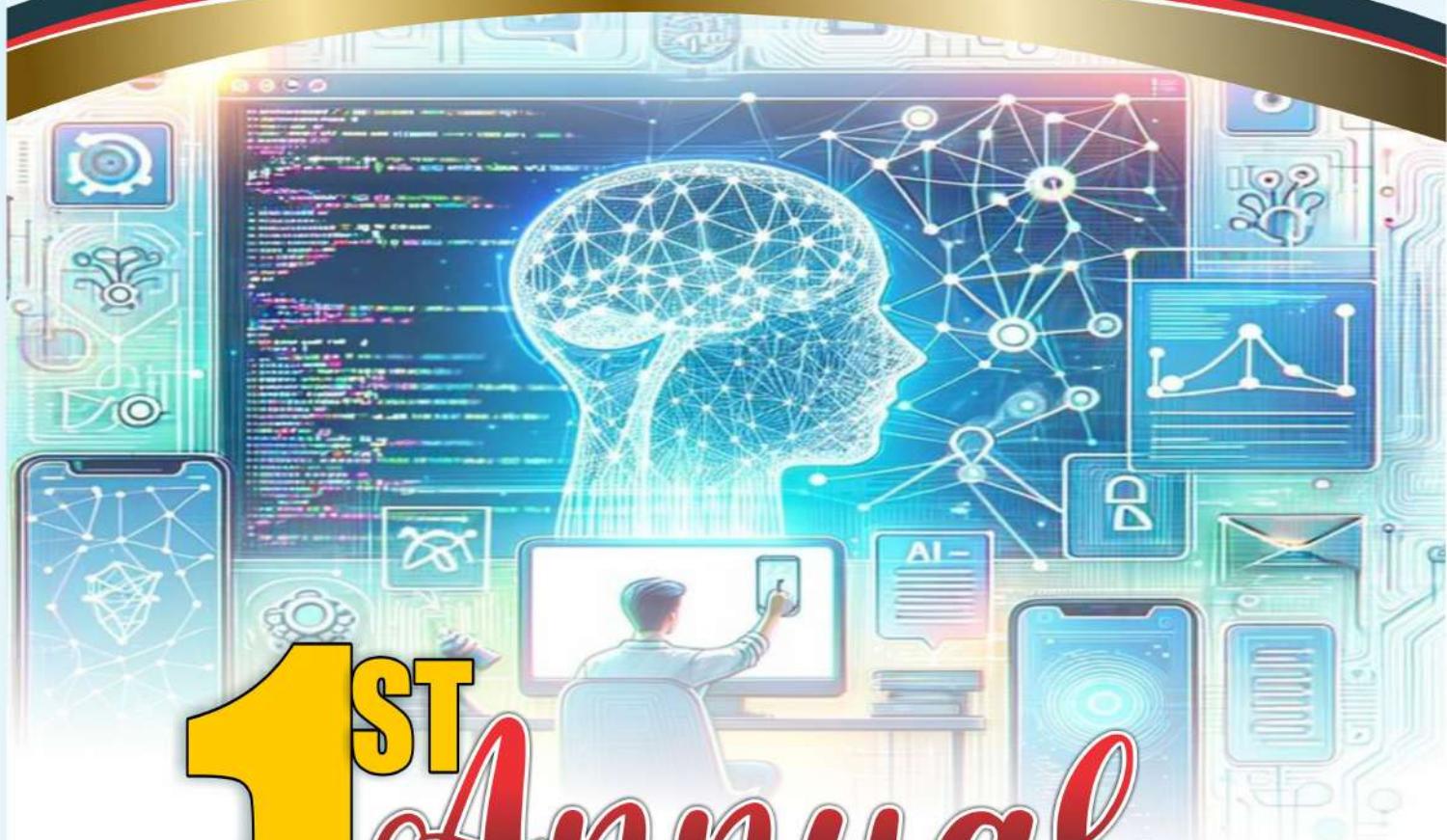




ASSOCIATION OF SCIENCE EDUCATORS ANAMBRA (ASEA)

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**SCIENCE EDUCATORS AND DIGITAL LITERACY
IN THE 21ST CENTURY**



1ST
Annual
CONFERENCE
PROCEEDINGS 2025

Editor
Prof. Josephine N. Okoli

ASSOCIATION OF SCIENCE EDUCATORS ANAMBRA (ASEA)

**THEME: SCIENCE EDUCATORS AND DIGITAL LITERACY IN THE 21ST
CENTURY**

1ST ANNUAL CONFERENCE PROCEEDINGS, 2025

10- 12th July, 2025

Editor

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Anambra State, Nigeria

Usan Peter

Chemistry Department
Federal Technical College, Awka,
Anambra State, Nigeria

PROGRAMME OF EVENTS

- Opening Praying
- Chairman's Opening Remark
- Breaking of Kola nut
- Welcome Address by the acting President of the Association
- Keynote Presentation by Prof. Cecilia O. Ekwueme
- Lead Paper Presentation by Prof. Telima Adolphus
- About the Electronic Book / Unveiling of Book Chapter – E-Book launch
- Item 7
- Meritorious Award
- Paper Presentations

MERITORIOUS AWARD

CITATION OF Dr SAMUEL ALFAYO BOH



It is my pleasure and singular honour to be called upon to read a citation on one of the eminent Doctor that the family of Alfayo has ever produced.

People are not chosen for their comfort, they most often to prepare for a life of self sacrifice and even sufferings on behalf of other. And most often their calling is not for privilege but for service. Whichever prism you use in view him, Dr Samuel Alfayo Boh a class teacher of high repute, a man of integrity and fear of God, sacrifices and service for the betterment and advisement of humanity.

May, 18, 1969 marked the beginning of the steadily progressive son of Boh colored mother and the Shongomite father. This account of this childhood and youth in Gombe State shows the prince he had to pay for such a birth. It did not take long before he was revealed as a man of vision and mission as every step he took in both early life and now was clogged with success, and a wide breath of accomplishment.

Dr.Samuel Alfayo Boh spends is early life in Boh with his parent. He attended Boh primary school from 1976 to1984 exposed his qualities as a gifted child enable him to proceed to Government Science Secondary School Kaltungo 1984 to 1987,Teachers College Gombe 1988 to 1990 the exceptional this qualities made way for him to enlist to College of Education Azare 1993 where he bagged National Certificate in Education (NCE) while in Azare, he was elected parliamentary student union 1994 to 1995 session and thereafter in the year 1987, he proceeded to famous University of Maiduguri Borno State and had a Bachelor of Education and passed with flying colours in 2000. Diploma in World Evangelism Mission Training Institute in Borno State in 1999. In 2001, the indefatigable Samuel was drafted in to the National youth service scheme in Tsafe, Zamfara State his service witnessed a continued story of one success after another like the Nehemiah of the Holy Bible. As a man who fully understand what benefits education could bring his way when tapped. Dr Samuel did not hesitate to define where he was headed for in that direction. In 2004, he gain admission to University of Maiduguri, Borno States as an intelligent

student, he graduated in 2008 with Master of Education in Curriculum and Instruction (M.ED). Diploma and Certificate in computer 2009. In the year between 2013 to 2016 he bagged Masters in Guidance and Counseling in Theological Seminary College Kaltungo in Gombe State. Moreover, the influence this celebrated academia exerted on him equipped him to master the techniques of research, the canons of interpretation and reconstruction of academic research, the craft and skills involved and teacher – students relationship in 2010 he proceeded to one of the best University in Nigeria University of Nigeria Nsukka in Enugu State and come out with Doctor of philosophy (Ph.D) in Curriculum and Instruction.

A man with a formidable profile charismatic personality, Dr Samuel is indeed an achieve per excellence he has not only carved a niche for himself, but has also made name and reputation in Nigeria. He has always impacted positively in the lives of everyone he meets. He has also shown high sense of professionalism and dedication to the service of humanity. On several occasion Samuel has interrupted his travels to attend to civilian, accident victims and he has truly saved a lot of lives.

Dr. Samuel Alfayo Boh started his civil service career as a classroom teacher; he had a little starting with the noble teaching profession. In 1996 he took appointment with Boh primary school, Labeke primary school in 1997, Kulishin primary school 1999, Pivotal Teachers Training Programme Lapan in 1999. In 2000 He moved to Government Day Secondary School Boh. In 2000 Tutor Senator T.U. Wada Educational Emancipation Scheme. Presently, lecturer with Federal University Kashere, in the Department of Educational Foundations

Dr. Samuel is a versatile personality of note and a man of many parts. He is fondly referred to as sport, Author and a born teacher of good repute. In his romance with great academics, he has received more than twenty awards, member of many associations, he has presented more than thirty academic papers in both international and national journals, he has published Ninety journals, sixteen book chapters, he has written eight books, presently chairman board of governors Jim Collis Kufai, fellow members of more than seven associations, former permanent commissioner sports commission Gombe State, chairman and secretary of many association, He is happily married to Mrs. Abigail Samuel and blessed with many children.

Having described himself as an enterprising person who has excellence attached to his name, Dr Samuel Alfayo Boh evinces a friendly disposition towards his students. He is a strong advocate of treating students with understanding and affection, Dr. Samuel incontestably mentors, counsels, reprimands, sympathizes and assists his young and old alike. Some of his students describe him as a luminous teacher whose passion for academic scholarship is infectious and whose pedagogical principle skills and friendly disposition are so admirable and endearing that attendance at his lectures is always high and far outstrips most others.

Ladies and gentlemen, Dr. Samuel Alfayo Boh is a small figure on the physical appearance. It is my great honour and privilege to call on this academic repute, erudite, scholar, indefatigable and inspirational mentor, community lover, and motivator ardent love of Shongomite culture and humanist to graciously joint the chairman and other for the formal presentation of this fabulous awards to acknowledge to celebrate his hard word, disciplines, kindness, humanness and commendable role he is playing in the academic careers and character-building

FOREWORD

It is with profound pride and optimism that I write this foreword to the maiden Book of Conference Proceedings of the Association of Science Educators Anambra State a timely and significant academic documentation that captures the robust engagements, research contributions, and transformative ideas presented at the 1st Annual Conference of the Association, scheduled for July 10, 2025, in Awka, Anambra State, Nigeria.

The conference, with the theme “Science Educators and Digital Literacy in the 21st Century,” could not have come at a more opportune moment. In an age where digital transformation is rapidly redefining education, economy, and society, the role of science educators in equipping learners with not only scientific knowledge but also digital competencies has become more critical than ever. The conference offered a strategic platform for scholars, researchers, policy makers, and practitioners to interrogate, share, and shape new pedagogical paradigms that incorporate digital literacy into the fabric of science education.

In his address of welcome, the Acting President of ASEA, Dr. Johnbosco O.C. Okekeokosisi, delivered a compelling call to action. He set the tone by acknowledging the historical importance of the event and the noble mission of ASEA to champion science education across Anambra State and beyond. His words reflected a clear vision of collective progress, innovation, and institutional synergy. Most notably, Dr. Okekeokosisi emphasized that digital literacy in science education is not merely about embracing technological tools but about empowering both educators and learners to critically engage, create, and transform scientific knowledge for societal advancement.

This compilation of conference proceedings is more than a record of presentations—it is a testimony to the enduring commitment of Nigerian science educators to adapt to global educational trends. With insightful keynote and lead paper presentations by eminent scholars such as Prof. Cecilia O. Ekwueme and Prof. Telima Adolphus, participants were exposed to a breadth of ideas, models, and classroom innovations. These contributions are now immortalized in this volume, accessible to researchers, policymakers, and education stakeholders worldwide. The articles by contributors are of quality standard and intimately related to the conference theme.

The proceedings are also a celebration of collective effort. Dr. Okekeokosisi rightly acknowledged the contributions of past leaders of STAN, the Executive Principal of Igwebuike Grammar School, the Local Organizing Committee, and institutional partners who ensured the success of this pioneering event. Their efforts reflect a shared belief in the transformative power of science education when driven by vision, collaboration, and strategic digital integration.

This book also symbolizes the maturity and forward-thinking disposition of ASEA. With its proceedings published online in the Association’s official website (www.jisepublications.org), ASEA is setting a benchmark for academic visibility, accessibility, and global relevance. The initiative aligns perfectly with the conference theme—leveraging digital platforms for knowledge dissemination.

As readers engage with the rich content within this publication, it is my hope that they find not only knowledge but also inspiration to further the cause of digital transformation in science education. May this volume serve as a resource, a reference, and a rallying point for continued innovation, research, and excellence in digital literacy, science teaching and learning.

Prof. Marcellinus C. Anaekwe
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National Open University of Nigeria,
Abuja.

PREFACE

Digital literacy in the 21st century is crucial for science educators to effectively teach and prepare students for a rapidly evolving scientific and technological world. Science educators must embrace digital tools and resources to enhance their teaching methods and foster students' scientific literacy, critical thinking and problem-solving skills. This includes leveraging online platforms, using educational technologies and digital content to create engaging and meaningful learning experiences.

In this conference proceedings efforts has been made towards promoting the use of digital tools in science education.

Prof. Josephine N. Okoli

Science Education Department

Nnamdi Azikiwe University, Awka,

Anambra State, Nigeriascience

ADDRESS OF THE ACTING PRESIDENT OF ASSOCIATION OF SCIENCE EDUCATORS ANAMBRA (ASEA), DR. JOHN BOSCO O.C. OKEKEOKOSI, AT THE OPENING CEREMONY OF THE 1ST ANNUAL CONFERENCE HELD IN AWKA, ANAMBRA STATE, NIGERIA ON 10TH JULY, 2025

Theme: “Science Educators and Digital Literacy in the 21st Century”

Distinguished Guests,

Mother of the Day, and Executive Provost of the Federal College of Education (Technical), Umunze, Prof. Tessy O. Okoli

Past and Immediate Past Chairmen of the Anambra State Chapter of the Science Teachers Association of Nigeria (STAN), Prof. C.V. Nnaka, Dr. Christiana U. Ezenduka Past and Immediate Past Secretary of the Anambra State Chapter of the Science Teachers Association of Nigeria (STAN), Dr. Chinwe B. Njelita, Mr. Kingsley N.C. Ezeokeke

The Executive Principal of Igwebuike Grammar School, Awka, Mrs. Amaka Ifebili

Our Esteemed Keynote and Lead Paper Presenters, Profs: Cecilia O. Ekwueme, Telima Adolphus

Meritorious Awardee, Dr. Samuel Alfayo Boh

Representatives of Educational Institutions, Pharm. Adauzoh C. Joe-Obasi

The Conference Planning Committee

The Local Organizing Committee (LOC),

My Fellow Science Educators,

Ladies and Gentlemen.

It is with deep humility and immense pleasure that I stand before you today as the Acting President of the Association of Science Educators Anambra (ASEA), to welcome you all to this historic gathering — the **1st Annual Conference** of our noble Association, taking place here in the vibrant capital city of Awka, Anambra State.

This moment marks a milestone in the life of our Association and in the educational landscape of our dear state. Today, we have gathered not just to deliberate on academic issues, but to collectively reflect on and shape the role of science educators in a rapidly changing digital world. The presence of each one of you here is a testament to your dedication to the advancement of science education in Nigeria, and in particular, in Anambra State.

Let me begin by extending heartfelt gratitude to our **Mother of the Day**, the erudite and distinguished **Executive Provost of the Federal College of Education (Technical), Umunze**, for honoring our invitation. Your presence is a great source of inspiration, and we are immensely grateful for your unwavering support towards science and technical education in the state. The Host and Board of Directors, Prof. Josephine N. Okoli, Prof. Isaac N. Nwankwo, Prof. M.C. Anaekwe

Chairman of the occasion Ass. Prof. Peter I.I. Ikoku

To the **Past Chairman and Immediate Past Chairman of Anambra State STAN**, we salute you. You laid the foundation for excellence and integrity in science education upon which ASEA continues to build. We are proud to carry forward the torch of progress you lit. Your legacies continue to motivate and guide our mission as science educators.

We also sincerely appreciate the **Executive Principal of Igwebuik Grammar School, Awka**, for the enormous and selfless support towards the successful hosting of this conference. Your generosity and logistical assistance have played a crucial role in bringing this vision to reality. We are proud to host this conference within your institution, and we thank you for embracing the ASEA family.

Special thanks also go to our **Keynote and Lead Paper Presenters**, whose scholarship and insight will surely enrich our understanding of the conference theme: *“Science Educators and Digital Literacy in the 21st Century.”* You are the thought leaders that will help us navigate this complex but exciting intersection between pedagogy and technology.

Meritorious Awardee, **Dr. Samuel Alfayo Boh**, whose contributions to teaching and learning in tertiary institutions lead to the foundation of our members.

The **representatives of educational institutions**, both public and private, we acknowledge your partnership and presence. Your contributions, ideas, and institutional support are essential in sustaining quality science education. Together, we can foster a generation of scientifically literate citizens equipped for the demands of the 21st century.

Let me also specially recognize the tireless efforts of the **Local Organizing Committee (LOC)**. You have worked round the clock, attending to logistics, communications, hospitality, and a host of behind-the-scenes responsibilities. This conference would not be possible without your selfless commitment. I say, “Well done!”

This conference has its theme **“Science Educators and Digital Literacy in the 21st Century”**. The theme is very apt considering the fact that we are in the digital age. Thus, the committee on conference looked inward to provide this conference theme for science educators to understand, educate, re-educate, write and deliberate on the effective use of digital tools – technologies in our present time for effective instructional delivery. Participants will be taken through hands-on and minds-on activities in various sessions and they will find the conference package very rewarding. I invite you to pay attention during keynote address to be presented by Prof. Cecilia O. Ekwueme, the Dean Faculty of Science Education, University of Calabar, Cross-River State, Nigeria. Your continuous attention is also needed during the lead paper presentation of Prof. Telima Adolphus of Rivers State University, PortHarcourt, Nigeria.

To all **participants** – educators, researchers, students, policy makers – thank you for making out time to be here. Your presence signifies hope for the future of science education. I urge you to make the most of this gathering by networking, exchanging ideas, and exploring new strategies to embed digital literacy in science classrooms and curricula.

As we delve into this conference theme, let us remember that digital literacy is not just about the use of devices or softwares. It is about empowering both teachers and learners to navigate, create, and critically evaluate digital content. It is about transforming science education into an interactive, engaging, and accessible experience that prepares our students for global competitiveness. We must rise to this responsibility with courage, collaboration and innovation.

As we officially declare this conference open, let us do so with a shared sense of purpose and vision. Let us reflect deeply, discuss intelligently and leave this gathering better equipped to build a technologically savvy and scientifically vibrant society.

Ladies and Gentlemen, it may interest us to note that this young growing association has an online Journal, Electronic Book (e-book) and Conference Proceedings. The E-Book and Conference Proceedings were hosted online at the association's website (jisepublications.org) for its visibility. It is obvious that this association has come to stay. To God be the glory.

Once again, I welcome you all to the 1st Annual Conference of the Association of Science Educators Anambra (ASEA). May our deliberations be fruitful, and may the bonds we forge here today grow stronger for the benefit of science education in our state and beyond.

Thank you, and God bless you all.

Dr. Johnbosco O.C. Okekeokosisi

Federal College of Education (Tech) Asaba,
Delta State, Nigeria
Acting President, ASEA
10th July, 2025

PAPER 19

THE INFLUENCE OF DIGITAL LITERACY ON STUDENTS' SCIENTIFIC INQUIRY SKILLS: EDUCATORS' PERSPECTIVES IN ORUMBA SOUTH LOCAL GOVERNMENT AREA, ANAMBRA STATE

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Abstract

This study examined the influence of digital literacy on students' scientific inquiry skills from the perspectives of science educators in Orumba South Local Government Area (LGA) of Anambra State, Nigeria. As education increasingly embraces digital technology, understanding how teachers' digital competencies shape students' ability to engage in scientific inquiry becomes essential. The study adopted a descriptive survey design involving 76 science teachers drawn from ten randomly selected public secondary schools in Orumba South LGA. A structured questionnaire titled "Digital Literacy and Scientific Inquiry Skills Survey (DLSISS)" was used for data collection. Data were analyzed using mean, standard deviation, and t-test statistics. The results showed that science teachers generally possess moderate digital literacy skills and perceive a positive relationship between digital literacy and students' development of scientific inquiry skills. However, challenges such as inadequate digital infrastructure, limited training opportunities, and inconsistent internet connectivity were highlighted as major barriers. There was no statistically significant difference between male and female teachers' perceptions. The study recommends targeted digital training for educators, improved infrastructure, and strategic policy support to enhance science teaching through digital tools.

Keywords: Digital Literacy, Scientific Inquiry skills, Science Education, Teacher Perception, Educational Technology

Introduction

In recent decades, the integration of digital literacy into education has become a global imperative, driven by rapid advancements in information and communication technology (ICT). This transformation is particularly crucial in science education, where inquiry, experimentation, and critical thinking are at the core of learning. In today's digital era, the traditional approach to science teaching is increasingly giving way to technologically enhanced instruction that fosters active student participation, collaboration, and problem-solving. Science educators are now expected to not only deliver content but also guide learners in using digital tools to explore, analyze, and interpret scientific phenomena.

Digital literacy, as defined by scholars such as Eshet-Alkalai (2004), encompasses more than just the ability to operate digital devices. It includes the skills to locate, evaluate, create, and communicate information effectively using various digital platforms. Within the context of education, digital literacy enables both teachers and students to engage in a more dynamic, interactive, and personalized learning experience. In science classrooms, this competence facilitates the use of simulations, virtual laboratories, animations, data logging tools, and collaborative platforms to enhance student understanding of complex concepts and processes.

The role of the science teacher is especially critical in this digital transformation. Digitally literate educators are better positioned to foster inquiry-based learning by guiding students through scientific investigations using technology. This includes supporting students in observing phenomena through simulations, forming hypotheses, conducting virtual experiments, collecting and analyzing data, and drawing evidence-based conclusions. These processes align closely with the scientific inquiry model, which is foundational to effective science education (National Research Council, 2000). When integrated successfully, digital tools can make inquiry more accessible, replicable, and engaging for students, thereby promoting deeper understanding and retention.

Despite the numerous advantages associated with digital literacy in science education, its implementation in Nigeria has faced several setbacks. According to Amzat and Yusuf (2020), efforts to digitize education in Nigeria have often been hampered by poor infrastructure, inadequate funding, and limited digital competence among teachers. These challenges are even more pronounced in rural and semi-urban areas such as Orumba South Local Government Area (LGA) in Anambra State, where many schools lack basic facilities like reliable electricity, internet connectivity, and access to functional digital devices.

Science educators in these regions often have limited opportunities for professional development in digital pedagogy. Most teacher training programs emphasize content delivery rather than technological integration, leaving many educators ill-equipped to leverage digital tools effectively. In addition, the absence of consistent policy implementation and support systems from government agencies further weakens the capacity of teachers to adopt digital practices in their classrooms. These limitations reduce the potential for digital literacy to meaningfully impact the teaching and learning of scientific inquiry skills.

Moreover, digital competence among teachers is not uniform. Some teachers are familiar with basic applications such as Microsoft Word and PowerPoint but lack exposure to more advanced educational technologies like simulations, virtual labs, and online scientific databases. This variation in digital skill levels leads to inconsistencies in how science is taught and experienced across schools, further contributing to educational inequality.

Given the centrality of science education to national development and innovation, understanding how digital literacy affects science teaching is essential. Scientific inquiry skills—such as observing, hypothesizing, experimenting, analyzing, and drawing conclusions—are not only crucial for academic success but also for nurturing future scientists, engineers, and informed citizens. The use of digital tools has the potential to make these skills more attainable and meaningful for students, but this depends heavily on the capacity and readiness of teachers to integrate technology into their pedagogical practice.

This study, therefore, investigates the influence of digital literacy on students' scientific inquiry skills from the perspectives of science educators in Orumba South LGA. It aims to assess the current level of digital literacy among science teachers, explore their perceptions of how digital tools impact students' inquiry-based learning, and identify challenges that hinder effective digital integration. Through this investigation, the study seeks to contribute to the ongoing discourse on educational technology in Nigeria and offer recommendations for enhancing science instruction through digital competence.

Statement of the Problem

Despite the growing relevance of digital tools in modern education, many science teachers in Nigeria struggles to integrate these tools effectively into their teaching practices. This affects learners' scientific inquiry skills as passive by scholars. The attributed challenges of teachers in ability to integrate digital tools into learning process could be linked to infrastructural challenges, lack of training, and inconsistent access to technology. Thus, this study seeks to address the gap in understanding how teachers' digital literacy levels influence students' ability to engage in scientific inquiry and what barriers hinder the effective use of digital tools in science education.

Purpose of the Study

The purpose of this study is to examine the influence of science teachers' digital literacy on students' scientific inquiry skills in public secondary schools in Orumba South Local Government Area of Anambra State. Specifically, the study aims to assess the level of digital literacy among science educators, explore their perceptions regarding the impact of digital tools on inquiry-based learning, and identify the major challenges faced in integrating digital technologies into science instruction.

Research Questions

This study was guided by the following research questions;

1. What is the level of digital literacy among science teachers in public secondary schools in Orumba South Local Government Area
2. What challenges do science teachers face in applying digital literacy to foster scientific Orumba South Local Government Area

Hypothesis

The following null hypothesis was tested at a 0.05 level of significance:

H01: There is no significant difference between male and female science teachers in their perception of how digital literacy influences students' scientific inquiry skills.

Methodology

This study adopted a descriptive survey design to investigate the influence of science teachers' digital literacy on students' scientific inquiry skills. The design enabled the researcher to gather quantifiable information from a defined population through structured instruments, providing insight into educators' perceptions and practices related to digital integration in science teaching. The population of this study comprised all science teachers in the 13 public secondary schools in Orumba South Local Government Area of Anambra State. These educators include biology, chemistry, physics, mathematics and basic science and technology teachers who are actively involved in delivering science instruction at the secondary school level. Out of the 13 government-owned secondary schools in Orumba South LGA, ten (10) schools were randomly selected. A total of 76 science teachers which included corps members were identified within these schools. The sample was selected using purposive sampling, focusing specifically on teachers currently teaching science subjects. This method ensured that only relevant respondents with direct classroom experience in science education were included in the study. A structured questionnaire titled "Digital Literacy and Scientific Inquiry Skills Survey (DLSISS)" was developed by the researcher. The questionnaire comprised three sections:

- **Section A:** Demographic information (e.g., gender, teaching experience, subject taught).
- **Section B:** Assessment of teachers' digital literacy competencies.
- **Section C:** Teachers' perceptions of the influence of digital literacy on students' scientific inquiry skills.

The items were based on a 4 point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The face and content validity of the instrument were ensured through expert review by specialists in Educational Technology and Science Education. To determine reliability, a pilot test was conducted with ten science teachers from outside the sampled schools. The instrument yielded a Cronbach's Alpha reliability coefficient of 0.81, indicating high internal consistency. The researcher, assisted by two trained research assistants, administered the questionnaires in person. Prior to data collection, participants were briefed about the purpose of the study and assured of confidentiality and voluntary participation. Signed consent was obtained from all respondents. Descriptive statistics (mean and standard deviation) were used to answer the research questions, while an independent sample t-test was employed to test the hypothesis at a 0.05 level of significance. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS).

Results

Research Question 1: What is the level of digital literacy among science teachers in public secondary schools in Orumba South LGA

Table 1: Mean Analysis of Teachers' Digital Literacy Skills

S/N	Item	SA	A	D	SD	\bar{X}	Remark
1	I can effectively use digital tools such as MS Word, PowerPoint	30	32	104	3.15	Accepted	
2	I can use the internet to access educational resources	34	28	9	3.19	Accepted	
3	I have used digital platforms (e.g., simulations, Google Earth, virtual labs, etc.) in science teaching	18	20	25	13	2.43	Not Accepted
4	I can integrate technology into lesson planning	25	30	15	6	2.97	Accepted
5	I have received formal training on digital literacy	20	26	18	12	2.67	Accepted
Grand Mean							2.88 Moderate

The grand mean of 2.88 suggests that science teachers in Orumba South possess moderate digital literacy. While most are proficient with basic tools and internet use, fewer have used more advanced platforms such as simulations in teaching.

Research Question 2: How do science teachers perceive the influence of digital literacy on students' scientific inquiry skills

Table 2: Mean Analysis of Teachers' Perceptions

S/N	Item	SA	A	D	SD	\bar{X}	Remark
1	Digital tools help students explore scientific concepts independently	36	30	6	4	3.29	Accepted
2	Use of technology fosters students' curiosity and questioning	32	34	6	4	3.24	Accepted
3	Students engage more in inquiry when lessons involve digital simulations	28	29	109	3.00	Accepted	
4	Technology encourages data analysis and interpretation in science	30	32	8	6	3.13	Accepted
5	Scientific inquiry is more effective when digital tools are used to visualize experiments	29	33	9	5	3.13	Accepted
Grand Mean							3.16 Positive Perception

All mean scores exceeded the decision mean of 2.50. This indicates that science teachers have a positive perception of the role digital literacy plays in enhancing students' scientific inquiry skills.

Research Question 3: What challenges do science teachers face in applying digital literacy to foster scientific inquiry in the classroom

Table 3: Perceived Challenges to Digital Literacy Integration

S/N	Item	SA	A	D	SD	\bar{X}	Remark
1	Lack of access to functional computers and digital devices	42	25	6	3	3.39	Accepted
2	Poor internet connectivity	40	24	8	4	3.32	Accepted
3	Inadequate training on integrating digital tools into science teaching	34	28	9	5	3.20	Accepted
4	Unstable power supply	38	26	8	4	3.29	Accepted
5	Lack of motivation to try new digital tools	22	24	20	10	2.70	Accepted
Grand Mean						3.18	Significant Challenges

Respondents identified several significant barriers to using digital tools in science teaching, with infrastructural challenges being the most prominent.

H01: There is no significant difference between male and female science teachers in their perception of how digital literacy influences students' scientific inquiry skills.

Table 4: T-test Analysis of Gender Differences in Perception

Gender	Mean	SD	N	df	t-cal	t-crit	Decision
Male	3.15	0.25	36	74	-0.91	1.99	Do not reject H ₀
Female	3.19	0.27	40				

Significance level: P > 0.05

The calculated t-value (-0.91) is less than the critical value (1.99). Therefore, the null hypothesis is not rejected. This means there is no statistically significant difference in the perceptions of male and female science teachers regarding the influence of digital literacy on students' inquiry skills.

Discussion

The findings of this study provided valuable insights into the digital literacy levels of science educators and their perspectives on how these skills influence students' scientific inquiry abilities in public secondary schools in Orumba South Local Government Area (LGA) of Anambra State. The discussion below elaborates on key outcomes, relates them to existing literature, and draws implications for educational practice and policy.

The first major finding revealed that science teachers in Orumba South LGA possess a moderate level of digital literacy. Most respondents reported being able to use basic digital tools such as Microsoft Word, PowerPoint, and search engines, indicating a foundational level of competence in digital technologies. However, many teachers expressed limited exposure to more advanced instructional technologies like virtual laboratories, data analysis software, online simulations, and digital assessment platforms. This pattern aligns with previous studies such as Nwachukwu and Okonkwo (2020), who found that while Nigerian secondary school teachers are becoming increasingly familiar with basic digital tools, the use of more sophisticated educational technology

remains limited due to infrastructural constraints, lack of training, and inconsistent policy implementation.

This gap in digital competency is significant because scientific inquiry—characterized by observation, hypothesis formation, experimentation, analysis, and conclusion—can be greatly enhanced through the use of advanced technologies. For instance, simulation tools allow students to engage in virtual experiments that replicate real-world conditions, even in the absence of physical lab resources. The inability to harness such tools limits the extent to which teachers can promote critical inquiry and experiential learning. The implication here is that professional development programs need to evolve beyond basic computer literacy to include pedagogical applications of digital tools, especially those tailored for science education.

Secondly, the study found that science teachers hold positive perceptions regarding the influence of digital literacy on students' scientific inquiry skills. Respondents agreed that when effectively used, digital tools help students explore scientific concepts independently, visualize abstract phenomena, and conduct virtual investigations. These perceptions are supported by international studies such as Kong and Song (2022), who argued that digital tools can transform science classrooms into active learning spaces that foster student autonomy, curiosity, and analytical thinking. The teachers in Orumba South LGA recognized that technology can deepen students' engagement with science by making learning more interactive and inquiry-driven.

However, a key finding is the disconnect between teachers' positive attitudes and the realities of their teaching environments. Despite acknowledging the benefits of digital integration, teachers reported several systemic barriers to effective implementation. The most frequently cited challenges were insufficient access to digital devices, poor internet connectivity, unstable electricity, and limited training opportunities. These obstacles are not unique to Orumba South but reflect broader trends across Nigeria and much of sub-Saharan Africa. Obikwelu and Ugwoke (2023) highlighted similar challenges, noting that infrastructural deficiencies remain the most significant hindrance to technology integration in education, particularly in rural and underserved communities.

Moreover, teachers mentioned a lack of motivation and institutional support as contributing factors to low digital engagement. The absence of school-based incentives, follow-up mentoring, and structured digital literacy programs discourages teachers from experimenting with new tools. Additionally, school leadership often lacks the resources or strategic planning necessary to sustain digital initiatives. This situation calls for a holistic policy approach—one that addresses both infrastructural and human capacity development, involving stakeholders at all levels of the educational system.

Interestingly, the hypothesis testing revealed no significant gender differences in teachers' perceptions of the impact of digital literacy on scientific inquiry. This is an encouraging outcome, as it suggests that both male and female teachers have embraced the value of digital tools in science education, regardless of their gender. This finding contrasts with earlier assumptions that female teachers may be less confident or less involved in digital education due to historical disparities in access and training. The result supports the need for inclusive training programs that cater to all educators and prioritize competence development over demographic targeting.

In summary, the study underscores that while there is an emerging digital awareness among science teachers, major structural and institutional limitations persist. Teachers understand the potential of digital literacy to enhance students' scientific inquiry skills but are held back by inadequate training, poor infrastructure, and limited access to advanced educational technologies. Addressing these issues requires targeted professional development, policy support, and strategic investments in ICT infrastructure, especially in rural areas like Orumba South LGA. Only then can the promise of digitally empowered, inquiry-based science education be fully realized in Nigerian secondary schools.

Conclusion

This study has explored the digital literacy levels of science teachers and their perceived impact on students' scientific inquiry skills within public secondary schools in Orumba South Local Government Area of Anambra State. The results reveal that science educators in this region exhibit a moderate degree of digital literacy, with proficiency largely limited to basic applications such as word processing, internet navigation, and multimedia usage. Conversely, there is a notable gap in their familiarity with advanced digital tools such as virtual laboratories, scientific simulation software, and data analysis platforms that could enrich inquiry-based science education.

Despite this limitation, science teachers expressed overwhelmingly positive perceptions regarding the influence of digital tools on students' scientific inquiry skills. They acknowledged the capacity of digital technology to stimulate curiosity, promote student autonomy, and enhance the observation, analysis, and interpretation processes that are central to scientific inquiry. This affirms the idea that even in resource-constrained environments, there is a strong awareness among educators of the pedagogical value of digital integration.

However, the study also identified several systemic and contextual challenges that limit the effective adoption of digital tools in science classrooms. Chief among these are inadequate infrastructure, irregular power supply, poor internet connectivity, and the lack of sustained professional development opportunities. These obstacles are especially pronounced in rural and semi-urban areas such as Orumba South, where public investment in education technology remains insufficient. Without strategic intervention, the full potential of digital literacy to enhance scientific inquiry in Nigerian secondary schools may remain unrealized.

An important finding of the study is the lack of significant gender differences in perceptions of digital literacy and its educational benefits. This suggests a shared understanding and experience across both male and female educators, reinforcing the need for inclusive policies and training programs that support all teachers regardless of gender.

In light of these findings, the study concludes that advancing science education in Nigeria requires a multifaceted approach. This includes increased funding for digital infrastructure, curriculum reforms that embed digital literacy in science teacher education, targeted professional development initiatives, and stronger public-private partnerships. Educational policymakers and stakeholders must prioritize these areas to equip science teachers with the tools and confidence needed to transform their classrooms into dynamic environments where digital technology enhances inquiry, innovation, and critical thinking.

By addressing these challenges, Nigeria can position its science educators not only to keep pace with global educational standards but also to empower a new generation of students with the digital and scientific competencies required for success in the 21st-century knowledge economy.

Conclusion

A multi-level and collaborative approach is required to enhance digital literacy among science teachers and fully realize its potential in fostering scientific inquiry among students. Effective implementation of these recommendations will not only improve teaching and learning outcomes but also position Nigerian students to thrive in a digitally-driven, knowledge-based global economy.

Recommendations

Based on the findings of this study, which revealed moderate levels of digital literacy among science teachers and their positive perceptions of its impact on students' scientific inquiry skills—alongside notable infrastructural and pedagogical challenges—the following recommendations are made to strengthen the integration of digital literacy into science education;

1. **Provision of Digital Infrastructure:** There is a critical need for governments, education boards, and school authorities to invest in robust digital infrastructure across public secondary schools. This includes providing functional computers, projectors, tablets, interactive whiteboards, internet connectivity, and relevant educational software in science laboratories and classrooms. Equipping teachers and students with these tools will facilitate practical, inquiry-based learning and close the gap between theoretical science instruction and experiential understanding.
2. **Regular Training and Capacity Building for Teachers:** Capacity development should be continuous and strategically focused. Ministries of Education and relevant agencies should organize regular workshops, seminars, and hands-on training sessions for science teachers, not only on the use of basic digital tools but also on integrating advanced technologies such as virtual labs, data analysis software, and simulation programs into the science curriculum. These training programs should be localized and practical, considering the specific needs and challenges of teachers in semi-urban and rural regions
3. **Incorporation of Digital Literacy in Pre-service Teacher Education:** Teacher training institutions and universities should revise their science education curricula to include modules on digital pedagogy and technological integration in scientific inquiry. This will ensure that pre-service teachers graduate with the competencies necessary to use digital tools effectively for instruction and student engagement, thereby fostering a future-ready teaching workforce.
4. **Public-Private Partnerships (PPP):** Government schools should explore partnerships with technology firms, telecommunications companies, and non-governmental organizations (NGOs) to support access to affordable digital tools, internet services, and technical expertise. Such collaborations can help schools implement and sustain digital literacy initiatives without relying solely on public funding, and they can provide additional resources such as e-learning platforms, cloud storage and customized educational content.
5. **Policy Development, Implementation and Monitoring:** The Ministry of Education at both state and federal levels should formulate and enforce clear policies that mandate

digital literacy training for science teachers. These policies should be accompanied by budgetary allocations specifically earmarked for digital education infrastructure, teacher support, and monitoring systems to evaluate the effectiveness of implementation across schools, especially in underserved areas

6. **Improvement of Power Supply and Internet Connectivity:** A significant challenge identified in this study was the lack of stable electricity and internet access. State and local governments should collaborate with power distribution companies and telecom providers to improve electricity supply and broadband penetration, particularly in rural districts like Orumba South LGA. This infrastructural upgrade is essential for enabling consistent digital tool usage in science education.
7. **Development of Contextually Relevant Digital Content:** Stakeholders in science education, including curriculum developers and edtech innovators, should create digital learning resources that are aligned with the Nigerian secondary school science curriculum. Content should be interactive, culturally relevant, and accessible both online and offline to accommodate bandwidth limitations. Locally developed simulations, animations, and inquiry-based activities can increase student engagement and improve the relevance of digital tools in the Nigerian classroom context.

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