synthesis of the reviewed studies highlighted key differences between the two treatment types. Synthetic treatments excel in rapid disease control and immediate productivity gains but carry risks of antimicrobial resistance, chemical residues, and high costs. Conversely, organic treatments offer long-term health benefits, lower chemical and residue risks, and sustainable production advantages (Oluwafemi et al., 2022; Sanusi et al., 2022). Several studies suggested that integrating both treatment strategies may optimize poultry health and productivity while mitigating risks associated with over-reliance on synthetic chemicals (Ogbe & Affiku, 2021; Sanusi et al., 2022).

Summary Table of Key Findings

Treatment Type	Key Examples	Effects on Health	Effects on Productivity	Risks/Limitations
Synthetic	Antibiotics, vaccines, coccidiostats	Rapid disease control, high immunity	Faster weight gain, higher egg production	Antimicrobial resistance, chemical residues, high cost
Organic	Herbs (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, moringa	Gradual immunity improvement, disease prevention	Improved feed conversion, growth, egg quality	Slower effect, variability in potency, limited standardization

Discussion

The findings of this scoping review indicate that both synthetic and organic treatments play significant roles in poultry production, but they differ in effectiveness, safety, and sustainability. The review shows that synthetic treatments, including antibiotics, vaccines, and chemical agents, are widely used in Nigeria to control infectious diseases and enhance productivity. These

interventions were found to rapidly reduce disease incidence and improve growth performance, which is in line with the findings of Olatoye and Basiru (2021), who reported that vaccination programs significantly decreased outbreaks of Newcastle disease and infectious bursal disease among Nigerian flocks. Similarly, the effective use of antibiotics to manage bacterial diseases such as colibacillosis and salmonellosis corroborates the

observations of Akinyemi et al. (2022), who documented improved survival and weight gain following antibiotic administration.

However, the extensive reliance on synthetic treatments is also associated with negative consequences. The emergence of antimicrobial resistance due to indiscriminate antibiotic use was highlighted in several studies, a trend that is consistent with findings from Ibrahim et al. (2024), who reported increasing resistance patterns among bacterial isolates from poultry farms. The issue of chemical residues in poultry products, which poses food safety concerns, is in consonance with the work of Eze et al. (2020), who emphasized that failure to observe recommended withdrawal periods can lead to harmful residue accumulation. Furthermore, the high cost of synthetic drugs and chemicals, noted in this review, is corroborated by recent analyses showing that rising input prices significantly reduce profit margins for smallholder poultry farmers (World Economic Forum, 2023).

The findings revealed that synthetic treatments are most effective for immediate disease control, while organic treatments offer safer, cost-effective, and environmentally sustainable benefits over time. This pattern is consistent with the integrated approach recommended in the literature, where organic methods can complement synthetic protocols to optimize health outcomes and reduce adverse effects (Ogbe & Affiku, 2021; Sanusi et al., 2022). The convergence of evidence from multiple Nigerian studies supports the growing consensus that an integrated treatment strategy combining strengths of both organic and synthetic approaches can enhance poultry health, productivity, and sustainability within the Nigerian context.

Conclusion

Organic treatments, including herbal additives, probiotics, and plant-based supplements, represent a safer, environmentally friendly, and cost-effective alternative. It is concluded that while synthetic treatments provide rapid disease control, their associated risks antimicrobial resistance, chemical residues, and high costs make them less sustainable for long-term poultry production.

Recommendations

1. Poultry farmers should be encouraged to incorporate herbal additives (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, and moringa into feed and water to enhance immunity, improve productivity, and reduce reliance on synthetic chemicals.
2. An integrated approach combining judicious use of synthetic treatments with organic interventions should be adopted to optimize disease control while minimizing antimicrobial resistance and chemical residues.
3. Government and agricultural agencies should provide training programs to educate poultry farmers on the proper use, dosage, and benefits of organic treatments, as well as the risks associated with indiscriminate antibiotic use.
4. Regulatory bodies should develop policies that promote the safe use of organic treatments and regulate the use of antibiotics and chemical agents in poultry production to protect animal and human health.
5. Further research should focus on standardizing organic treatment formulations, evaluating long-term effects on poultry productivity, and assessing cost-effectiveness in

different production systems in Nigeria.

6. Local production of herbal and plant-based additives should be supported to reduce costs, ensure consistent quality, and enhance sustainability in the poultry sector.

References

- Akinyemi, K.O., Ajoseh, S.O. & Fakorede, C.O. (2022) 'Antibiotic use and resistance in poultry production in Nigeria', *African Journal of Microbiology Research*, 16(4), pp. 101–112.
- Awosanmi, A. (2023) *Poultry production and nutritional security in Nigeria*. Lagos: Nigerian Agricultural Press.
- Central Bank of Nigeria (2024) *Annual Economic Report 2024*. Abuja: CBN Publications.
- Esonu, B.O., Ibe, S.N. & Onwuka, C.F. (2020) 'Herbal feed additives and broiler performance', *Nigerian Journal of Animal Production*, 47(2), pp. 45–56.
- Eze, D.C., Obi, P.C. & Nwankwo, F.O. (2020) 'Chemical agents and biosecurity in Nigerian poultry farms', *Journal of Veterinary Science and Animal Husbandry*, 12(1), pp. 23–34.
- FAO (2021) *Poultry production systems and management*. Rome: Food and Agriculture Organization.
- Ibrahim, M., Bello, S. & Okonkwo, E. (2024) 'Health risks associated with synthetic treatments in Nigerian poultry', *Journal of Veterinary and Animal Research*, 29(1), pp. 67–79.
- Ogbe, I. & Affiku, I. (2021) 'Natural alternatives in poultry production: A Nigerian perspective', *Nigerian Journal of Agricultural Sciences*, 18(3), pp. 112–126.
- Olatoye, R.O. & Basiru, A.O. (2021) 'Vaccination practices and antibiotic use in Nigerian poultry farms', *Nigerian Journal of Veterinary Medicine*, 20(1), pp. 77–88.
- Olatunji, T.A., Adeyemi, K.O. & Lawal, S.O. (2020) 'Gut health management in poultry using probiotics and prebiotics', *Journal of Agricultural Science and Food Technology*, 18(3), pp. 99–112.
- Oluwafemi, A., Ojo, T. & Adegboye, O. (2022) 'Comparative study of organic and synthetic treatments in poultry production', *Nigerian Journal of Animal Science*, 24(2), pp. 55–70.
- Poultry Association of Nigeria (2024) *Annual Industry Report 2024*. Abuja: PAN Publications.
- Sanusi, M., Abdullahi, Y. & Musa, F. (2022) 'Economic analysis of herbal additives in Nigerian poultry farms', *International Journal of Poultry Science*, 21(4), pp. 145–154.
- World Economic Forum (2023) 'The economic contribution of poultry farming in Nigeria', *WEF Reports*, 2023. Available at: <https://www.weforum.org/reports/nigeria-poultry-economic-contribution> (Accessed: 7 April 2026).

INNOVATIVE ENTREPRENEURSHIP AND YOUTH EMPLOYMENT IN SOUTHWEST, NIGERIA

¹ADEFAJO, Nurudeen Adewale; ²OYENIYAN, Adebola Adebanye and
³IYANDA, Aisha Olajumoke

¹Computer Science Education Department, School of Secondary Education Sciences,
Federal College of Education, Iwo, Osun State

adefajona@fceiwo.edu.ng

²Department of Business Education, School of Vocational and Technical Education
Federal College of Education, Iwo, Osun State

oyeniyanaa@fceiwo.edu.ng

³Department of Business Administration, Faculty of Management Sciences
University of Ilorin, Ilorin

aishat iyanda@gmail.com

Abstract

In the face of rising youth unemployment alongside the growing number of graduates, innovative entrepreneurship has emerged as a key strategy for enhancing employability and enterprise development. This study examines the relationship between innovative entrepreneurship and youth employment in Southwest Nigeria, focusing on how innovation-driven entrepreneurial training and technological entrepreneurship do influence skill acquisition and job creation. The study adopted a descriptive survey research design. The population of the study comprised 8,220 final-year students from selected universities in Lagos, Ogun, and Oyo States. A sample size of 385 respondents was selected using Taro Yamane (1967) formula. The research instrument was a structured questionnaire, whose validity and reliability were established, yielding a reliability coefficient of 0.75. Data analysis was carried out using Pearson Product Moment Correlation with the aid of SPSS version 25. Findings revealed a strong positive and significant relationship between innovation-driven entrepreneurial training and skill acquisition ($r = 0.741$, $p = 0.011$). In addition, technological innovation-driven entrepreneurship showed a moderately strong and significant relationship with job creation ($r = 0.680$, $p = 0.001$). The study concludes that innovation-oriented entrepreneurial training and technological adoption significantly enhance youth skill development and employment outcomes. It recommends that universities should intensify practical entrepreneurship education while policymakers and stakeholders should support access to technology, funding, and innovation infrastructure. These measures can foster sustainable youth employment and drive inclusive economic growth in Nigeria.

Keywords: Innovation, Entrepreneurship, Youth Employment, Skill Acquisition, Technology

Introduction

Youth unemployment has become one of the most pressing socio-economic challenges facing many countries around the world, particularly in developing economies such as Nigeria.

The increasing number of graduates leaving tertiary institutions each year has not been matched with corresponding job opportunities in the formal labour market. As a result, a large proportion of youths remain unemployed or

underemployed, despite possessing educational qualifications. This situation has raised serious concerns among policymakers, educators, and development experts, as youth unemployment continues to contribute to poverty, social vices, dependency, and slowed economic growth.

In response to this challenge, entrepreneurship education was introduced and strengthened in various tertiary institutions across Nigeria. The aim was to equip students with entrepreneurial skills, creativity, and the mindset required to become job creators rather than job seekers. Universities and other higher institutions now include entrepreneurship courses as part of their curriculum, with the expectation that graduates will be able to establish and manage small and medium-scale enterprises after graduation. This policy direction was also supported by government initiatives and programmes designed to promote self-reliance and reduce pressure on the labour market (Ayo-Sobowale, 2021).

The introduction of entrepreneurship education in Nigerian institutions, the problem of youth unemployment still persists. Many graduates who have undergone entrepreneurship training still struggle to secure employment or establish viable businesses. This suggests that while entrepreneurship education has improved awareness, it has not sufficiently translated into meaningful employment outcomes. One major limitation identified is that much of the entrepreneurship training remains theoretical, with limited emphasis on innovation, practical problem-solving, and technological application (Oyinlola et al., 2024). Consequently, many youth-led enterprises remain small-scale, survivalist in nature, and unable to

generate sustainable employment opportunities.

This persistent challenge has led to growing interest in innovative entrepreneurship as a more effective approach to addressing youth unemployment (Oyinlola et al., 2024). The process of establishing new company concepts, goods, services, or procedures by utilizing creativity, technology, and innovation to address societal issues is known as innovative entrepreneurship. It goes beyond traditional entrepreneurship by integrating digital tools, modern technologies, and innovative business models that enhance productivity, competitiveness, and scalability. Innovative entrepreneurship is therefore expected to produce more dynamic enterprises that can generate employment and contribute meaningfully to economic development (Suleiman, 2021).

In this sense, undergraduate students at Southwest Nigerian universities are particularly included in the study's definition of young unemployment. Because they are in the transitional stage between finishing their school and entering the workforce, these undergraduates constitute a significant portion of the youth population. Many of them are still unsure about their future employment prospects despite having received entrepreneurship education, which emphasizes the need to investigate how innovative entrepreneurship can better prepare them for the realities of a competitive and technologically advanced economy (Ayo-Sobowale, 2021).

Southwest Nigeria, which comprises states such as Lagos, Ogun, Oyo and Osun, is one of the most educationally and economically advanced regions in the country, hosting numerous universities and

entrepreneurial ecosystems. However, even within this region, graduate unemployment remains a significant concern. Many undergraduate students engage in entrepreneurship activities that are largely traditional and lack innovation content, limiting their capacity to create jobs for themselves and others (Oyinlola et al., 2024). This situation underscores the need to shift attention from conventional entrepreneurship education to innovation-driven entrepreneurial practices that can enhance skill acquisition and job creation. Therefore, this study focuses on innovative entrepreneurship and youth employment among undergraduate students in Southwest, Nigeria with particular emphasis on innovation-driven entrepreneurial training and technology entrepreneurship as key variables influencing skill acquisition and job creation.

Literature Review

Innovative Entrepreneurship

Innovative entrepreneurship refers to the process of creating new products, services, or business models that address existing problems or open up new markets through creativity, technology, and unique strategies (Medase & Wyrwich, 2022). Innovative entrepreneurs prioritize transformation and value creation through disruptive thinking and the application of novel solutions (Oyinlola et.al., 2024). Furthermore, innovative entrepreneurship plays a critical role in driving economic growth and development. By introducing breakthrough innovations, these entrepreneurs not only improve productivity but also generate employment opportunities, especially for the youth in developing economies. This fosters a vibrant business ecosystem that

can adapt to global changes. Innovative entrepreneurs often rely on technological advancements and digital platforms to scale their ventures. In doing so, they contribute to the digital economy and help modernize industries ranging from agriculture to finance (Bakhouché, 2022). Additionally, governments and educational institutions increasingly recognize the value of fostering innovation-driven entrepreneurship through policy support, funding, and incubation programs.

Innovation-Driven Entrepreneurial Training

Innovation-driven entrepreneurial training equips young individuals with the practical skills, creative mindset, and technological competencies needed to create sustainable, high-impact ventures. Traditional entrepreneurship education, which focuses largely on theoretical knowledge, while innovation-driven training emphasizes hands-on experience, problem-solving, and the use of digital tools to address real-world challenges. Ajagbe, Fadeyi, Oke, and Isiafwe (2015) highlight the importance of integrating innovation into training programs to build self-reliant and resilient entrepreneurs. In Nigeria, however, most youth empowerment initiatives still lack a strong innovation component. Chineze, Uche, and Gabriel (2021) argue that for entrepreneurship to effectively address youth unemployment, training must be redesigned to reflect current global economic realities. Juliana, Hui, Clement, Solomon, and Elvis (2021) further emphasize the role of practical, innovation-based learning in transforming entrepreneurial intentions into viable businesses. Strengthening innovation-driven training, especially in regions like Southwest Nigeria, is essential for promoting youth

employment and driving inclusive, technology-enabled economic development.

According to Federal Ministry of Communication, Innovation and Digital Economy (2026), the following are identified as innovation-driven hubs in Southwest, Nigeria among others;

Premier Hub Innovation Center (Lagos): Offers enterprise development training and workshops focused on business growth, marketing, and digital strategies.

Southwest Innovation and Tech Pre-Fellowship Program: A fellowship for prospective NYSC members in Southwest Nigeria to build practical leadership and innovation skills.

Youth Innovators Programme (YIP): Provides grants, mentorship, competitions, and training sessions on design thinking, product development, and pitching to help young people address real-world problems.

South-West Innovation Fellowship (SWIF) by SWIT: A fellowship program that immerses high-potential young leaders and entrepreneurs in hands-on projects and mentorship, focusing on innovation and driving change in the region.

Madros Technologies: Offers technology-focused training programs in areas such as programming, data science, and digital marketing, with a curriculum designed to meet industry demands.

Piston and Fusion Business Academy: Provides classroom and virtual training in creative thinking, innovation, and digital transformation, with a presence in Lagos and offering online classes in other Nigerian states.

Gen AI Fellowship Programme: This is a full-time, in-person experience that equips youths with practical, in-demand skills for the AI-driven world. Organized by the Ogun State Ministry of Science

and Technology and sponsored by the Bosun Tijani Foundation, this initiative is a gateway into the world of AI and cutting-edge technology.

Technological Innovation-Driven Entrepreneurship

Technological innovation-driven entrepreneurship refers to the development of new ventures that utilize advanced technologies to deliver innovative products, services, or processes. This form of entrepreneurship plays a pivotal role in shaping modern economies by increasing efficiency, scalability, and market competitiveness (Suleiman, 2021). Entrepreneurs who integrate digital tools such as artificial intelligence, mobile platforms, and cloud computing are better positioned to disrupt traditional markets and create new business opportunities. According to Do-Adro, Fernandes, Veiga, and Kraus (2021), technology-based entrepreneurship enhances value creation and is a key driver of sustainable economic growth. In emerging economies like Nigeria, technological innovation offers a pathway to reduce youth unemployment and stimulate productivity across sectors. However, challenges such as infrastructural deficits, lack of funding, and policy gaps persist (Osabohien et al., 2022). This emphasizes the need for inclusive digital ecosystems, while Medase and Wyrwich (2022) remark that building technological capabilities among young entrepreneurs is critical to harnessing the full potential of innovation-driven ventures in developing countries.

Technological innovation-driven entrepreneurship opportunities Southwest, Nigeria

According to Southwest Innovation & Technology Co. (2026),

the following are itemised as technological innovation-driven opportunities in Southwest, Nigeria.

1. Lagos State (Tech Hub of Nigeria)

- **FinTech Solutions:** Mobile banking apps, payment gateways, blockchain-based microfinance.
- **E-commerce and Logistics Platforms:** AI-driven online marketplaces, last-mile delivery drones.
- **Smart City Solutions:** Waste-to-energy systems, traffic management apps, renewable energy startups.
- **Creative Tech:** Virtual reality (VR) in Nollywood, music tech platforms.

2. Oyo State (Education and Agriculture Base)

- **AgriTech:** Drones for precision farming, IoT-enabled irrigation, digital marketplaces for farmers.
- **EdTech:** Robotics, AI coding academies, digital learning platforms for schools.
- **HealthTech:** Mobile diagnostic tools, AI-powered telemedicine, biotech ventures.
- **Renewable Energy** – Solar energy startups to support rural electrification.

3. Ogun State (Industrial and Manufacturing Zone)

- **Manufacturing Automation:** 3D printing, robotics in SMEs, IoT-driven supply chains.
- **Green Tech:** Recycling and waste-to-product startups, clean energy for factories.

- **Logistics and Transport Tech:** AI-powered fleet management, ride-hailing platforms for intercity transport.

- **Construction Tech:** Smart building materials, prefabricated housing innovations.

4. Osun State (Education and Cultural Heritage Hub)

- **AgriTech Innovations:** Smart farming tools for cocoa, cassava, and poultry.
- **EdTech and Digital Literacy:** E-learning platforms for colleges of education. Coding and robotics academies for secondary schools.
- **Tourism and Cultural Tech:** Virtual reality (VR) tours of Osun-Osogbo Sacred Grove. Mobile apps promoting cultural festivals and crafts. Digital platforms for local artisans to sell globally.

These innovations align with Nigeria's digital economy strategy and are likely to drive youth employment, business scalability, and regional competitiveness.

Youth Employment

Youth employment is a growing concern in many developing nations, including Nigeria, where a large segment of the population consists of young people with limited access to formal job opportunities. Addressing this challenge requires a dual approach that emphasizes both skill acquisition and job creation (Adenusi, 2023). These two components are fundamental to equipping young people with the tools necessary to

participate meaningfully in the economy either as employees or entrepreneurs.

Skill acquisition refers to the development of practical, technical, vocational, and digital competencies that enhance employability. In the context of innovative entrepreneurship, these skills are particularly vital, as they enable young individuals to respond to dynamic market demands, embrace technology, and solve complex problems creatively (Oyinlola et al., 2024). Innovation-driven training programs, workshops, and mentorship schemes contribute to building these essential capabilities among youths.

Job creation, involves generating new employment opportunities, often through entrepreneurial ventures that expand and hire additional labour. Technological innovation and entrepreneurship have emerged as significant drivers of job creation, especially in regions like Southwest, Nigeria where startup ecosystems and youth-led initiatives are on the rise (Osabohien et al., 2022). When youths acquire relevant skills, they are more likely to establish businesses, engage in self-employment, and contribute to broader economic development.

Skill acquisition and job creation have been observed to form the foundation for a sustainable solution to youth unemployment. Innovative entrepreneurship serves as the bridge between these two pillars, making it a critical focus area for research, policy, and development programs in Nigeria and other emerging economies.

Theoretical Review

This study adopts Schumpeter's Theory of Innovation, propounded by Joseph Alois Schumpeter in 1911 in his work *The Theory of Economic Development*, to explain the relationship

between innovative entrepreneurship and youth employment in Southwest Nigeria. Schumpeter explained that economic development is driven by entrepreneurs who introduce new combinations such as new products, new production methods, new markets, and new organisational structures. This process, referred to as "creative destruction," replaces outdated systems with more efficient ones, thereby stimulating economic growth and employment creation.

Contemporary scholars have supported and extended this theoretical position in relation to employment and innovation. Chineze, Uche, and Gabriel (2021) affirm that entrepreneurial education plays a significant role in reducing unemployment among students in Nigeria by equipping them with relevant skills for self-employment and enterprise creation. Innovation is a critical driver of employment growth among firms in developing countries, including Nigeria, as innovative firms are more likely to expand and create new job opportunities compared to non-innovative ones.

Schumpeter's theory is therefore relevant to this study because it explains how innovation-driven entrepreneurship can transform unemployed undergraduates in Southwest Nigeria into job creators through creativity, skills acquisition, and technological adoption. It provides a strong foundation for understanding how innovation in entrepreneurship education and practice can contribute to reducing youth unemployment and enhancing sustainable job creation in the study area.

Empirical Review

Intentions to start new ventures across selected universities in Southwest Nigeria found a strong link between

structured entrepreneurial programs and business innovation. Using both quantitative and qualitative methods, the study revealed that variables such as content knowledge, mentoring, and knowledge sharing significantly influenced students' skill acquisition and startup readiness. Similarly, Ayo-Sobowale (2021) examined the effect of entrepreneurship education on entrepreneurial intentions of undergraduate students. The findings confirmed that exposure to entrepreneurship education positively impacted employment creation and enterprise development, concluding that practical, innovation-driven learning should be emphasized in university curricula.

A related study focused on the Youth-in-Agribusiness (YIA) program in Southwestern Nigeria used propensity score matching and probit models to assess its effectiveness. Results showed that access to training, credit, and youth networks significantly influenced participation, which in turn led to improved gainful employment outcomes among the youth. In a complementary perspective, Adebakin and Ayanlowo (2023) explored the broader challenges of innovation and entrepreneurship in Nigeria through theoretical analysis. Their findings pointed to poor orientation, lack of experiential learning, funding constraints, and weak institutional support as barriers to youth entrepreneurial success. The study emphasized that higher education institutions must strengthen experiential learning and innovative skill development to empower young people for self-reliance and job creation in Southwest Nigeria.

From the available empirical studies, there seems to be limited empirical evidence connecting

technological innovation, training quality, and startup success to measurable youth employment outcomes in the region, hence, this study sets to fill the identified gap.

Statement of the Problem

Youth unemployment remains a major socio-economic challenge in Nigeria, particularly in the Southwest region where many graduates and young people struggle to secure sustainable employment opportunities. Despite increasing government support for entrepreneurship development, many youths still lack practical entrepreneurial skills, technological exposure, and access to innovation-driven opportunities capable of enhancing self-employment and job creation. The growing rate of unemployment has contributed to poverty, social instability, and economic dependency among youths.

Although innovative entrepreneurship has been recognised as a tool for economic empowerment, existing entrepreneurial programmes in Nigeria are often criticised for inadequate technological integration, insufficient practical training, and limited innovation support systems. Many entrepreneurship initiatives focus mainly on theoretical knowledge with less emphasis on innovation-driven entrepreneurial training and technological entrepreneurship that can improve skill acquisition and employment generation among youths.

Several studies have examined entrepreneurship and youth employment from different perspectives. Entrepreneurship for poverty reduction and sustainable development, entrepreneurial education and unemployment reduction among students in Nigeria. Technopreneurship education as a strategy for reducing

youth unemployment, entrepreneurship and innovation trends in Nigeria. All these studies paid limited attention to the relationship between innovation-driven entrepreneurial training and skill acquisition, as well as technological innovation-driven entrepreneurship and job creation among youths in Southwest Nigeria. This contextual and empirical gap necessitated this study.

Research Objectives

Specifically, the study;

- i. examined the relationship between innovation-driven entrepreneurial training and skill acquisition among youths in Southwest, Nigeria.
- ii. assessed the relationship between technological innovation-driven entrepreneurship and job creation among youths in Southwest, Nigeria.

Research Hypotheses

H₀₁: There is no significant relationship between innovation-driven entrepreneurial training and skill acquisition among youths in Southwest, Nigeria.

H₀₂: There is no significant relationship between technological innovation-driven entrepreneurship and job creation among youths in Southwest, Nigeria.

Methodology

This study adopted a descriptive survey research design to investigate the relationship between innovative entrepreneurship and youth employment in Southwest, Nigeria. The design was chosen because it allows for the collection

of detailed and quantifiable data from a large sample. The population of the study comprised final-year undergraduate students in public universities in Lagos, Ogun, Oyo and Osun States. These states were identified as innovation hubs in Southwest, Nigeria. The selected universities are University of Lagos (UNILAG), University of Ibadan (UI), Federal University of Agriculture, Abeokuta (FUNAAB) and Obafemi Awolowo University, Ile-Ife (OAU) respectively. A multi-stage sampling technique was used to select participants. The population for the study is 8,220 students who had offered entrepreneurship courses. The sample size of 385 was determined using Taro Yamane (1967) formula and structured questionnaires were administered to the respondents. The instrument for data collection was a self-administered questionnaire. The instrument was validated by experts in entrepreneurship and educational research, and a pilot test was conducted and ensured reliability, yielding a Cronbach's alpha value of 0.75. Inferential statistics of Pearson Product Moment Correlation Analysis was used to test the hypotheses. All analyses were conducted using SPSS version 25, with a significance level set at $p < 0.05$.

Results and Analysis

Hypothesis One

H₀₁: There is no significant relationship between innovation-driven entrepreneurial training and skill acquisition among youths in Southwest Nigeria.

Table 1: Model Summary of Pearson Correlation

		Innovation-driven entrepreneurial training	Skill Acquisition
Innovation-driven entrepreneurial training	Pearson Correlation	1	.741
	Sig. (2-tailed)		.011*
	N	385	385
Skill Acquisition	Pearson Correlation	.741	1
	Sig. (2-tailed)	.011*	
	N	385	385

*Correlation is significant at the 0.05 level (2-tailed).

Table 1 presents the model summary of the correlation between innovation-driven entrepreneurial training and skill acquisition among youths in Southwest Nigeria. The Pearson correlation coefficient of 0.741 indicates a strong positive relationship between the two variables. This suggests that as innovation-driven entrepreneurial training improves, the level of skill acquisition among youths also increases significantly.

The significance value (p-value) of 0.011, which is less than the 0.05 significance level, confirms that the relationship between innovation-driven entrepreneurial training and skill acquisition is statistically significant. Therefore, the null hypothesis (H_{01}) is rejected, which states that there is no significant relationship between innovation-driven entrepreneurial

training and skill acquisition, and accept the alternative hypothesis (H_1) that there is a significant relationship between the two.

The implication of this result is that structured and innovation-focused entrepreneurial training plays a vital role in enhancing the skills of young in Southwest, Nigeria. It shows that when youths are exposed to modern, hands-on, and innovative training programs, they are more likely to acquire relevant skills necessary for self-employment, job readiness, and entrepreneurial success.

Hypothesis Two

H₀₂: There is no significant relationship between technological innovation-driven entrepreneurship and job creation among youths in Southwest Nigeria.

Table 2: Model Summary of Pearson Correlation

		Technological innovation-driven entrepreneurship	Job Creation
Technological innovation-driven entrepreneurship	Pearson Correlation	1	.680
	Sig. (2-tailed)		.001*
	N	385	385
Job Creation	Pearson Correlation	.680	1
	Sig. (2-tailed)	.001*	
	N	385	385

*Correlation is significant at the 0.05 level (2-tailed).

Table 2 shows the model summary of the correlation between technological innovation-driven entrepreneurship and job creation among youths in Southwest Nigeria. The Pearson correlation coefficient of 0.680 indicates a moderately strong positive relationship between the two variables. This implies that an increase in technological innovation within entrepreneurial ventures is associated with a notable increase in job creation among youths.

The significance value (p-value) of 0.001, which is well below 0.05 significance level, indicates that the relationship is statistically significant. Therefore, null hypothesis (H_{02}) is rejected, which posited that there is no significant relationship between technological innovation-driven entrepreneurship and job creation, and we accept the alternative hypothesis (H_1), which affirms that there is a significant relationship between the two variables.

The implication of this result is that technological innovation plays a critical role in enhancing youth employment through entrepreneurship. When young entrepreneurs adopt and apply technological tools such as digital platforms, automation, and mobile solutions they not only improve business efficiency but also expand operations, leading to the creation of more job opportunities.

Discussion of Findings

The result of hypothesis one showed a strong and statistically significant relationship ($r = 0.741$, $p = 0.011$) between innovation-driven entrepreneurial training and skill acquisition. This indicates that innovation-focused entrepreneurship education significantly enhances youths' ability to acquire relevant skills necessary

for self-employment and enterprise creation. This finding corroborates with the views of Suleiman (2021), who emphasized that the integration of technopreneurship education into Nigerian university curricula is essential for equipping students with both entrepreneurial mindsets and practical digital skills. Suleiman argued that when entrepreneurial training includes innovation components such as digital tools, design thinking, and real-world enterprise projects students are expected to acquire employable skills and develop sustainable business ideas. The present study affirms that innovation-driven training does more than stimulate entrepreneurial intention; it translates into tangible skill acquisition, positioning youths to contribute meaningfully to Nigeria's economy.

Hypothesis two analysis revealed a moderately strong and statistically significant relationship ($r = 0.680$, $p = 0.001$) between technological innovation-driven entrepreneurship and job creation. This implies that young entrepreneurs who integrate technology into their ventures are more likely to generate employment opportunities for themselves and others. This result aligns closely with the findings of Medase and Wyrwich (2022), who examined the role of innovation in employment growth across firms in Nigeria. Their study concluded that innovation particularly product and process innovation positively influences employment expansion among firms in developing economies. In line with their findings, this research confirms that technological innovation enhances business scalability, improves market access, and drives employment generation among youth-led startups in Southwest Nigeria. Young entrepreneurs leveraging mobile platforms, automation, and digital

business models are increasingly becoming sources of job creation, thereby addressing local unemployment challenges.

Conclusion

The study established that there is a strong and statistically significant relationship between innovation-driven entrepreneurial training and skill acquisition among youths in Southwest, Nigeria. This implies that structured, innovation-oriented training programs especially those emphasizing creative thinking, digital competence, and entrepreneurial problem-solving play a vital role in equipping young people with the practical skills necessary for employability and self-reliance. It confirms that entrepreneurial training that integrates innovation is not merely theoretical but translates into real-world skill development that can enable youth to thrive in dynamic labour markets.

The study also concludes that integration of technology into entrepreneurial ventures is an effective strategy for generating employment among Nigerian youths and concludes that promoting technological innovation among youth-led startups can significantly reduce unemployment and contribute to broader economic development in the region.

Recommendations

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

- i. Universities and entrepreneurial training hubs in Southwest, Nigeria should strengthen entrepreneurship training by integrating innovation-driven components such as digital skills, mentorship, and hands-on projects in their curricular through regular curriculum updates which

will help align training with evolving market demands, enhancing skill acquisition among youths and improving their readiness for self-employment and business creation in Southwest, Nigeria.

- ii. Government and private sectors should support youth entrepreneurs by improving access to technology, innovation funding, digital training and establishing regional innovation hubs and providing affordable technology resources which can empower youths to apply technology in business operations across Southwest, Nigeria.

References

- Adenusi, D. E. (2023). Entrepreneurship, job creation, income empowerment and poverty reduction in low-income economies. *Theoretical Economics Letters*, 13(06), 1579–1598.
- Adeosun, O. T., & Shittu, A. I. (2021). Learning and innovation in youth-owned small businesses. *Rajagiri Management Journal*, 15(1), 69–87.
- Adeosun, O. T., Shittu, A. I., & Ugbede, D. (2023). Disruptive financial innovations: the case of Nigerian micro-entrepreneurs. *Journal of Business and Socio-Economic Development*, 3(1), 17–35.
- Adebakin, A. B., & Ayanlowo, A. E. (2023). Entrepreneurship Education: A Sustainable Strategy for Economic Development in Nigeria. In *The Importance of Entrepreneurship in Fostering*

- Economic Progress* (pp. 120-134). IGI Global.
- Agri, E. M., Nanwul, D. A., & Acha, O. F. (2017). Promoting entrepreneurship for poverty reduction and sustainable development in Nigeria. *Journal of Business Management and Economics*, 8(1), 38–46. <https://doi.org/10.1109/SADFE.2009.7>
- Ajagbe, M. A., Fadeyi, O., Oke, A. O., & Isiaevwe, D. T. (2015). *Building Sustainable Future for Nigeria through Entrepreneurship*, 5(3), 42–49. <https://doi.org/10.6007/IJARAFMS/v5-3/1740>
- Ayo-Sobowale, M. O. (2021). *Effect of Entrepreneurship Education on Entrepreneurial Intentions of Undergraduate Students in Selected Universities in South-West of Nigeria* (Doctoral dissertation, Kwara State University (Nigeria)).
- Bakhouché, A. (2022). Assessing the innovation-finance nexus for SMEs: Evidence from the Arab Region (MENA). *Journal of the Knowledge Economy*, 13(3), 1875–1895. <https://doi.org/10.1007/s13132-021-00786-x>
- Bhurtel, A. (2015). Technical and vocational education and training in workforce development. *Journal of Training and Development*, 1(July), 77–84. <https://doi.org/10.3126/jtd.v1i0.13094>
- Chineze, J., & J., Uche R., E., & Gabriel E., E. (2021). Effect of entrepreneurial education on unemployment reduction among students in Nigeria. *Business and Management Research*, 10(2), 16. <https://doi.org/10.5430/bmr.v10n2p16>
- Do-Adro, F., Fernandes, C. I., Veiga, P. M., & Kraus, S. (2021). Social entrepreneurship orientation and performance in non-profit organizations. *International Entrepreneurship and Management Journal*, 17(4), 1591–1618. <https://doi.org/10.1007/s11365-021-00748-4>
- European Commission. (2020). Social enterprises and their ecosystems in Europe. Comparative synthesis report. Authors: Carlo Borzaga, Giulia Galera, Barbara Franchini, Stefania Chiomento, Rocío Nogales and Chiara Carini. Luxembourg: Publications Office of the European Union. Available at <https://europa.eu/!Qq64ny>
- Hill, S., Ionescu-Somers, A., Coduras Martínez, A., Guerrero, M., Menipaz, E., Boutaleb, F. & Shay, J. (2023). Global Entrepreneurship Monitor 2022/2023 Global Report: Adapting to a "New Normal".
- Ifeoma, A. R., Purity, N. O., & Yusuf, A. E. (2018). Effect of entrepreneurship development on poverty alleviation in Nigeria. *Journal of Business and Management*, 20(2), 80-87.
- Juliana, N. O., Hui, H. J., Clement, M., Solomon, E. N., & Elvis, O. K. (2021). The impact of creativity and innovation on entrepreneurship development: evidence from Nigeria. *Open*

- Journal of Business and Management*, 9(4), 1743-1770.
- Medase, S. K., & Wyrwich, M. (2022). The role of innovation for employment growth among firms in developing countries: Evidence from Nigeria. *African Journal of Science, Technology, Innovation and Development*, 14(3), 610-619.
- Osabohien, R., Worgwu, H., Rafi, S. K., Adediran, O., Matthew, O., & Aderounmu, B. (2022). Impact of business innovation on future employment in Nigeria. *Managerial and Decision economics*, 43(8), 3795-3806.
- Oyinlola, M., Kolade, O., Okoya, S. A., Ajala, O., Adefila, A., Adediji, A., & Akinlabi, E. T. (2024). Entrepreneurship and innovation in Nigerian universities: Trends, challenges and opportunities. *Heliyon*.
- Suleiman, Y. (2021). Integrating Technopreneurship Education in Nigerian Universities: Strategy for Decreasing Youth Unemployment. *Journal of Education and Research*, 11(1), 49-76.

SMART CLASSROOMS AND THE FUTURE OF EDUCATION FOR SUSTAINABLE DEVELOPMENT

OLUSOLA-FADUMIYE Titilope Olufunke (Ph.D)

*Department of Vocational and Technical Education, Faculty of Education
Ekiti State University, Ado-Ekiti.*

E-mail: olusola.fadumiye@eksu.edu.ng

Abstract

Smart classrooms are reshaping teaching and learning by integrating digital technologies that make education more interactive, flexible, and learner-centered. This study examines the role of smart classrooms in advancing the future of education for sustainable development, emphasizing tools such as interactive boards, internet-enabled devices, learning management systems and artificial intelligence. These technologies enhance access to quality education, promote collaboration and support personalized learning that meets diverse student needs. Smart classrooms also contribute to sustainability by reducing reliance on paper-based resources and equipping learners with critical digital, problem-solving and lifelong learning skills essential for a rapidly evolving global society. However, significant challenges persist, including inadequate infrastructure, high implementation costs, limited teacher training and unequal access to digital tools, particularly in developing regions. In conclusion, while smart classrooms hold strong potential to transform education and support sustainable development goals, their effectiveness depends on strategic implementation and equitable access. It is recommended that governments and educational stakeholders invest in robust digital infrastructure, provide continuous professional development for teachers, and establish inclusive policies that bridge the digital divide. Strengthening partnerships between public and private sectors is also essential to ensure that smart classroom initiatives are sustainable, scalable and beneficial to all learners.

Keywords: Smart Classroom, Sustainable Development, Education, Digital Technology, Learning Skills.

Introduction

The increasing advancement of digital technologies has brought significant transformation to the educational sector across the globe. Smart classrooms have emerged as innovative learning environments that integrate advanced technological tools such as interactive whiteboards, artificial intelligence, learning management systems, cloud computing, virtual learning platforms, and multimedia resources to enhance teaching and learning processes (Kwet & Prinsloo, 2020). These technologies facilitate

interactive learning, promote collaboration, improve student engagement, and support personalized learning experiences tailored to individual student needs.

The perception of smart classrooms is becoming increasingly relevant in the 21st century, where educational institutions are expected to equip learners with digital competencies, critical thinking skills, and problem-solving abilities necessary for the modern workforce. Smart classrooms enable educators to deliver content more effectively, monitor student progress in

real time, and adopt flexible teaching strategies that accommodate diverse learning styles (Kaur et al., 2022). In addition, smart classroom environments support blended learning, hybrid education, and remote learning, thereby improving access to quality education regardless of geographical location. Furthermore, smart classrooms contribute significantly to sustainable development by promoting inclusive and equitable education, reducing dependency on paper-based instructional materials, and supporting environmentally friendly learning practices. The integration of technology in classrooms also enhances lifelong learning opportunities, improves digital literacy, and fosters innovation among learners. These developments align with global educational priorities aimed at improving educational quality, accessibility and sustainability.

Despite these benefits, the implementation of smart classrooms presents several challenges, particularly in developing countries. Issues such as inadequate infrastructure, insufficient funding, limited technical expertise, poor internet connectivity, and resistance to technological change often hinder the effective adoption of smart classroom technologies (Iqbal et al., 2020). Additionally, the lack of adequate training for teachers and educational administrators may affect the sustainability of smart classroom initiatives. Given these opportunities and challenges, there is a growing need for scholarly contributions that examine smart classroom innovations, their impact on teaching and learning, and their role in shaping the future of education for sustainable development. This edited volume therefore invites researchers, educators, policymakers, and practitioners to contribute empirical

and theoretical chapters that explore smart classrooms, digital transformation and sustainable education practices. The study aims to provide insights, best practices and policy recommendations that will support the successful implementation of smart classrooms and enhance the future of education globally and to examine the role of smart classrooms in enhancing teaching and learning processes and their potential contribution to Education for Sustainable Development.

Problem Statement

Education systems worldwide are under increasing pressure to equip learners with the knowledge, skills and values required to address complex global challenges such as climate change, resource depletion and social inequality core concerns of Sustainable Development. Despite the global emphasis on Education for Sustainable Development, many educational institutions, particularly in developing regions, continue to rely on traditional, teacher-centered pedagogies that do not adequately foster critical thinking, problem-solving, or sustainability awareness. At the same time, advancements in digital technologies have led to the emergence of smart classrooms, characterized by the integration of interactive tools, internet connectivity, and digital learning platforms. These innovations, supported by frameworks from organizations have the potential to transform teaching and learning processes by promoting engagement, collaboration, and real-time access to information. However, the adoption of smart classroom technologies remains uneven and their role in advancing sustainability-oriented education is not yet fully understood. In many contexts, the implementation of

smart classrooms is hindered by challenges such as inadequate infrastructure, limited teacher training, high costs, and inconsistent policy support. Furthermore, there is a lack of clear conceptual alignment between smart classroom practices and the goals of sustainable education, raising concerns about whether technology integration alone can meaningfully contribute to long-term educational transformation. Therefore, there is a need to critically examine how smart classrooms can be effectively leveraged to support the principles of sustainability in education, identify the gaps in current implementation and explore pathways for integrating digital innovation with pedagogical approaches that promote sustainable development.

Literature Review

Smart Classrooms and the Future of Education for Sustainable Development

The concept of smart classrooms has gained increasing attention in educational research due to rapid advancements in information and communication technologies (ICT). Smart classrooms are generally defined as technology-enhanced learning environments that integrate digital tools, artificial intelligence, and interactive systems to improve teaching and learning outcomes. Early studies emphasize that these environments represent a shift from traditional teacher-centered instruction to more interactive, learner-centered approaches that promote engagement and collaboration. According to Yang et al., (2018) explored the technological foundations of smart classrooms that highlight the integration of tools such as artificial intelligence, cloud computing, sensor technologies and learning analytics to enhance classroom

management and personalized learning experiences. These technologies enable real-time feedback, automated assessment, and adaptive learning systems, which are essential for meeting diverse learner needs. Furthermore, systematic reviews indicate that smart classrooms support key educational features such as interactivity, engagement and personalization, which are critical for effective learning environments.

In addition to technological aspects, recent literature has focused on the physical and pedagogical dimensions of smart classrooms. Studies show that smart learning environments incorporate flexible classroom designs, multimedia content delivery, and collaborative platforms that enhance student participation and academic performance. These environments are not limited to digital tools but also include the integration of space, pedagogy, and technology to create holistic learning ecosystems (Carrion-Martinez et al., 2020). As a result, smart classrooms are increasingly seen as dynamic environments that support innovative teaching strategies such as problem-based learning and cooperative inquiry. The relationship between smart classrooms and education for sustainable development has also been widely discussed. Literature suggests that smart classrooms contribute to sustainability by promoting digital literacy, reducing the use of paper-based resources, and enabling flexible, remote, and inclusive learning opportunities. Education for sustainable development requires transformative learning approaches, and smart classrooms provide the infrastructure needed to support such methodologies. They facilitate active learning, critical thinking, and global awareness, which are essential

competencies for addressing sustainability challenges. Even though the numerous benefits, several challenges have been identified in the literature. These include high implementation costs, inadequate infrastructure, lack of teacher training, and concerns related to data privacy and system integration. Researchers also note that fragmented or partial adoption of smart classroom technologies may limit their effectiveness, emphasizing the need for comprehensive planning and policy support.

Smart Classroom Technologies

Smart classroom technologies refer to the integration of digital tools, internet connectivity and innovative instructional resources into the teaching and learning environment to enhance educational delivery and students' learning experiences (Bautista et al., 2025). The advancement of technology in education has transformed traditional classrooms into modern learning spaces where teachers and students interact using digital devices and multimedia resources. Smart classroom technologies promote interactive learning, improve students' engagement and support sustainable development in education. One of the most important smart classroom technologies is the interactive whiteboard, also known as a smart board (Songkram et al., 2021). Interactive whiteboards allow teachers to present lessons using multimedia such as videos, animations, and images, making learning more engaging and easier to understand. Teachers can also write digitally, save lesson notes and share them with students after class. This technology enhances classroom participation and promotes collaborative learning among students. Another essential smart classroom technology is the Learning Management System (LMS). Learning

management systems enable teachers to upload lecture materials, assignments and quizzes online. Students can access these materials anytime and anywhere, which promotes flexible and self-paced learning. Additionally, LMS platforms allow teachers to monitor students' progress and provide feedback, thereby improving learning outcomes and academic performance. Video conferencing tools are also important smart classroom technologies, especially in supporting remote and hybrid learning. These tools enable teachers to conduct virtual classes, organize online discussions, and invite guest speakers from different parts of the world. This helps to expand students' learning opportunities and promote global collaboration. Video conferencing technologies became particularly significant during the COVID-19 pandemic, where many educational institutions adopted online learning systems. Furthermore, mobile devices such as laptops, tablets and smartphones play a crucial role in smart classrooms. These devices allow students to access e-books, educational applications, and online research materials. Students can also participate in interactive learning activities, take digital notes and collaborate with peers. The use of mobile devices reduces dependence on printed materials, thereby promoting sustainable education practices. Internet connectivity and wireless networks are the backbone of smart classroom technologies (Dimitriadou & Lanitis, 2023). Reliable internet access allows teachers and students to explore online educational resources, participate in virtual learning, and access cloud-based platforms. Internet-enabled classrooms encourage digital literacy development, which is essential for preparing students for the modern workforce. Additionally,

educational applications and artificial intelligence tools are increasingly being used in smart classrooms. These technologies provide personalized learning experiences, automated assessments, and interactive quizzes. Artificial intelligence tools can also help teachers analyze students' performance and identify areas that require improvement. This improves teaching effectiveness and supports students' academic success. Despite the numerous benefits of smart classroom technologies, there are challenges associated with their implementation. These challenges include inadequate infrastructure, limited funding, lack of technical skills among teachers, and unstable internet connectivity, particularly in developing countries. Therefore, there is a need for government support, teacher training, and investment in digital infrastructure to ensure effective implementation of smart classroom technologies.

Smart Classrooms and Teaching Effectiveness

Smart classrooms have emerged as a modern approach to improving teaching effectiveness through the integration of digital technologies and innovative instructional methods. The advancement of information and communication technology has transformed traditional teaching methods into more interactive, engaging, and learner-centered approaches. Smart classrooms utilize technologies such as interactive whiteboards, multimedia tools, internet connectivity, learning management systems, and artificial intelligence to enhance teaching effectiveness and improve learning outcomes (Preston et al., 2018). Teaching effectiveness refers to the ability of teachers to deliver instruction in a manner that enhances students'

understanding, promotes engagement and improves academic performance. Smart classrooms contribute to teaching effectiveness by providing teachers with digital tools that support lesson delivery, classroom management and assessment (Kinshuk et al., 2016). Through the use of multimedia presentations, teachers can explain complex concepts using videos, animations, and images, which improve students' comprehension and retention of information. Hence, technology-enhanced learning environments improve teaching effectiveness by supporting interactive and student-centered learning approaches. Another way smart classrooms improve teaching effectiveness is by promoting active student participation. Interactive technologies such as smart boards, online quizzes, and digital collaboration platforms encourage students to engage actively in classroom activities. Students can ask questions, participate in discussions, and complete interactive tasks during lessons. This increases students' motivation and interest in learning. Thus, digital technologies improve teaching quality and increase student engagement in classroom instruction. Smart classrooms also enhance teaching effectiveness by supporting flexible learning and personalized instruction. Teachers can use learning management systems to provide individualized learning materials based on students' abilities and learning pace. This helps teachers address individual differences among learners and improve academic achievement. Furthermore, smart classroom technologies enable teachers to provide immediate feedback through online assessments and quizzes. Immediate feedback helps students identify their weaknesses and improve their learning performance. Additionally, smart

classrooms improve teaching effectiveness through access to diverse educational resources. Teachers can access online journals, e-books, videos, and instructional materials that enhance lesson preparation and delivery. This access allows teachers to update their knowledge and incorporate current information into their teaching. Internet-enabled classrooms also promote collaborative learning, where students and teachers can communicate and share ideas beyond the physical classroom. Smart classrooms also support effective classroom management. Digital attendance systems, automated grading tools, and online assignment submission platforms help teachers manage classroom activities efficiently (Miraoui, 2018). These tools reduce teachers' workload and allow them to focus more on instructional delivery and student support. Moreover, video conferencing tools enable teachers to conduct virtual classes and maintain continuity of learning, especially during disruptions such as pandemics or emergencies. The challenges faced in smart classroom

include inadequate technological infrastructure, limited teacher training, unstable internet connectivity and insufficient funding. In many developing countries, teachers may lack the technical skills required to effectively use smart classroom technologies. Therefore, there is a need for continuous professional development and investment in digital infrastructure to maximize the benefits of smart classrooms. However, smart classrooms significantly enhance teaching effectiveness by improving lesson delivery, promoting student engagement, supporting personalized learning, and facilitating classroom management. The integration of smart classroom technologies creates interactive and flexible learning environments that improve educational outcomes. Therefore, educational institutions and governments should promote the adoption of smart classrooms to improve teaching effectiveness and support sustainable development in education. Fig 1. Shows the emerging technologies encountered in a smart classroom.

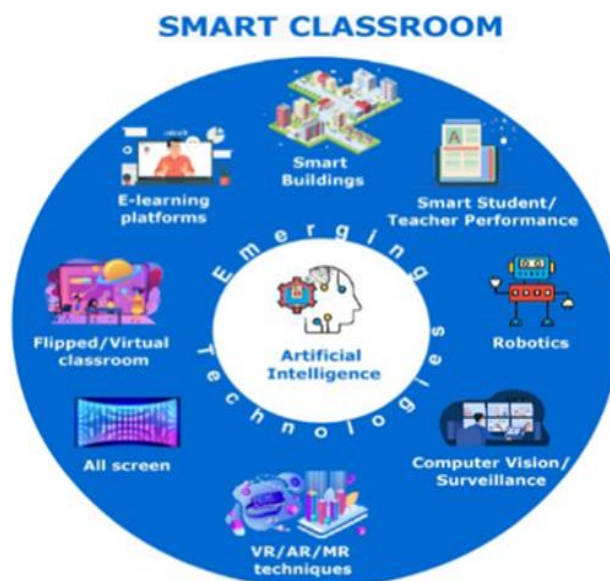


Fig 1: The main technologies encountered in a smart classroom (Source: Dimitriadou & Lanitis, 2023)

Smart Classrooms and Sustainable Development

Smart classrooms have become an essential component of modern education systems aimed at promoting sustainable development. The integration of information and communication technologies into teaching and learning environments has transformed traditional classrooms into interactive, flexible, and innovative learning spaces. Smart classrooms utilize digital tools such as interactive whiteboards, internet connectivity, multimedia resources, learning management systems, and artificial intelligence to enhance teaching effectiveness and support sustainable education. These technologies help improve access to quality education, reduce educational inequalities, and promote lifelong learning, which are key elements of sustainable development.

Sustainable development in education focuses on providing inclusive, equitable, and quality learning opportunities that prepare individuals to contribute meaningfully to economic growth, environmental protection, and social well-being (Eappen et al., 2025). Smart classrooms contribute to sustainable development by improving access to education. Through digital platforms and online learning tools, students in remote and underserved areas can access quality educational materials and participate in virtual learning environments. This helps bridge the gap between urban and rural education and promotes equal learning opportunities. According to United Nations, quality education is one of the major goals of the Sustainable Development Goals, particularly Goal 4, which focuses on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. Smart classrooms also promote

environmental sustainability by reducing the use of paper-based learning materials. The use of e-books, digital assignments, and online assessments minimizes paper consumption and supports eco-friendly educational practices. Additionally, smart classrooms encourage the use of digital resources, which helps conserve natural resources and reduce environmental pollution. This aligns with sustainable development principles that promote responsible consumption and environmental protection (Yang et al., 2023). Furthermore, smart classrooms support the development of digital skills and competencies needed for the 21st-century workforce. Students exposed to smart classroom technologies develop skills such as critical thinking, problem-solving, creativity, collaboration, and digital literacy. These skills are essential for innovation, entrepreneurship, and economic sustainability. According to Ugwunnamchi, (2026) digital learning environments enhance students' skills and competencies required for sustainable development and global competitiveness. Another important contribution of smart classrooms to sustainable development is the promotion of inclusive education. Smart classroom technologies support learners with diverse learning needs, including students with disabilities. For example, digital tools such as screen readers, captioned videos, and audio learning materials help improve accessibility for learners with special needs. This ensures that education is inclusive and equitable, which is a key principle of sustainable development. Smart classrooms also enhance collaboration and global learning opportunities. Students and teachers can interact with peers from different countries, share ideas, and participate in international learning

communities. This promotes cultural understanding, global awareness, and cooperative problem-solving, which are essential for sustainable development. Additionally, smart classrooms encourage innovation and research, enabling students to develop solutions to social, economic, and environmental challenges. Despite these benefits, the implementation of smart classrooms for sustainable development faces several challenges. These challenges include inadequate infrastructure, high cost of technological equipment, unstable internet connectivity, and lack of teacher training. In many developing countries, these challenges hinder the effective integration of smart classroom technologies. Therefore, governments, educational institutions, and stakeholders must invest in infrastructure development, teacher training, and supportive policies to ensure successful implementation. Additionally, smart classrooms play a significant role in promoting sustainable development by improving access to quality education, supporting environmental sustainability, developing digital skills, and promoting inclusive learning. The integration of smart classroom technologies helps create innovative and future-ready educational systems that prepare learners for sustainable economic and social development (Zeeshan et al., 2022). Therefore, adopting smart classrooms is essential for achieving sustainable development goals and improving educational outcomes.

Artificial Intelligence in Smart Classrooms

Artificial Intelligence (AI) has become an important component of smart classrooms, transforming traditional teaching and learning methods into more innovative,

personalized, and interactive experiences. Smart classrooms integrate artificial intelligence technologies such as intelligent tutoring systems, automated grading tools, chatbots, learning analytics, and adaptive learning platforms to improve teaching effectiveness and enhance students' learning outcomes. The use of artificial intelligence in smart classrooms helps teachers deliver lessons more efficiently while supporting students with individualized learning experiences. Artificial intelligence enhances personalized learning in smart classrooms. AI-powered learning systems analyze students' learning patterns, strengths, and weaknesses, and provide customized learning materials based on individual needs. This helps students learn at their own pace and improves their understanding of difficult concepts. Personalized learning also helps teachers identify struggling students and provide timely support. According to Quevedo Piratova et al. (2025) artificial intelligence in education supports adaptive learning and improves students' academic performance by addressing individual learning differences.

Another important role of artificial intelligence in smart classrooms is automated assessment and feedback. AI-based systems can grade assignments, quizzes, and tests automatically, which reduces teachers' workload and saves time. These systems also provide immediate feedback to students, allowing them to identify their mistakes and improve their performance. Immediate feedback enhances students' motivation and engagement in learning. Furthermore, AI-powered grading systems ensure fairness and consistency in evaluation. Artificial intelligence also improves classroom engagement through intelligent tutoring systems and virtual

assistants. AI-powered chatbots and virtual tutors can answer students' questions, provide explanations, and guide learners during independent study. These tools are available at any time, allowing students to access academic support beyond classroom hours. Virtual tutors also encourage self-directed learning and promote independent problem-solving skills among students. Moreover, artificial intelligence enhances learning analytics and data-driven decision-making in smart classrooms. AI tools collect and analyze students' learning data, including attendance, participation, and performance. Teachers can use this information to monitor students' progress and adjust their teaching strategies accordingly. Learning analytics also help educational institutions identify trends and improve teaching methods. According to Imoniri, (2025) artificial intelligence supports data-driven teaching and improves educational outcomes through predictive analysis. Artificial intelligence also supports inclusive education in smart classrooms. AI-powered tools such as speech recognition, text-to-speech, and language translation help learners with disabilities and diverse learning needs. For example, students with visual impairments can use screen readers, while students with hearing impairments can benefit from automatic captioning systems. These technologies promote equal access to education and support sustainable development goals. Despite the numerous benefits, the integration of artificial intelligence in smart classrooms also presents challenges. These challenges include high cost of implementation, data privacy concerns, lack of technical expertise, and inadequate infrastructure. In many developing countries, limited access to digital technologies and internet

connectivity hinders the effective use of AI in education. Therefore, there is a need for government support, investment in infrastructure, and teacher training to ensure successful implementation. Therefore, artificial intelligence plays a significant role in smart classrooms by enhancing personalized learning, improving assessment, supporting classroom engagement, and promoting inclusive education. AI technologies help create interactive and efficient learning environments that improve teaching effectiveness and student performance. The adoption of artificial intelligence in smart classrooms is essential for preparing learners for the digital age and achieving sustainable development in education.

Challenges and Opportunities of Smart Classrooms

Smart classrooms have emerged as a significant innovation in modern education, transforming traditional teaching and learning methods into technology-driven, interactive, and student-centered environments. The integration of digital technologies such as interactive whiteboards, internet connectivity, artificial intelligence, and learning management systems has enhanced educational delivery and improved learning outcomes. While smart classrooms present numerous opportunities for improving education and promoting sustainable development, they also pose several challenges that must be addressed for effective implementation.

One of the major opportunities of smart classrooms is improved teaching and learning effectiveness. Smart classroom technologies enable teachers to present lessons using multimedia resources such as videos, animations, and interactive presentations. These tools

help simplify complex concepts and improve students' understanding. Students also become more engaged in learning through interactive activities, online discussions, and collaborative learning platforms. According to Chukwuemeka et al. (2025) technology-enhanced learning environments improve student engagement and academic performance. Another important opportunity of smart classrooms is increased access to educational resources. Smart classrooms allow teachers and students to access digital libraries, online journals, and educational websites. This access enhances research and promotes independent learning. Students can also participate in online learning and virtual classrooms, which expand learning opportunities beyond the physical classroom (Cheung et al., 2021). Smart classrooms also promote inclusive education by supporting learners with diverse needs through assistive technologies such as screen readers, audio learning materials, and captioned videos. Smart classrooms also promote skill development necessary for the 21st-century workforce. Students develop digital literacy, critical thinking, collaboration, and problem-solving skills through the use of smart technologies. These skills prepare students for future employment and entrepreneurial opportunities. Additionally, smart classrooms support flexible learning, allowing students to learn at their own pace and access educational content anytime and anywhere. In spite of these opportunities, smart classrooms face several challenges that affect their implementation. One major challenge is inadequate infrastructure. Many educational institutions, particularly in developing countries, lack the necessary facilities such as reliable electricity,

internet connectivity and modern technological devices. This limits the effective use of smart classroom technologies. Although, infrastructure limitations remain significant barriers to digital education in developing regions.

Another challenge is the high cost of implementation and maintenance of smart classroom technologies. Purchasing digital devices, installing internet facilities, and maintaining equipment require substantial financial investment. Many institutions may find it difficult to allocate sufficient funds for smart classroom development. Furthermore, there is the challenge of inadequate technical skills among teachers. Some teachers may lack the necessary training to effectively use smart classroom technologies. This can reduce the effectiveness of smart classrooms and limit their benefits. Resistance to change is another challenge associated with smart classrooms. Some teachers and students may prefer traditional teaching methods and may be reluctant to adopt new technologies. Additionally, issues related to data privacy, cyber security, and digital distractions can affect smart classroom implementation. Students may become distracted by non-educational online content, which can negatively affect learning outcomes. However, smart classrooms also provide opportunities for sustainable development. The use of digital learning materials reduces reliance on paper, promoting environmental sustainability. Smart classrooms also enhance collaboration and global learning opportunities, allowing students to interact with peers from different countries and share knowledge. Therefore, technology-driven education supports the achievement of the Sustainable Development Goals, particularly Goal 4, which focuses on

quality education. Furthermore, smart classrooms present both challenges and opportunities for modern education. While challenges such as inadequate infrastructure, high costs, and limited technical skills exist, the opportunities for improved teaching effectiveness, increased access to resources, and sustainable development are significant. Therefore, governments, educational institutions, and stakeholders should invest in infrastructure, provide teacher training, and develop supportive policies to maximize the benefits of smart classrooms and improve educational outcomes.

In summary, existing literature demonstrates that smart classrooms play a significant role in transforming education systems and supporting sustainable development. However, further research is needed to address existing challenges, improve implementation strategies, and ensure equitable access to smart classroom technologies across different regions.

Empirical Review: Smart Classrooms and the Future of Education for Sustainable Development

Empirical studies on smart classrooms provide evidence of their impact on teaching effectiveness, student engagement, and learning outcomes, particularly in relation to sustainable development goals. Many researchers have adopted quantitative, qualitative, and mixed-method approaches to examine how technology-enhanced learning environments influence educational practices. Studies of Kaur et al. (2022) using experimental and quasi-experimental designs report that students taught in smart classrooms perform better academically than those in traditional settings. For instance, research

comparing ICT-integrated classrooms with conventional classrooms found significant improvements in students' achievement, retention, and motivation. These gains are often attributed to the use of multimedia resources, interactive whiteboards, and real-time feedback systems that make learning more engaging and accessible.

Survey-based studies further support these findings by highlighting positive student perceptions of smart classrooms. Learners frequently report increased interest, participation, and collaboration when digital tools are incorporated into lessons. In particular, the use of learning management systems and online collaborative platforms has been shown to enhance communication between students and teachers, thereby improving overall learning experiences. Empirical research has also examined the role of smart classrooms in promoting skills relevant to sustainable development. According to Ojetunde & Ramnarain (2023) studies indicate that technology-enhanced environments help develop critical thinking, problem-solving, digital literacy, and environmental awareness. For example, project-based learning supported by smart classroom technologies enables students to explore real-world sustainability issues, fostering a deeper understanding of global challenges. However, empirical evidence also highlights several challenges. Studies conducted by Chukwuemaeka et al. (2025) in developing regions reveal that inadequate infrastructure, unstable power supply, and limited internet connectivity significantly affect the effectiveness of smart classrooms. Additionally, teacher-related factors such as lack of training, resistance to change, and low digital competence have been found to hinder successful

implementation. Some research also points to inequalities in access to digital devices, which can widen the educational gap between students. According to Cebrian et al. (2020) Mixed-method studies was used on smart classrooms to improve learning outcomes, their success depends on proper integration into the curriculum and pedagogy. Merely introducing technology without aligning it with instructional goals often results in minimal impact. Effective use requires continuous teacher support, institutional commitment, and learner-centered teaching strategies. Overall, empirical literature confirms that smart classrooms have a positive impact on education and can contribute significantly to sustainable development. Nevertheless, the extent of their effectiveness depends on contextual factors such as infrastructure, teacher preparedness and policy support. Further empirical research is needed to explore long-term impacts and develop models for equitable and sustainable implementation.

Summary

Smart classrooms represent a modern approach to teaching and learning that integrates digital technologies, interactive tools, and innovative instructional strategies to improve educational outcomes and promote sustainable development. These classrooms utilize technologies such as interactive whiteboards, internet connectivity, multimedia resources, artificial intelligence, and learning management systems to create engaging, flexible, and student-centered learning environments. The adoption of smart classrooms is transforming traditional education by enhancing teaching effectiveness, improving students' understanding, and promoting active participation. Teachers can deliver

lessons using digital content, simulations, and real-time assessments, while students benefit from personalized learning experiences and access to global educational resources. This technology-driven learning environment supports the development of critical thinking, problem-solving, creativity, and digital literacy skills necessary for sustainable development. Smart classrooms also contribute to sustainable education by reducing reliance on paper-based materials, promoting resource efficiency, and supporting inclusive education. Through virtual learning platforms, students in remote and underserved areas can access quality education, thereby reducing educational inequalities and promoting lifelong learning opportunities. Furthermore, smart classrooms prepare learners for the demands of the 21st-century workforce by equipping them with digital competencies and innovation skills. These skills are essential for economic growth, environmental awareness, and social sustainability. However, successful implementation requires adequate infrastructure, teacher training, supportive policies, and continuous funding. In conclusion, smart classrooms play a significant role in shaping the future of education by fostering innovative learning environments, improving educational quality, and supporting sustainable development goals. The integration of smart technologies in education is therefore essential for building resilient, inclusive, and future-ready educational systems.

Methodology

This study adopts a conceptual and qualitative research approach to examine the role of smart classrooms in shaping the future of education for sustainable development. Rather than

collecting primary data, the paper relies on a systematic review and critical analysis of existing literature to develop insights and recommendations. The data for this study were obtained from secondary sources, including peer-reviewed journal articles, academic books, conference papers, and reports from international organizations and other educational bodies. Relevant materials were selected based on their relevance and credibility, with particular emphasis on works published within the last decade to reflect current trends in educational technology and sustainability. A thematic analysis method was employed to analyze the collected literature. Key themes identified include the concept and components of smart classrooms, their impact on teaching and learning, their contribution to sustainable development, and the challenges associated with their implementation. These themes guided the organization and interpretation of the findings. In addition, a comparative analytical approach was used to examine different perspectives from developed and developing countries, highlighting disparities in access, infrastructure and implementation strategies. This helped to provide a balanced and comprehensive understanding of the topic. To ensure validity and reliability, sources were cross-checked and information was synthesized from multiple authors to avoid bias. The study is limited by its reliance on secondary data, which may not fully capture rapidly evolving technological developments. Overall, this methodology provides a structured framework for analyzing the intersection of smart classrooms and sustainable education, allowing for informed conclusions and practical recommendations.

Conclusion

Smart classrooms represent a transformative approach to education, aligning strongly with the goals of sustainable development by fostering inclusive, engaging, and technology-driven learning environments. Through the integration of digital tools and innovative teaching methods, they enhance students' critical thinking, collaboration, and digital literacy skills, which are essential for addressing modern global challenges. Additionally, smart classrooms contribute to environmental sustainability by reducing reliance on traditional paper-based resources and promoting efficient use of educational materials. However, the successful adoption of smart classrooms is not without challenges. Issues such as inadequate infrastructure, high costs of implementation, limited technical expertise among educators, and unequal access to digital resources can hinder their effectiveness, particularly in developing regions. These barriers must be addressed to ensure that the benefits of smart classrooms are widely shared. In conclusion, while smart classrooms hold great promise for shaping the future of education in line with sustainable development goals, their impact depends on strategic planning, investment and inclusive policies. With proper support, capacity building and equitable access, smart classrooms can serve as a powerful tool for creating a more sustainable, innovative and learner-centered educational system.

Recommendations

To fully harness the potential of smart classrooms in advancing education for sustainable development, several strategic actions are necessary.

- Governments and educational authorities should invest in reliable

digital infrastructure, including stable electricity, high-speed internet and modern classroom technologies.

- Continuous professional development for teachers is essential, and educators need regular training to effectively integrate technology into their teaching practices, adapt to new digital tools and apply innovative, student-centered pedagogies that promote critical thinking and problem-solving.
- Policies should be designed to ensure equitable access to smart classroom resources and efforts must be made to bridge the digital divide by providing affordable devices, subsidized internet access and inclusive learning platforms for all students, regardless of socio-economic background.
- Curriculum development should incorporate digital literacy, environmental awareness and sustainability concepts. This ensures that students are not only users of technology but are also equipped with the knowledge and skills to contribute meaningfully to sustainable development.
- Partnerships between governments, private sector organizations, and non-governmental organizations should be strengthened. Such collaborations can support funding, innovation, and the scaling of smart classroom initiatives.
- Regular monitoring and evaluation mechanisms should be established to assess the effectiveness of smart classroom implementation. Feedback from teachers and students can guide improvements and ensure that these systems

remain relevant, efficient and aligned with sustainability goals.

References

- Bautista, G., & López-Costa, M. (2025). Smart learning spaces considering the integration of the pedagogical, environmental and digital dimensions: a systematic review. *Learning Environments Research*, 28(3), 455-472.
- Carrión-Martínez, J. J., Luque-de la Rosa, A., Fernández-Cerero, J., & Montenegro-Rueda, M. (2020). Information and communications technologies (ICTs) in education for sustainable development: A bibliographic review. *Sustainability*, 12(8), 3288.
- Cebrián, G., Palau, R., & Mogas, J. (2020). The smart classroom as a means to the development of education for sustainable development methodologies. *Sustainability*, 12(7), 3010.
- Cheung, S. K., Kwok, L. F., Phusavat, K., & Yang, H. H. (2021). Shaping the future learning environments with smart elements: challenges and opportunities. *International Journal of Educational Technology in Higher Education*, 18(1), 16.
- Chukwuemeka, E. J., Dominic, S., Akanbi, K. R., & Aregbesola, B. G. (2025). Transforming from traditional to smart education in Nigeria: Challenges and opportunities for learning. *Ilorin Journal of Education*, 46(1), 48-62

- Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments*, 10, 12.
- Eappen, P., Çela, E., & Vajjhala, N. R. (2025). Smart Classrooms and Sustainable IoT: Emerging Trends and Innovations. *INTED2025 Proceedings*, 1293-1299.
- Imoniri, A. R. (2025). Harnessing artificial intelligence in science education for skills development and economic transformation in Nigeria. *Teacher Education and Curriculum Studies*, 10(3), 77-83.
- Iqbal, H. M., Parra-Saldivar, R., Zavala-Yoe, R., & Ramirez-Mendoza, R. A. (2020). Smart educational tools and learning management systems: supportive framework. *International journal on interactive design and manufacturing (IJIDeM)*, 14(4), 1179-1193.
- Miraoui, M. (2018). A context-aware smart classroom for enhanced learning environment. *International Journal on Smart Sensing and Intelligent Systems*, 11(1).
- Kaur, A., Bhatia, M., & Stea, G. (2022). A survey of smart classroom literature. *Education Sciences*, 12(2), 86.
- Kinshuk, Chen, N. S., Cheng, I. L., & Chew, S. W. (2016). Evolution is not enough: Revolutionizing current learning environments to smart learning environments. *International Journal of Artificial Intelligence in Education*, 26(2), 561-581.
- Kwet, M., & Prinsloo, P. (2020). The 'smart' classroom: a new frontier in the age of the smart university. *Teaching in Higher Education*, 25(4), 510-526.
- Ojetunde, S. M., & Ramnarain, U. (2023). Applying fourth industrial revolution technologies in education: Effects and students' experience. *Smart Learning Environments*, 10, 32.
- Preston, A., Lazem, S., Kharrufa, A., & Olivier, P. (2018). Supporting the smart teacher: An agenda for the use of embedded sensing in novel learning spaces. *Smart Learning Environments*, 5(19).
- Quevedo Piratova, D. A., Sánchez Duarte, M. M., Chiappe, A., & Sáez Delgado, F. M. (2025). Intelligent classrooms: How Ai and Iot can reshape learning spaces. *European Journal of Education*, 60(1), e70000.
- Songkram, N., Songkram, N., Chootongchai, S., & Samanakup, T. (2021). Developing students' learning and innovation skills using the virtual smart classroom. *International Journal of Emerging Technologies in Learning (iJET)*, 16(4), 34-51.
- Ugwunnamchi, U. J. (2026). Smart Curriculum Implementation for Sustainable Education Development in Nigeria. *Multi-Disciplinary Research and Development Journals Int'l*, 8(1), 12-19.

- Yang, J., Lin, R., Sun, Y., Chu, J., & Amelina, N. (2023). Leveraging smart education for sustainable development in the digital era: Insights from China's four key pillars. *Tecnologias, Sociedade e Conhecimento*, 10(2), 10–37.
- Yang, J., Pan, H., Zhou, W., & Huang, R. (2018). Evaluation of smart classroom from the perspective of infusing technology into pedagogy Smart Learning Environments, 5(20).
- Zeeshan, K., Hämäläinen, T., & Neittaanmäki, P. (2022). Internet of Things for sustainable smart education: An overview. *Sustainability*, 14(7), 4293.
- Zhang, X., Ding, Y., Huang, X., Long, L., & Ding, S. (2024). Smart classrooms: How sensors and AI are shaping educational paradigms. *Sensors*, 24(17), 5487.

IMPROVING DIGITAL SKILLS AMONG BUSINESS EDUCATION STUDENTS FOR EMPLOYABILITY IN NIGERIA

¹FADIJI, Adekunle Theophilus and ²Dr. AINA, Matthew Adebayo

^{1&2}Department of Vocational and Technical Education
Faculty of Education, Ekiti State University, Ado Ekiti

Abstract

Digital skills have become essential requirements for employability in the twenty-first-century workforce. In Nigeria, the rapid growth of information and communication technology (ICT) and the digital economy has transformed the nature of work, thereby increasing the demand for digitally skilled graduates. However, many business education students in Nigerian tertiary institutions still lack adequate digital competencies required for effective participation in the modern labour market. This paper examines digital skills, benefits of digital skill among business education students. The paper further identifies strategies for improving digital competency through integration of practical-based learning approach, provision of ICT facilities, participation in on-line programmes, among others. The study concludes that enhancing digital skills among business education students will improve their employability, entrepreneurial capabilities, and overall contribution to national economic growth. It is recommended that today's business education students and graduates should always update their knowledge of digital skills in order to be globally employable, among others.

Keywords: Digital Skills, Business Education, Employability, Digital Competencies

Introduction

Business Education is an integral part of the general education. It is that part of Education which prepares the recipients to acquire competencies that will enable them function well in business environment either as employees or employers. It is a programme that inculcate necessary skills in the areas of accounting, marketing and office technology and management into the minds of prospective graduates in order to be employable and contribute to the growth of the nation's economy. Thus, Idialu in Aina and Onajite (2023) defined business education as a programme of study organised to prepare the learner for entrance into a particular vocation or to upgrade employed worker. It is therefore a programme that is expected to provide recipients with the knowledge, skills and

competencies for the workplace as well as for general living.

In view of the foregoing, the Federal Government of Nigeria (FGN) (2013) listed the goals of business education to include: application of the knowledge, skills and attitudes acquired through the study of business to a variety of learning tasks and relate them to business phenomenon at local, national and global levels; gaining an understanding of business concepts through the study of subjects such as accounting, entrepreneurship, information and communication technology, marketing and business leadership, among others.

Also, Owojori (2010) remarked that vocational education, of which business education is an integral parts has the following objectives:

- (a) to provide functional education for Nigerian citizens
- (b) to provide further education for different categories of people in order to improve their basic knowledge and skills
- (c) to provide in-service and on the job training for different categories of workers and professionals in order to improve their skills.
- (d) to provide opportunity for each individual to exploit his interest, aptitude and intrinsic intelligence to the highest possible degree, and
- (e) to provide every occupation with the necessary skills peculiar to their specific occupation.

In Nigeria context, business education programme is designed under three options, which are accounting, marketing and OTM, where students are initially introduced to the basics of business education for the first two years. Thereafter, students are trained in their specialised interest for the last two years to ensure competency. By this, Odunaike and Amoda in Onajite, Olaniyi, Oyerinde and Aina (2023) remarked that the objectives of business education include development of skills for personal use in the future and developing basic skills in office occupation, among others. Thus, it is a programme designed for effective participation in economic activities, which equips learners with practical and theoretical knowledge in business areas. Osuala (2009) noted that business education is expected to provide students with employable skills necessary for self-employment and national development.

In support of the above, the United Nations, in a bid to ensure sustainable development, has rolled out 17 goals in order to make life more comfortable for the individuals. Out of the goals, this study is therefore, related to Goals 1, 4 and 8 of the United

Sustainable Development Goals. Goal 1 targets means of putting an End to Poverty in all its forms everywhere, Goal 4 pays attention to Quality Education which ensures inclusive and equitable quality education. Also, Goal 8 concentrates on Decent Work and Economic Growth. The goal is expected to promote productive employment and economic growth. The foregoing goals can be achieved through business education programme that is effectively delivered, with the help of technologies that are globally available. In today's digital age, business education experts are expected to incorporate the use of technologies into the teaching and learning of the course contents. This will enable business education graduates to be more versatile and eventually become global workers through digital skills.

Digital Skills:

The introduction of technologies, especially computer and internet, into education has made digital skills to become indispensable. With changes in business environment in the mode of operations, the International Labour Organisation (ILO) (2020) stated that with digital technology, the role of TVET teachers is increasingly not to deliver information, but to assist in interpreting information. This is expected to enhance the employability of graduates of business education programme. In their contributions, Ogbuene (2025), Amesi, Amaewhule and Akoku (2022), Amesi and Allison (2022) listed the digital skills expected of business education graduates to include software skills in word processor, spreadsheets, powerpoint, desktop publishing, Microsoft excel, graphic, Microsoft word, corel draw, among others.

In view of the above, Aina (2024) presented the following digital skills as

very important which cannot be overemphasized for employment among business education graduates.

(a) Computer Skills

The input and output units can be likened to an official who is working at his desk with an 'in tray' where files and documents requiring his attention are kept. After he has processed them, he then passes them out into the 'out tray'. Although the computer processes data, it does not 'think' for itself. For instance, if the data fed into the computer are wrong (garbage in) the result produced will be wrong (garbage out).

(b) Word Processing Skills

Word processing refers to the use of computers to handle text and produce printed document. These texts are in the form of memos, letters, reports which are keyed into the computer, retained on memory, manipulated electronically and printed or sorted in a storage medium. In word processing, text can be viewed on a display screen during typing and editing and changes can be made easily. As such a perfect copy can be produced on the screen before printing.

(c) Internet Skills

It is sometimes referred to as information 'super highway'. The internet enables the user to exchange information with other users anywhere in the world provided the computer (PC) is connected to the internet you can send perceive information on a wide range of subject areas or access information on business, science and technology and education among others. The internet enhances the easy flow of information through different interconnected computer networks. It is a quick and easy way of sending messages and it guarantees confidentiality of messages

sent. All these skills are acquired through mastery of the computer keyboard.

Orji, Okanazu and Ali (2015) defined digital skills as the ability to locate, organise, understand, evaluate and create information using digital technology. It is the basic understanding of how to interact with a computer in order to make it do what you want in real time. Also, the Digital Marketing Institute (2017) Future Learn (2020) and Digital Skills Global (2021) explained that digital skills needs in the 21st century include emailing, social marketing skills, business data analytical skills and coding skills. By this, Aina, Oyerinde and Enijuni (2023) also listed digital skills required of business education graduates to include graphic design, word processing, online research, web design, e-commerce, online learning development, e-mailing, proof reading, e-editing, among others.

As earlier revealed, business education is aimed at producing skillful personnel who will be employable in the world of work or create their own employment opportunities and later become employees. Therefore, employability can be referred to as the ability to possess skills, knowledge, attitudes and personal qualities that make business education graduate attractive to employers.

It is expected that in today's business environment, graduates of business education programme with strong digital skills in addition to academic knowledge will be highly employable. Samson (2013) described employability as highly human skills that included social skills, basic thinking skills and responsibility. In their contribution, Blackmore, Bulaitis and Tan (2016) remarked that employability has assumed a global recognition and therefore increasing attention is being given to the role of higher education in

developing employability skills. It is the combination of knowledge, personal attributes and competencies that ensure employment after graduation and foster continued progress in career progression.

(d) Cloud Computing

Cloud computing is a paradigm shift which provides access to storage, data bases, networking and servers through the internet instead of relying on physical infrastructure or local computers. Foster Zhao Raicu and Lu (2008) opine that cloud computing is a new paradigm which provides applications and services that can be accessed through the internet with the ability to share, manage and store data which is physically hosted on remote servers instead of using in-house resources or personal machines.

By this, Mell and Grance in Victor-Igwe (2022) remark that cloud computing is a model for convenient and rapid network access to a shared pool of computing resources that can be provisioned with minimal efforts or service provider interactions. The scholars further attest that it comprises of five essential characteristics which are:

- i. **On demand self-service:** Using Cloud Computing, a consumer can unilaterally access provision to computing capabilities as needed automatically without requiring human interaction from each services provider.
- ii. **Broad network access:** Cloud computing makes capabilities available over the network which is accessed through standard mechanisms thus promoting the use of heterogenous thick or thin client platforms such as mobile phones, laptops and PDAS.
- iii. **Multi tenancy:** It allows the computing resources of the provider

to be pooled to serve multiple consumers using a multi-tenant model with different physical and virtual resources dynamically assigned and reassigned according to the demands of the consumers.

- iv. **Rapid elasticity:** Here, the capabilities can be rapidly and elastically provisioned, in most cases automatically, to quickly scale out the rapidly released to quickly scale in.
- v. **Measured service:** The cloud service providers automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service.

The effectiveness of the use of cloud computing is however, closely related to the knowledge acquired in digital skills. These skills will help in messaging tools like google mail, real time analysis, team collaboration, support service among others.

Benefits of Digital Skills to Business Education

The importance of digital skills among business education graduates cannot be underestimated as it is no longer optional but highly necessary for entering the workforce either as employees or self-employed. In today's technology driven world, it is also important to possess these skills to enable business education graduates to handle information and communicate effectively. It also helps in problem solving manage business relationships adequately.

With digital skills, business education lecturers need to teach concepts and techniques to allow students to work with any digital device or tool, and adopt to new technology for better understanding. Thus, Dayagbil

and Boholano in Amesi et al (2022) reported that business education lecturers can readily connect their students not just in their own localities, their places of learning to each other, but also to a huge and ever expanding diversity of social, cultural, political networks and therefore to multiple ways of being knowing and communicating. With digital revolution altering conventional workplace functions and designing new jobs, there is a pressing need for business education students to develop and deepen their digital skills for improved work quality after graduation and stay employable. In view of this Osborn (2021) outlined the importance of digital skills to include increasing revenue, building stronger customer relationships, having a competitive edge over competitors, providing new strategies and approaches to working, improving productivity and effectiveness. In addition, Future Learn (2020) stated that it will boost the career of those who want to embrace the flexibility of freelance work, enhances personal and professional skills that gives more options for getting a job.

It is on the foregoing, that the researchers note that acquisition of good digital skills will enhance employability improves productivity, promotes entrepreneurship, facilitates communication and collaboration. By this, it is expected that the emergence of remote work will provide new opportunities for digitally competent business education graduates.

Ways of Improving Digital Skills among Business Education

It has been established that knowledge of digital skills is germane for employability of business education graduates in the current dispensation. The acquisition of digital skills needed for enhanced employability can therefore be

improved through different ways which include:

- **Integration of practical based learning approach:** This is the incorporation of activity oriented and real-life learning experiences into the teaching and learning processes of business education programme. This will help in digital skill development which may be through demonstrations, industrial training or internship because it will focus on learning by doing. By this, Addah (2008) remarked that the keyboard is the most important and frequently used device and that prospective keyboard user should master the keyboard for effective manipulative skills. Based on the foregoing it is therefore very important for prospective business education graduates regardless of their options to have good mastery of the keyboard as this will enhance their digital skill acquisition for employment opportunities.
- **Participation in on-line programme:** All virtual engagements involve in the manipulation of digital skills. Business education students are expected to develop interest in virtual learning which will encourage them to be more versatile and be more relevant in their workplace after graduation. Through regular participation, in the use of tools such as spreadsheet, word processor, power-point, among others. Baland (2017) opined that students' motivation can be improved thereby facilitating students' academic learning and achievement.

Other ways of improving digital skills among business education include provision of modern digital facilities,

implementation of self-directed learning, integration of information and communication technology into the teaching and learning processes of business education programme, among others. Supporting the foregoing, Ezeani and Falade (2017) reported that the ability to use computer is an essential part of every one's life because the demand for ICT literacy is increasing in Nigeria as employees and employers realised that ICT enhances job efficiency. Also in his contribution, Olaniyi (2024) remarked that, to remain in the rapidly evolving digital era, businesses and organisations across major industries must adopt mode strategies and technologies. Thus, these observations can only be made manifest if the digital competencies of the employees are high.

Conclusion

The need for digital skill across the workforce will continue to increase all over the world for communication, marketing, record keeping and financial data analysis. In view of this, it is concluded that business education students who intend to be gainfully employed are expected to equip themselves with adequate digital skills required in the contemporary business world, which will thereafter contribute to the nation's economic growth.

Recommendations

- (1) It is recommended that today's business education students and graduates should always update their level of digital skill in order to be more employable globally.
- (2) Institutions offering business education programme should equip their business education laboratory with adequate digital facilities in order to expose these students to the real-life experience in today's

workplace environment for enhanced job opportunities.

References

- Addah, E. (2008). *My computer: Ado as I do book*. Lagos: Value plus publications limited.
- Aina, M. A & Onajite O. G. (2023). Effectiveness of the Use of the use of technology in teaching for promoting economic growth away business education graduates in Ekiti State *International Journal of Education and Social Science Research*, 6 (3), 173 – 182.
- Aina, M. A. (2024). Improving relationship management among secretariat professionals for effective job performance in Nigeria. *EKSU Journal of Multidisciplinary Studies*, 2(1), 40-49.
- Aina, M. A., Oyerinde, D.O., & Enijuni, A.T. (2023). Attitudinal and digital skills acquired by business education students for self-employment in state owned Universities in Ekiti State, Nigeria. *EKSU Journal of Education*, 10(2), 112-117.
- Amesi J., Amaewhule, W.A & Akoju, A.U (2022). Digital skills required by business education lecturers for teaching accounting education centers in tertiary institutions in River State, *Nigeria Journal of Business Education*, 9(2), 38-52.
- Beeland, W. (2017). Student Enjoyment: Visual Learning and Technology: Can Interactive Whiteboard Help? Retrieved on 24th May, 2026 from <http://downloads01.smarttech.com/media/research/international/research.usa/beelendem.pdf>.
- Blackmore, P., Bulaitis, Z. H & Tan, E. (2016). Employability in Higher

- Education: A review of practice and strategies around the world. Exerted: University of Exeter.
- Digital Marketing Institute (2017). 10 digital skills that can make students instantly employable. Retrieved April 25, 2026 from: <https://digitalmarketinginstitute.com/blog/10-digital-skills-that-can-make-students-instantly-employable>.
- Digital Skills Global (2021). The top 10 digital skills tech companies are looking for today. Retrieved April, 25, 2026 from: <https://digitalskillsglobal.com/blog/the-top-10-digital-skills-tech-companies-are-looking-for-today>.
- Ezeani, N. S., & Falade, C. A (2017). Information and Communication Technology (ICT): A veritable tool for national development; *Association of Business Educators of Nigeria (ABEN) Conference Proceeding Nigeria*, 4 (1), 342-348.
- FGN, (2013) National Policy on Education, 6th Edition Lagos: NERDC Press.
- Foster, L., Zhao, Y., Raicu, I., Lu, S. (2008). Cloud computing and grid computing, 360-Degrees Compared Grid Computing Environments workshop.
- Future Learn (2020). The complete guide to digital skills. Retrieved March, 2026 from: <https://www.futurelearn.com/info/blog/the-complete-guide-to-digital-skills>.
- International Labour Organisation (2020). The digitization of TVET and Skills Systems, Geneva, ILO.
- Ogbuene, A. C. (2025). Digital skills and tertiary education in Nigeria addressing the generational gap between the Genx and Genz *International Journal of Research and Innovation in Social Science*, IX (IIIS) 7774 – 7732.
- Olaniyi, O. N. (2024). Business education and cloud computing in a digitalized world. *Research and Evaluation in Education* Edited by Ajayi, I. A. Olofintoye T. T. and Omirin M. S., 135-150.
- Onajite, O. G, Olaniyi, O.N, Oyerinde, D. O & Aina M. A (2023). Business education teaching research utilization for academic staff job performance *Irish Journal of Educational Practice*, 6(3), 1-15.
- Orji, C.T, Okanazu, D.O & Ali, C.C (2015). Digital Skills required by technical education and training lecturers for instructional delivery in Nigeria Universities, *Journal of Home Economics Research*, 23(1), 28-41.
- Osborn, C. (2021). Digital skills training is more important than ever. Retrieved April 20, 2026 from <https://guardianing/features/rethinking-the-nexus-between-technology-and-education-in-nigeria>.
- Osuala, E.C (2019). Business and computer education Enugu: Choston Agency Ltd.
- Owojori, A. A. (2010). Business education for economic empowerment in Nigeria. *Journal of Business Educators of Nigeria*, 2(1), 100-117.
- Samson, R. (2013). Highly human jobs. The Futurist. May-June Edition, 29-35.
- Victor-Igwe, J. N. (2022). Business education and cloud computing: Prospects and Challenges. *Nigeria Journal of Business Education*, 9(2), 131-141.

ENVIRONMENTAL INFORMATION UTILIZATION AND SOCIAL RESPONSIBILITIES OF MEDIA HOUSES IN URBAN AREAS

Prof. E. O. ADEPOJU, AJAYI, Joseph Kolawole (PhD) and AKINTAYO, Toyosi Eunice

Department of Vocational and Technical Education, (Library and Information Science), Ekiti State University, Ado-Ekiti, Nigeria

Abstract

Environmental sustainability has become an urgent global concern due to the escalating threats of climate change, urban pollution, and ecological degradation. The study is non-empirical, relying exclusively on secondary sources such as books, journal articles, government reports, and credible online publications. By adopting a literature-based approach, it builds a scholarly argument that environmental information utilization is not only a civic obligation but also a professional responsibility for media houses. The study examines the impact of environmental information utilization on the social responsibilities of media houses in urban areas. It highlights the civic and ethical obligations of media institutions, the role of environmental journalism, and the link between effective information use and societal transformation. The study also emphasizes the challenges faced by Nigerian media in accessing, interpreting, and disseminating environmental information, ranging from financial constraints and technical limitations to political censorship and low audience engagement. Findings from the reviewed literature revealed that effective utilization of environmental information significantly enhances the ability of media houses to fulfill their social responsibilities. Media houses contribute to public enlightenment, policy advocacy, early warning dissemination, and environmental accountability by translating complex environmental data into accessible information for urban populations. The study further found that local and regional media outlets play a critical role in addressing community-specific environmental problems such as flooding and poor waste management, especially through indigenous language broadcasts that promote grassroots participation. The study concludes that environmental information utilization is fundamental to the social responsibility mandate of media houses in urban areas. Strengthening institutional capacity, improving access to environmental data, enhancing collaboration with environmental experts and government agencies, and encouraging supportive policy frameworks will enable media houses to more effectively complement government efforts and contribute to sustainable urban development. The study recommended among that media houses should carry out special need training programs in environmental journalism to enhance the competence of journalists.

Keywords: Environmental Journalism, Climate Communication, Media Accountability, Environmental Awareness, Sustainable Media Practices, Public Engagement, Urban Development, Environmental Reporting

Introduction

The media is widely regarded as one of the most influential institutions in modern society, functioning as a critical channel for the collection, processing,

and dissemination of information (McQuail, 2010). Media houses—whether in print, broadcast, or digital form—do not merely entertain; they shape public opinion, influence

policymaking, and facilitate civic participation.

In Nigeria, notable media outlets such as Channels Television, Arise News, The Punch, Daily Trust, and The Guardian operate mainly in large urban centers like Lagos, Abuja, and Port Harcourt, where rapid industrialization and population density have heightened environmental challenges (Asemah, 2011). These cities face pressing ecological issues ranging from traffic-induced air pollution and flooding to coastal erosion and industrial emissions (UNEP, 2016). Lagos, for example, is notorious for recurrent flooding, while Port Harcourt has earned global attention for its “black soot” pollution crisis caused by illegal oil refining and industrial waste (Okoro & Nnaji, 2017).

Globally, environmental journalism has emerged as a cornerstone of sustainable development. UNESCO (2019) emphasizes that the media is indispensable for achieving the Sustainable Development Goals (SDGs), particularly Goal 11 (Sustainable Cities and Communities) and Goal 13 (Climate Action). In Nigeria, this responsibility is not limited to metropolitan centers. Local and regional media outlets such as Tribune (Ibadan), OSRC (Akure), Progress FM (Ado-Ekiti), and EKSU Campus FM play crucial roles in addressing community-specific issues such as indiscriminate waste disposal, seasonal flooding in Iroha and Ajilosun (Ado-Ekiti), and bush burning in rural towns.

Thus, the role of the media in environmental communication is not only informational but transformational, as their reportage influences civic attitudes, public discourse, and ultimately, policy decisions.

Environmental Information

Environmental information refers to all forms of data, knowledge, facts, and reports relating to the natural and built environment. It includes information on climate change, biodiversity, pollution, waste management, flooding, deforestation, erosion, environmental health, conservation, and other ecological issues that influence human life and sustainable development (UNEP, 2023). Environmental information is generated by government agencies, research institutions, environmental organizations, universities, meteorological agencies, and international bodies such as the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). Access to reliable environmental information enables governments, organizations, and citizens to make informed decisions regarding environmental protection and sustainable resource management. In modern societies, environmental information has become increasingly important because environmental challenges such as climate change, urban flooding, air pollution, and waste disposal require collective action and informed public participation (UNESCO, 2026).

Environmental Information Utilization

Environmental information utilization refers to the process of collecting, analyzing, interpreting, applying, and disseminating environmental information for decision-making, policy formulation, public education, and environmental management (UNEP, 2023). Utilization goes beyond merely possessing environmental information; it involves transforming available environmental

data into meaningful knowledge that can influence individual behavior, organizational practices, and public policies. Media houses utilize environmental information by obtaining reports from government agencies, scientific institutions, environmental experts, and non-governmental organizations, and presenting such information in forms that are understandable to the general public. Effective utilization of environmental information promotes environmental awareness, encourages responsible environmental behavior, supports disaster preparedness, and strengthens sustainable development initiatives (UNESCO, 2026). In urban areas where environmental problems are more pronounced, effective utilization of environmental information becomes essential for promoting resilience and improving the quality of life.

Social Responsibility

Social responsibility refers to the ethical obligation of individuals, organizations, and institutions to act in ways that promote the welfare of society while minimizing negative impacts on people and the environment. Within the context of mass communication, social responsibility is founded on the principle that the freedom enjoyed by the media must be exercised in the public interest (McQuail, 2010). This responsibility requires media organizations to provide accurate, objective, balanced, and timely information, educate citizens, promote democratic values, encourage public participation, and advocate for solutions to societal problems. Environmental reporting forms an important aspect of the media's social responsibility because it helps citizens understand environmental risks, supports environmental policy implementation,

and encourages sustainable practices (Baran & Davis, 2015). By fulfilling their social responsibility, media houses contribute significantly to environmental governance, public accountability, and national development.

Media Houses

Media houses are organizations involved in the gathering, processing, production, and dissemination of information through various communication channels such as newspapers, magazines, radio, television, and digital media platforms (McQuail, 2010). They serve as important institutions for information dissemination, education, entertainment, and public enlightenment. In democratic societies, media houses perform several functions, including acting as watchdogs over government activities, setting public agendas, facilitating public discourse, and promoting transparency and accountability (McCombs & Shaw, 1972). In relation to environmental sustainability, media houses play a significant role by reporting environmental issues, raising public awareness, promoting environmental campaigns, and providing platforms for discussions among policymakers, environmental experts, and the public. Their ability to communicate scientific environmental information in simple language makes them indispensable partners in achieving sustainable development goals (UNESCO, 2026).

Urban Areas

Urban areas are settlements characterized by high population density, extensive infrastructure, commercial activities, industrial development, and rapid socio-economic growth. Cities and towns often experience increased environmental pressures resulting from

population expansion, industrialization, transportation, and inadequate waste management systems (UNEP, 2023). Common environmental challenges in urban areas include air pollution, flooding, poor drainage, indiscriminate waste disposal, noise pollution, traffic congestion, water contamination, and climate-related disasters. Because these challenges directly affect public health and sustainable development, urban residents require continuous access to accurate environmental information. Consequently, media houses operating in urban areas have greater responsibilities to disseminate relevant environmental information that promotes environmental awareness, preparedness, and active citizen participation in environmental protection.

Overall, the interaction between environmental information utilization and the social responsibility of media houses is fundamental to achieving environmental sustainability in urban communities. When media organizations effectively utilize credible environmental information, they are better positioned to educate the public, influence environmental policies, encourage responsible environmental behavior, and support government efforts aimed at addressing environmental challenges. This relationship forms the central focus of the present study (UNESCO, 2026; UNEP, 2023).

Roles of Media Houses in the Society

Media houses perform a wide range of functions that reinforce their relevance in democratic societies. One of their fundamental roles is the watchdog function, where they hold governments, industries, and corporate actors accountable for actions that may harm society (Baran & Davis, 2015).

Investigative reports exposing illegal dumping of waste, oil spills, and corporate pollution fall within this mandate.

Another critical function is public education. Media institutions translate technical environmental reports into accessible language for the general public. For example, newspapers like *The Guardian* run weekly columns on environmental sustainability, while Channels Television has dedicated segments on climate change and disaster risk management (Nwabueze, 2014).

The media also serve as a platform for dialogue by giving voice to environmental activists, policymakers, academics, and the public. In Nigeria, radio stations such as Lagos Traffic Radio and Wazobia FM regularly engage experts to discuss waste disposal, flooding, and urban planning challenges.

Moreover, media houses play a crucial role in agenda-setting. According to McCombs and Shaw (1972), the media do not tell people what to think but what to think about. By consistently reporting on climate change, urban flooding, or pollution, media houses bring these issues into public consciousness, influencing both policy priorities and civic engagement. For example, consistent coverage of deforestation and flooding in Ekiti by Nigerian Tribune and Progress FM has raised public consciousness and influenced government action.

Notably, Yoruba-language programs on local radio stations such as Amuludun FM (Ibadan) and Voice FM (Ado-Ekiti) extend environmental awareness to rural and semi-urban communities, ensuring inclusivity in information dissemination.

Social Responsibilities Dissemination by Media Houses

The social responsibility theory of the press posits that freedom of the media comes with the duty to serve the public interest (McQuail, 2010). Media organizations must balance commercial goals with ethical obligations such as fairness, accuracy, inclusivity, and advocacy for societal well-being.

In Nigeria, social responsibility is evident when media houses create awareness on public health and environmental hazards. For example, investigative reports by Premium Times and Channels Television on the Lagos flooding crisis of 2022 highlighted the consequences of poor drainage and indiscriminate waste disposal, thereby compelling policy makers to act (Okoro & Nnaji, 2017). Similarly, urban newspapers like *Punch* and *Vanguard* have played active roles in disseminating campaigns against plastic pollution, erosion control, and oil spillage in the Niger Delta. By doing so, they fulfill their responsibility of informing and empowering the public.

Globally, media organizations in cities like London, New York, and Beijing have taken similar initiatives, using environmental information to educate urban populations on climate resilience and sustainability (UNEP, 2016). This indicates that environmental journalism is not just a local responsibility but a universal obligation.

Broadcasting emergency alerts, such as the 2019 Ado-Ekiti flooding updates aired by local radio stations urging residents to evacuate low-lying areas near Ureje River.

Through these initiatives, media institutions fulfill their social responsibility mandate by safeguarding lives, influencing environmental policy, and promoting sustainable urban living.

Environmental Information Generation and Use by Media Houses

Environmental information consists of scientific reports, data, statistics, and narratives about natural and ecological systems. Media houses generate and use this information in several ways.

First, they rely on collaboration with research institutions and NGOs. For instance, Nigerian media often cite reports from the Nigerian Meteorological Agency (NiMet), National Emergency Management Agency (NEMA), and NGOs like the Nigerian Conservation Foundation (NCF) in their coverage of environmental hazards.

Second, they produce investigative reports. Investigative environmental journalism in Nigeria has exposed issues such as the illegal dumping of toxic waste in Lagos and oil spills in Ogoniland (Nwabueze, 2014).

Third, they use digital media platforms to spread environmental campaigns. Social media platforms such as Twitter and Facebook have been used by Arise News and Channels Television to amplify environmental messages to urban audiences (UNESCO, 2019).

In Ekiti State, collaborations between EKSWMMA and local media have advanced sanitation campaigns, flood-prevention jingles, and waste-management awareness. Thus, the generation and utilization of environmental information not only enhance public knowledge but also contribute to democratic accountability by exposing ecological crimes.

Impact of Environmental Information Utilization on Social Responsibilities of Media Houses

The utilization of environmental information enhances the social

responsibilities of media houses in the following ways:

- **Public Awareness:** Through consistent reporting, urban dwellers are educated about risks such as flooding, air pollution, and improper waste management. This leads to increased community participation in environmental management (Nwabueze, 2014).
- **Policy Advocacy:** Media-driven campaigns often compel governments to enact or enforce environmental policies. For example, sustained media advocacy contributed to Lagos State's ban on plastic sachets and Styrofoam in 2024 (Okoro & Nnaji, 2017).
- **Behavioral Change:** Environmental information disseminated by the media encourages individuals and businesses to adopt sustainable practices, such as waste recycling, reduction of emissions, and tree planting (Baran & Davis, 2015).
- **Credibility and Trust:** By prioritizing environmental information, media houses enhance their legitimacy as socially responsible institutions (McQuail, 2010). This, in turn, strengthens democratic institutions and reinforces media trust among urban citizens.

Problems Encountered by Media Houses in the Utilization of Environmental Information

Despite their importance, media houses face numerous obstacles in the effective utilization of environmental information:

- i **Limited Access to Data:** Government agencies and corporations sometimes withhold

environmental data, making it difficult for journalists to report accurately (Okoro & Nnaji, 2017).

- ii **Commercial Pressures:** Media houses often prioritize entertainment and political content over environmental reporting because of audience demand and advertising revenue (Asemah, 2011).
- iii **Inadequate Training:** Many journalists lack the technical knowledge to interpret environmental data, leading to superficial reporting (Nwabueze, 2014).
- iv **Political Influence and Censorship:** Reporting on environmental pollution by powerful oil companies or government agencies may lead to censorship or threats (Baran & Davis, 2015).
- v **Financial Constraints:** Investigative environmental journalism is expensive, requiring resources that many media houses cannot afford (UNESCO, 2019).
- vi **Low Audience Interest:** Many urban dwellers focus on politics, security, or economic issues, showing limited interest in environmental topics (UNEP, 2016).

Environmental Problems in Ekiti State

Ekiti State, though less industrialized than megacities like Lagos and Port Harcourt, faces significant environmental challenges, particularly in its urban and semi-urban areas such as Ado-Ekiti, Ikere-Ekiti, Oye-Ekiti, and Ijero-Ekiti. These problems are largely driven by population growth, urban expansion, poor environmental awareness, and weak enforcement of

environmental regulations. The major environmental problems identified include:

a. Flooding and Poor Drainage Systems

Seasonal flooding remains one of the most persistent environmental problems in Ekiti State, especially in Ado-Ekiti. Areas such as Irona, Ajilosun, Odo-Ado, Ureje axis, and parts of Basiri frequently experience flooding during heavy rainfall. This problem is largely attributed to blocked drainage channels, unplanned urban development, construction on waterways, and indiscriminate dumping of refuse into gutters and streams. Flooding often leads to loss of property, displacement of residents, traffic disruption, and increased health risks.

b. Indiscriminate Waste Disposal and Poor Solid Waste Management

Improper disposal of solid waste is widespread in urban areas of Ekiti State. Many residents dump refuse along roadsides, in open spaces, waterways, and drainage channels. The limited number of waste collection points, irregular evacuation of waste, and low public compliance with sanitation regulations exacerbate the situation. This has resulted in environmental pollution, unpleasant aesthetics, breeding of disease vectors, and blocked drainage systems that worsen flooding.

c. Gully Erosion and Soil Degradation

Ekiti State's undulating terrain makes it highly susceptible to erosion. Gully erosion is prevalent in parts of Ado-Ekiti, Ikere-Ekiti, and Ilawe-Ekiti. Poor road construction, deforestation, sand excavation, and lack of effective drainage contribute significantly to soil

degradation. Erosion destroys farmlands, damages roads and buildings, and threatens livelihoods.

d. Deforestation and Bush Burning

Deforestation due to logging, fuelwood collection, and agricultural expansion is common in Ekiti State. Bush burning, particularly during the dry season, contributes to loss of biodiversity, soil infertility, and air pollution. These practices also undermine climate resilience and increase vulnerability to erosion and flooding.

e. Environmental Sanitation and Public Health Challenges

Poor environmental sanitation, including open defecation in some peri-urban communities, stagnant water, and poorly managed markets, poses serious public health risks. These conditions contribute to outbreaks of malaria, cholera, and other water-borne and vector-borne diseases.

Government Interventions at Various Levels to Address Environmental Problems in Ekiti State

Environmental management in Ekiti State involves the combined efforts of the federal, state, and local governments, each playing distinct but complementary roles.

Federal Government Interventions:

At the federal level, agencies such as the Federal Ministry of Environment, National Environmental Standards and Regulations Enforcement Agency (NESREA), National Emergency Management Agency (NEMA), and Nigerian Meteorological Agency (NiMet) contribute to environmental management in Ekiti State.

Ekiti State Government

Interventions: The Ekiti State Government plays a central role in addressing environmental challenges through the Ministry of Environment and Natural Resources and agencies such as the Ekiti State Waste Management Authority (EKSWMA).

Local Government Interventions: Local governments are closest to the grassroots and play a vital role in environmental governance.

Role of Media Houses in Supporting Government Efforts, and Environmental Governance

Media houses in Ekiti State complement government efforts by disseminating environmental information, sensitizing the public, and serving as watchdogs. Through radio jingles, news reports, talk shows, and public service announcements, stations such as Progress FM, EKSU FM, Voice FM, and regional newspapers raise awareness on sanitation, flooding, erosion control, and climate change. Their engagement strengthens accountability and encourages citizen participation in environmental protection. Media houses in Ekiti State complement government interventions by generating and disseminating environmental information, sensitizing the public, and acting as watchdogs. Through news reports, radio jingles, talk shows, and public service announcements, local media outlets educate residents on flooding risks, sanitation practices, erosion control, and climate change adaptation. This aligns with the social responsibility theory of the press, which emphasizes that the media must serve the public good by promoting societal well-being and sustainable development (McQuail, 2010; Okoro & Nnaji, 2017).

Responsibilities of the Media in Complementing Government Environmental Efforts

While government institutions at the federal, state, and local levels play critical roles in environmental management, the effectiveness of these interventions largely depends on public awareness, acceptance, and participation. Media houses therefore serve as indispensable partners in complementing government efforts through the strategic utilization of environmental information. Within the framework of the social responsibility theory of the press, the media are expected to support policies and initiatives that promote public welfare, including environmental sustainability (McQuail, 2010).

One major responsibility of the media is public enlightenment and environmental education. Media houses are tasked with translating complex environmental policies, scientific data, and government regulations into simple, accessible messages that can be understood by diverse audiences. Through radio jingles, documentaries, talk shows, news features, and opinion articles, the media educate citizens on proper waste disposal, flood prevention measures, erosion control, and climate change adaptation strategies. In Ekiti State, radio stations such as Progress FM, EKSU FM, and Voice FM play this role by broadcasting environmental programs in both English and Yoruba, thereby ensuring grassroots participation and inclusivity (Nwabueze, 2014).

Another critical responsibility is policy advocacy and agenda setting. Media houses influence public discourse by consistently highlighting environmental problems and government responses. By prioritizing

issues such as flooding, waste mismanagement, deforestation, and erosion in their reportage, the media draw public and governmental attention to environmental concerns that might otherwise be neglected. According to McCombs and Shaw (1972), sustained media coverage elevates issues onto the public agenda, thereby encouraging policy review, improved implementation, and accountability.

The media also have a responsibility to serve as watchdogs and accountability agents. While complementing government efforts, media houses must independently monitor and evaluate the implementation of environmental policies and projects. Investigative reporting on abandoned drainage projects, illegal dumping, or misuse of ecological funds helps to ensure transparency and responsible governance. This watchdog role strengthens democratic processes and enhances the credibility of environmental governance (Baran & Davis, 2015).

In addition, the media are responsible for early warning dissemination and risk communication. During periods of heavy rainfall or environmental emergencies, media houses relay timely information from agencies such as NiMet and NEMA to alert residents in flood-prone areas. Broadcasting evacuation notices, safety guidelines, and emergency contacts helps to minimize loss of lives and property. Local radio stations in Ekiti State have, in the past, played vital roles in disseminating flood alerts and sanitation advisories, particularly in vulnerable urban communities.

Furthermore, media houses are expected to promote behavioral change and civic participation. By consistently emphasizing the consequences of environmental negligence and

showcasing positive environmental practices, the media encourage citizens to adopt responsible behaviors. Campaigns promoting waste sorting, tree planting, environmental sanitation, and community clean-up exercises support government initiatives and foster a culture of environmental responsibility among urban residents (UNEP, 2016).

Finally, the media have a responsibility to facilitate stakeholder collaboration. Media platforms provide spaces for dialogue among government agencies, environmental experts, civil society organizations, and community members. Through panel discussions, phone-in programs, and town hall broadcasts, the media help bridge communication gaps, clarify misconceptions, and strengthen partnerships aimed at environmental sustainability. Such collaborative engagement enhances the effectiveness of government environmental policies and promotes shared ownership of environmental challenges and solutions (UNESCO, 2019).

Summary

This paper examined the impact of environmental information utilization on the social responsibilities of media houses in urban areas, with particular reference to Nigeria and Ekiti State. Using a literature-based approach, the study established that media houses play vital roles as watchdogs, educators, agenda setters, and advocates for environmental sustainability. Effective utilization of environmental information enables the media to raise public awareness, support environmental policies, encourage responsible environmental behaviour, and promote sustainable urban development.

The study identified major environmental challenges in Ekiti State,

including flooding, poor waste management, erosion, deforestation, bush burning, and inadequate sanitation. It also highlighted the interventions of the federal, state, and local governments in addressing these challenges. Furthermore, the paper emphasized that media houses complement these efforts through public enlightenment, environmental reporting, early warning dissemination, and policy advocacy.

Despite these contributions, the study found that media organizations face several constraints, including inadequate access to environmental information, insufficient training, financial limitations, political interference, and low public interest in environmental issues. The paper concludes that strengthening the capacity of media houses, improving access to credible environmental information, and enhancing collaboration among government agencies, environmental experts, and the media are essential for promoting effective environmental communication and sustainable urban development.

Conclusion

Environmental information utilization is central to the social responsibility mandate of media houses in urban areas. By reporting environmental issues, educating the public, and advocating for sustainable practices, the media contribute to urban resilience and sustainable development. However, challenges such as inadequate resources, political pressures, and low audience engagement hinder effective environmental journalism. Strengthening the capacity of media houses to utilize environmental information will ensure that they remain true to their responsibility as watchdogs and agents of social change.

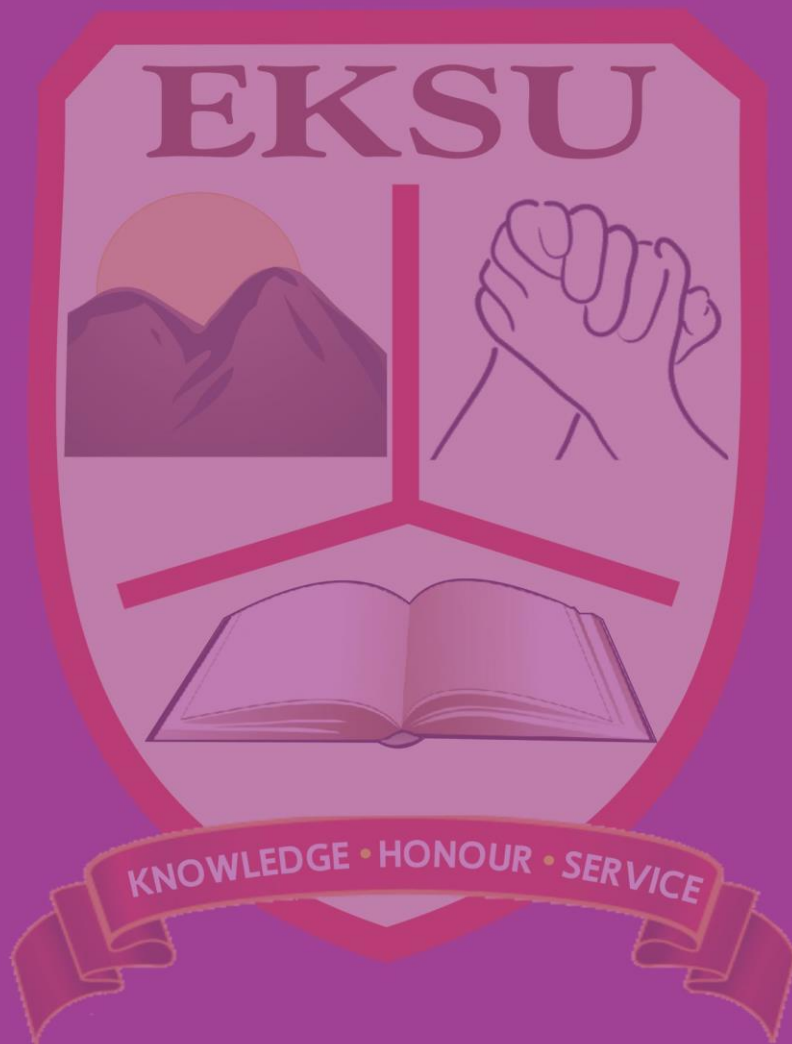
Recommendations

1. Capacity Development: Media house should carry out a Specialized training programs in environmental journalism to enhance the competence of journalists.
2. Collaboration with Experts: Media houses should work closely with scientists, environmentalists, and NGOs for credible and timely data.
3. Policy Framework: Governments should strengthen laws that promote press freedom in environmental reporting.
4. Funding Support: Grants and sponsorships from international organizations should be made available to support investigative environmental journalism.
5. Public Engagement: Media houses should create engaging programs—such as environmental talk shows, documentaries, and drama series—to stimulate audience interest.
6. Use of ICTs: Social media, mobile apps, and data visualization tools should be integrated into environmental communication strategies for wider reach.
7. Expand Yoruba-language broadcasts in Ekiti State for grassroots engagement.
8. Encourage EKSU's Faculty of Environmental Sciences to partner with local media outlets for research-based reporting.
9. Promote community-based initiatives such as radio-supported town hall meetings

References

- Adeoti, J. O. (2018). "Urban Flooding and Waste Management in Ado-Ekiti." *Journal of Nigerian*

- Environmental Studies*, 5(1), 88–103.
- Asemah, E. S. (2011). *Selected Mass Media Themes*. Jos: Jos University Press.
- Baran, S. J., & Davis, D. K. (2015). *Mass Communication Theory: Foundations, Ferment, and Future*. Stamford: Cengage Learning.
- Ekiti State Ministry of Environment (2022). *Annual Report on Environmental Challenges in Ekiti State*. Ado-Ekiti: Government Press.
- McCombs, M. E., & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly*, 36(2), 176–187.
- McCombs, M. E., & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly*, 36(2), 176–187. <https://doi.org/10.1086/267990>.
- McQuail, D. (2010). *McQuail's Mass Communication Theory*. London: Sage.
- McQuail, D. (2010). *McQuail's mass communication theory* (6th ed.). Sage Publications.
- Nwabueze, C. (2014). *Introduction to Mass Communication: Media Ecology in the Global Village*. Owerri: Top Shelf.
- Okoro, N., & Nnaji, G. (2017). Environmental communication and media responsibility in Nigeria. *Journal of Communication and Media Studies*, 9(2), 45–57.
- UNEP (2016). *Global Environment Outlook: Regional Assessments*. Nairobi: United Nations Environment Programme.
- UNEP. (2023). *UNEP strategy for environmental education and training*. United Nations Environment Programme. (UNEP - UN Environment Programme).
- UNESCO (2019). *Journalism, Fake News & Disinformation: Handbook for Journalism Education and Training*. Paris: UNESCO
- Baran, S. J., & Davis, D. K. (2015). *Mass communication theory: Foundations, ferment, and future* (7th ed.). Cengage Learning.
- UNESCO. (2026). *Reporting the environment: A practical manual for journalists*. UNESCO. (UNESCO).



ISSN : 2 6 3 5 3 4 3 1

DE-DIVINE CREATION VENTURES
08034668749; 08133613720, 07030115871