ASSOCIATION OF SCIENCE EDUCATORS ANAMBRA (ASEA)

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SCIENCE EDUCATORS AND DIGITAL LITERACY IN THE 21ST CENTURY

1ST Annual CONFERENCE PROCEEDINGS 2025
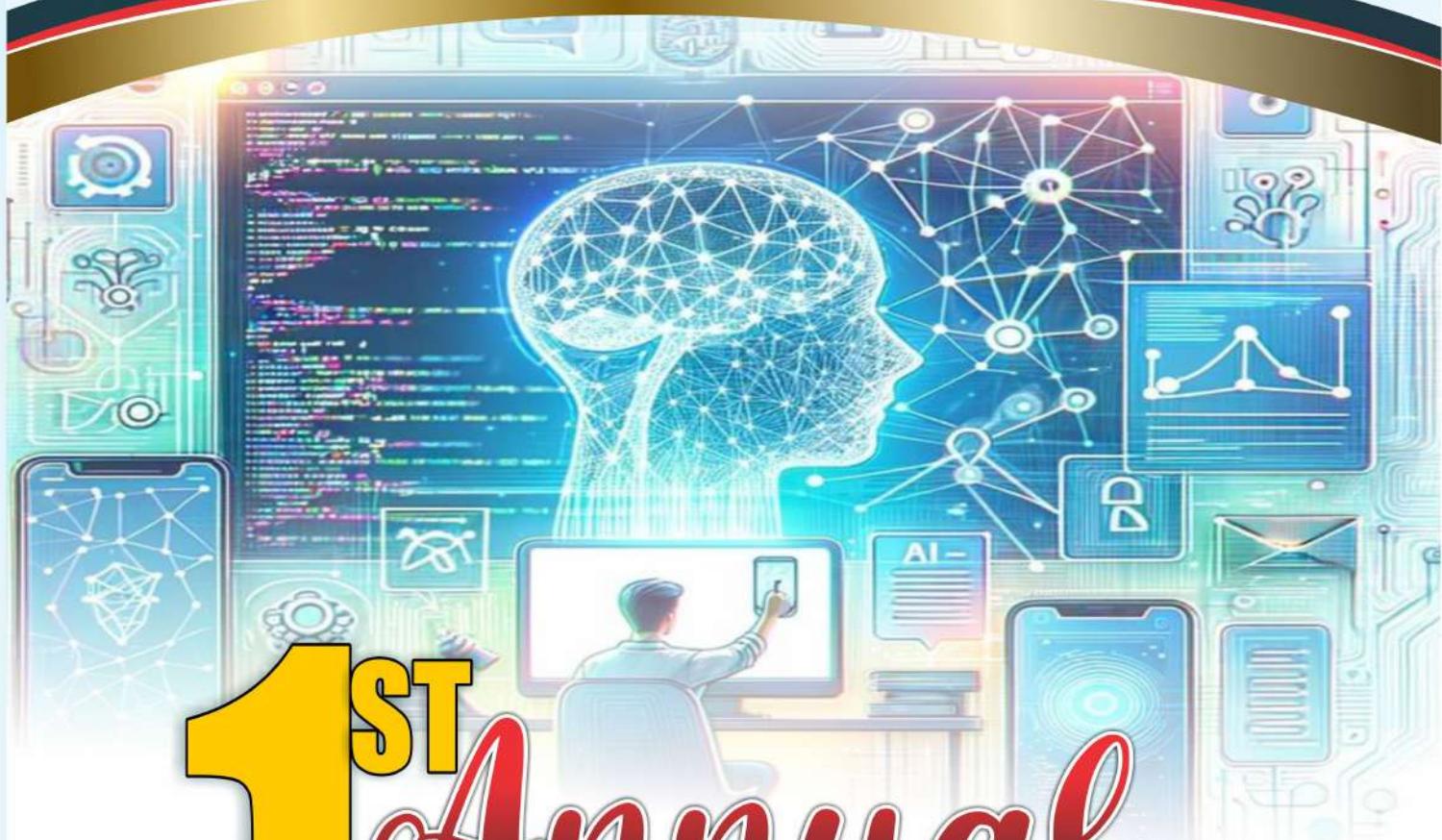
Editor
Prof. Josephine N. Okoli

ASSOCIATION OF SCIENCE EDUCTORS 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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Printed in Nigeria by:

Love Isaac Consultancy Services
No 1 Etolue Street, Ifite Awka, Anambra State, Nigeria
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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 Universitry, Awka,
Anambra State, Nigeriascience

ADDRESS OF THE ACTING PRESIDENT OF ASSOCIATION OF SCIENCE EDUCATORS ANAMBRA (ASEA), DR. JOHNBOSCO O.C. OKEKEOKOSISI, 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. Ikokwu

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 Igwebuike 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 11

DIGITAL LITERACY AND UTILIZATION OF EDUCATIONAL TECHNOLOGIES AMONG BASIC SCIENCE TEACHERS IN ANAMBRA STATE: IMPLICATIONS FOR EFFECTIVE SCIENCE TEACHING

[1] **Prof. Okoli, Josephine Nwannek,** [2] **Christian-Ike, Nwanneka Oluchukwu**
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Abstract

A research study on the digital literacy and utilization of educational technologies among Basic science teachers in Anambra state. Four research questions guided the study. The study adopted a descriptive research survey design. The population used was 178 Basic Science teachers in public secondary schools in Anambra State.The whole population was used because its manageable. The method of reliability is Cronbach Alpha. The instrument used was a structured questionnaire, which yielded a reliability of coefficient of 0.81. The method of analyses used was arithmetic mean. The finding of the study showed that Basic Science teachers in Anambra State possess digital literacy skills in Microsoft word, PowerPoint presentation, internet browsing, WhatsApp communication, Google form, Excel and have the ability to join a meeting or training virtually. They agreed that their digital literacy skills help them to deliver lessons effectively, simplify complex scientific concept, engage students among others. It was also revealed that most frequently utilize digital tools are Google search, Youtube, Microsoft word, WhatsApp and AI tools (e.g., ChatGPT) which are used for instructional purposes. Some challenges such as lack of reliable internet in school, insufficient training on digital tools, inadequate digital devices, frequents power outages, large class sizes, preparing digital lessons with digital tools, and lack of personal digital devices by the students hinder the effective use of digital tools in teaching. The study's findings recommend that Lesson plan submission and supervision should be done online weekly by the school management, Digital gadget like phone tablet should be one of the prospectuses for students' admission packages in secondary schools in Anambra State, Curriculum developers should develop a tech-driven Basic Science Curriculum for effective teaching and Government should provide technical training for both teachers and students.

Keywords: Digital Literacy and Utilization, Educational Technologies, Effective Science Teaching

Introduction

Science and technology play vital roles in development of nations. It constitutes the force that engineers the advancement of nations. It is the application of science and technology that brought astounding changes in all facets of the world's economy and fields of human endeavor. Moreover, the level of advancement in science and technology is the basis for classifying nations of the world into developed, developing and underdeveloped nations as well as first world, second world or third world countries. Thus, it is very pertinent that the use of science and technology is encouraged in schools through science education.

Science education is the production of scientifically literate society and the development of potential scientific and technological manpower through schools. It is an essential tool for sustainable development (Okereke & Okigbo,2019).Science education play a vital role in helping to develop nations by giving the citizens privileges and opportunities to improve their economy and as well ensures that knowledge is enhanced and innovation is promoted in the contemporary economy of today's society (Nwogu &Ikiroma ,2019). This underscores the need for effective teaching and learning of science at the Basic Education level. It can be offered as Basic science in both lower and upper basic education.

Basic Science is the bedrock of all sciences. It encompasses the integrated content of core science subjects such as biology, physics, chemistry, agricultural science and geography. Basic Science as a foundational subject given to a student at basic education level provides the student with basic information about sciences. It inculcates scientific literacy among students (Christian-Ike & Okoli, 2021; Christian-Ike, Nnalue & Nwuba, 2024). Thus, it requires instructional strategies that are interactive, exploratory and engaging. Traditional chalk- and talk methods are often inadequate for teaching complex and abstract scientific concepts. Consequently, educational technologies such as animations, simulations, virtual laboratories, learning management systems (LMS), interactive quizzes and artificial intelligence tools (e.g. CHATGPT) are now recognized as effective aids in enhancing students' understanding and interest in science. The knowledge of these technologies become imminent for a basic science teacher and improves their digital literacy.

In the rapidly evolving educational landscape of the 21st century, digital literacy is a foundational skill for teachers across all disciplines. Digital literacy is defined as the ability to search, evaluate, organize and perform tasks through digital equipment and the internet in learning, work or education (Yukai,2022). Digital literacy skills mean the skills associated with using technology to enable users to find, evaluate, organize and perform tasks through digital equipment. The ability of one to apply them is relevant in specific contexts (Vanex, 2017). Digital literacy can also be termed digital competences. Digital competence in teaching goes beyond teachers' basic computer usage. It is the ability to integrate various educational technologies to improve instructional delivery, classroom management and assessment. With the increasingly digitalization in teaching and learning, the need for basic science teachers to be proficient in using digital tools for lesson planning, presentation, communication, assessment and professional development cannot be overstated.

Basic science teachers' proficiency in utilization of the educational technologies such as animations, simulations, virtual laboratories, learning management systems (LMS), interactive quizzes and artificial intelligence tools (e.g. CHATGPT) will largely be influenced by their digital literacy. Basic teachers who possess high level of digital competence are more likely to integrate digital tools effectively into their classroom practices. On the contrary, Basic teachers who possess low level of digital literacy are likely to struggle to use even the most basic technological tools. As such resulting in missed opportunities for innovative instruction and students' engagement.

The innovative educational reform in Anambra State emphasizes on the need for science teachers to be digitally competent in line with national and global goals for ICT integration in education (Soludo Innovation District (SID),2024). Anambra State Government said plans are underway to upgrade 29 public schools in the state into "smart schools" for an efficient and technology driven education system (State Commissioner for Education, Ngozi Chuma-Udeh, 2025). Recently some

schools in the state are equipped with digital infrastructure such as Desktop, tablets and smart phones etc. to aid access to various digital tools like Microsoft word, PowerPoint, internet, google forms among others inorder to improve innovative instructional delivery. While some schools are equipped with these digital infrastructures to access these tools, the extent of their utilization by Basic Science teachers remain unclear. There is need to investigate the specific types of digital tools frequently utilized by these teachers, the purposes for which they are used and how the use of these tools improve effective teaching of Basic Science.

The study therefore seeks to investigate the digital literacy skills possessed by Basic Science teachers' in Anambra State, determine how their digital competence influences their teaching effectiveness and the specific types of digital tools frequently utilized by these teachers and the challenges facing the integration of educational technologies in instructional delivery.

Statement of the Problem

Despite global advancement in digital technology and its growing role in education, many secondary school classrooms in Nigeria including those in Anambra State still operate with minimal integration of educational technologies. This situation is particularly concerning in the teaching of basic science, a subject that requires innovative and technology-supported instructional practices to simplify complex scientific concepts and improve students' participations in classroom activities at basic education level.

The Government of Anambra state had made several efforts to promote ICT integration through provision of basic infrastructure in schools and inaugurating some tech skills initiatives such as Solution Skills, ICT teachers' training among others. However, these efforts seem to yield minimal outcomes as many teachers still lack the requisite digital literacy skills needed to utilize educational technologies meaningfully. Some schools that have these tools often underutilized or misapplied due to limited or inconsistent technological training or inadequate support systems.

There is also limited empirical evidence on the digital literacy levels possessed by Basic Science teachers' in Anambra State, what specific types of digital tools commonly used by these teachers in the classroom activities and how their digital competence influences their teaching effectiveness. While some teachers may occasionally use projectors, slides, or internet resources, it is still unclear how these practices are consistent and pedagogically effective. Thus, there is an urgent need to determine the digital literacy skills possessed by Basic Science teachers, their use of educational technologies and their implications for effective basic science teaching in Anambra State.

Purpose of the Study

The study seeks to investigate the digital literacy skills, the utilization of educational technologies by basic science teachers and its implication for effective science teaching in Anambra State. Specifically, the study seeks to determine:
1. The digital literacy skills possessed by the basic science teachers in Anambra State
2. The digital literacy skills influence on the teaching effectiveness of basic science teachers in Anambra State
3. The type of digital tools frequently utilized by basic science teachers in Anambra State
4. The challenges facing the integration of educational technologies into teaching by basic science teachers in Anambra State.

Research Questions

The following research questions guided the study;

1. What are the digital literacy skills possessed by Basic science teachers in Anambra State?
2. What is the influence of digital literacy skill on the teaching effectiveness of Basic science teachers in Anambra State?
3. What digital tools are frequently utilized by Basic science teachers in Anambra State?
4. What challenges are facing the integration of educational technologies into teaching by basic science teachers in Anambra State?

Methodology

The study adopted the descriptive survey research design. Five research questions guided the study. The population comprised 178 basic science teachers in Anambra State. There was no sampling because the population was manageable. The instruments for data collection was titled   Digital Literacy and Utilization of Educational Technology Questionnaire (DLUETQ). The instrument was divided into sections based on the research questions. It consists of 40 items in total. The instrument was validated by three experts from Department of Science Education, Nnamdi Azikiwe University Awka. The reliability coefficient of the instrument using Cronbach Alpha was 0.86. Data were obtained by administering the instruments to the basic science teachers in Anambra State using Google Form. The questionnaire was shared on their various WhatsApp platforms for quick distribution. The data collected through google form were analyzed using mean and standard deviation. However, a criterion means of 2.50 was used as the decision rule. In this regard, any cluster with a mean score of 2.50 and above is taken to be agreed/ often used while any mean score below 2.50 is regarded as disagreed/sometimes used.

Results

Research Question 1: What are the digital literacy skills possessed by Basic Science teachers in Anambra State

Table 1: **Mean and Standard Deviation on the Digital literacy skills possessed by Basic Science Teachers in Anambra State.**

S/N	ITEMS	SA	A	D	SD	X	S.D	REMARK
1	I can effectively use Microsoft Word to prepare lesson content	52	68	40	18	2.72	1.00	Agreed
2	I can create and present slides using PowerPoint.	44	66	42	26	2.56	1.05	Agreed
3	I can confidently search the internet for science teaching resources	44	64	42	26	2.56	1.06	Agreed
4	I can use WhatsApp for academic communication	48	72	36	22	2.65	1.02	Agreed
5	I can use Google Forms to test students' knowledge	40	68	44	26	2.51	1.05	Agreed
6	I can use Excel or Google Sheets to record and analyze students' results.	42	70	40	26	2.57	1.04	Agreed
7	I am comfortable using Learning Management Systems like Google Classroom in my science lessons	28	41	66	43	2.32	0.98	Not Agreed
8	I often include videos or animations in my science lessons	38	64	48	28	2.48	1.08	Not Agreed
9	I can troubleshoot basic ICT problems during teaching.	36	62	50	30	2.47	1.08	Not Agreed
10	I participate in online training programs to improve my digital skills	56	72	30	20	2.81	0.98	Agreed
	Mean cluster 2.56							

The result in Table 1 shows that items 1, 2, 3, 4, 5, 6 and 10 have mean scores above 2.50. This implies that the Basic Science teachers in Anambra State possess digital literacy skills in Microsoft word, PowerPoint presentation, internet browsing, WhatsApp communication, Google form, Excel and have the ability to join a meeting or training virtually. It is also revealed that items 7,8 and 9 have mean scores below 2.50. This implies that Basic Science teachers in Anambra State do not possess digital literacy skills in use of learning management system, use of videos/animations and cannot troubleshoot basic ICT problems. The mean cluster of 2.56 indicates that Basic Science teachers in Anambra State possess digital literacy skills but at moderate level.

Research Question 2: What is the influence of digital literacy skills on the teaching effectiveness of Basic Science teachers in Anambra State

Table 2: **Mean and Standard Deviation on the influence of digital literacy skills on the teaching effectiveness of Basic Science Teachers in Anambra State.**

S/N	ITEMS	SA	A	D	SD	X	S. D	REMARK
1	My digital skills help me deliver science lessons more effectively	50	68	40	20	2.70	1.03	Agreed
2	I use digital tools to simplify complex scientific concepts	45	66	44	23	2.61	1.04	Agreed
3	I create more engaging lessons with the help of digital technology	48	64	42	26	2.64	1.03	Agreed
4	I assess student performance better through digital assessment tools	28	56	52	42	2.33	1.12	Not Agreed
5	I track students' progress more efficiently using digital platforms	30	50	54	44	2.31	1.13	Not Agreed
6	I use digital tools to support students with different learning needs.	42	68	42	26	2.59	1.03	Agreed
7	I get timely feedback from students when I use digital tools	40	64	48	26	2.53	1.05	Agreed
8	I incorporate collaborative learning using online tools	46	70	40	22	2.66	1.01	Agreed
9	My students are more attentive when I use digital content.	50	66	40	22	2.68	1.03	Agreed
10	My teaching effectiveness improves when I apply digital literacy skills	52	70	36	20	2.75	1.00	Agreed
	Mean cluster 2.58							

The result in Table 2 shows that items 1, 2, 3, 7, 8, 9 and 10 have mean scores above 2.50. This implies that the Basic Science teachers in Anambra State agreed that their digital literacy skills help them to deliver lessons effectively, simplify complex scientific concept, engage students, support individual differences, gives timely feedback, helps in collaborative learning and improves more in their digital literacy skills. On contrary, items 4 and 5 revealed mean scores below 2.50 which indicates that the teachers disagreed on their digital literacy skills assisting them in assessing students' performance effectively and in tracking of students' progress. A mean cluster of 2.58 indicates that digital literacy skills help in effective teaching of Basic science concepts in Anambra State.

Research Question 3: Which digital tools are most frequently utilized by Basic science teachers for teaching in Anambra State

Table 3: **Mean and Standard Deviation on the digital tools most frequently utilized by Basic Science Teachers in Anambra State.**

S/N	ITEMS	Very often	Often	Sometimes	Rarely	X	S. D	REMARK
1	Google Search	60	70	30	18	2.89	1.01	Often used
2	YouTube (Videos/Demonstration)	56	72	32	18	2.88	1.00	Often used
3	Microsoft Word	54	74	30	20	2.87	1.01	Often used
4	PowerPoint or Google Slides	30	48	50	50	2.34	1.14	Sometimes used
5	Google Forms	28	46	52	52	2.28	1.15	Sometimes used
6	WhatsApp or Telegram	58	72	30	18	2.89	1.01	Often used
7	Google Classroom	24	48	56	50	2.23	1.16	Sometimes used
8	Videos/Virtual simulations	30	52	56	40	2.33	1.15	Sometimes used
9	Excel or Google Sheets	34	54	50	40	2.39	1.13	Sometimes used
10	AI tools (e.g., ChatGPT)	55	72	28	23	2.87	1.02	Often used

The result in Table 3 shows that items 1, 2, 3, 6, and 10 have mean scores ranging from 2.50 to 3.49. This implies that the Basic Science teachers in Anambra State most frequently utilize Google search, You tube, Microsoft word, WhatsApp and AI tools (e.g., ChatGPT) for instructional purposes. On contrary, items 4,5,7,8, and 9 revealed mean scores below 2.50 which indicates that the teachers sometimes utilize these digital tools for instructional purposes. This indicates that only few digital tools are commonly utilized by Basic Science teachers for teaching in Anambra State.

Research Question 4: What challenges are facing the integration of educational technologies into teaching by Basic science teachers in Anambra State?

Table 4: **Mean and Standard Deviation on the challenges facing the integration of educational technologies into teaching by Basic Science Teachers in Anambra State**

S/N	ITEMS	SA	A	D	SD	X	S. D	REMARK
1	Lack of reliable internet in school	58	66	38	16	2.96	0.98	Agreed
2	Insufficient training on digital tools	54	64	40	20	2.88	1.01	Agreed
3	Inadequate digital devices (e.g., projectors, laptops)	50	62	44	22	2.81	1.03	Agreed
4	Frequent power outages	56	68	36	18	2.90	0.99	Agreed
5	Large class sizes hinder technology use	40	60	50	28	2.57	1.06	Agreed
6	Low confidence with digital tools.	36	56	54	32	2.45	1.09	Not Agreed
7	Weak support from school leadership	34	52	58	34	2.40	1.10	Not Agreed
8	Preparing digital lessons takes too much time	38	60	50	30	2.66	1.08	Agreed
9	Students lack personal digital devices	42	58	48	30	2.56	1.07	Agreed
10	Technical issues beyond my ability to resolve	36	54	54	34	2.45	1.09	Not Agreed

The result in Table 4 shows that items 1, 2, 3, 4, 5.8 and 9 have mean scores above 2.50. This implies that the Basic Science teachers in Anambra State encounter some challenges in integrating educational technologies in their teaching. These include lack of reliable internet in school, insufficient training on digital tools, inadequate digital devices, frequents power outages, large class sizes, preparing digital lessons with digital tools, and lack of personal digital devices by the students. Items 6,7 and 10 revealed mean scores below 2.50, which implies that teachers have

confidence with the use of digital tools, have support from their school management and technical issues are not challenges they face in integrating educational technologies in teaching.

Discussion

The result in Table 1 shows that items 1, 2, 3, 4, 5, 6 and 10 have mean scores above 2.50. This implies that the Basic Science teachers in Anambra State possess digital literacy skills in Microsoft word, PowerPoint presentation, internet browsing, WhatsApp communication, Google form, Excel and have the ability to join a meeting or training virtually. It is also revealed that items 7,8 and 9 have mean scores below 2.50. This implies that Basic Science teachers in Anambra State do not possess digital literacy skills in use of learning management system, use of videos/animations and cannot troubleshoot basic ICT problems. The findings of the study revealed that basic science teachers possess basic to intermediate digital literacy skills. Specifically, the findings indicate that these teachers are familiar with communication and office applications which are essential for lesson preparation, data recording and online interactions. The study is in consistent with the findings of Tondeur et al.(2017) , who reported that while teachers often develop competencies in commonly used digital tools , many still lack advanced ICT skills required for effective technology integration in teaching. Similarly, Kaarakainen, Kivinen and Vainio (2018) found that teachers are often confident with basic digital tasks but struggle with specialized applications relevant to pedagogical innovation.

The result in Table 2 shows that items 1, 2, 3, 7, 8, 9 and 10 have mean scores above 2.50. This implies that the Basic Science teachers in Anambra State agreed that their digital literacy skills help them to deliver lessons effectively, simplify complex scientific concept, engage students, support individual differences, gives timely feedback, helps in collaborative learning and improves more in their digital literacy skills. On contrary, items 4 and 5 revealed mean scores below 2.50 which indicates that the teachers disagreed on their digital literacy skills assisting them in assessing students' performance effectively and in tracking of students' progress. The findings summarily revealed that digital literacy skills support effective lesson delivery and enhances teaching effectiveness. The finding supports the recent study in higher education by Zahran et al (2025) who confirmed that teachers with developed digital literacy skills create more interactive and engaging lessons, significantly boosting effectiveness in STEM education.

The result in Table 3 shows that items 1, 2, 3, 6, and 10 have mean scores ranging from 2.50 to 3.49. This implies that the Basic Science teachers in Anambra State most frequently utilize Google search, You tube, Microsoft word, WhatsApp and AI tools (e.g., ChatGPT) for instructional purposes. On contrary, items 4,5,7,8, and 9 revealed mean scores below 2.50 which indicates that the teachers sometimes utilize these digital tools for instructional purposes but not often like aforementioned tools. This indicates that teachers are leveraging widely accessible and efficient tools to enhance their teaching. The findings align with the study of national survey that reports that 40% of teachers use chatgpt weekly for lesson planning (Arianna, 2023). Supporting the studies of Moghavvemi et al.(2018) and Smarkola, (2020), teachers' reliance on google search and you tube helps teachers to source information for instructional delivery.

The result in Table 4 shows that items 1, 2, 3, 4, 5.8 and 9 have mean scores above 2.50. This implies that the Basic Science teachers in Anambra State encounter some challenges in integrating educational technologies in their teaching. These include lack of reliable internet in school, insufficient training on digital tools, inadequate digital devices, frequents power outages, large

class sizes, preparing digital lessons with digital tools, and lack of personal digital devices by the students. Items 6,7 and 10 revealed mean scores below 2.50, which implies that teachers have confidence with the use of digital tools, have support from their school management and technical issues are not challenges they face in integrating educational technologies in teaching. This finding aligns with the study of Ifinedo, Rikala and Hamalainen (2020), who identified that many teachers in sub-Saharan Africa, including Nigeria, face challenges in adopting digital platforms due to a lack of professional development opportunities. A study by Tarman et al (2019) also revealed that most highly identified barriers were mainly external obstacles like lack of technology, restricted internet access, but the findings on the lack of administrative and technical support disagreed with the current study. Another study revealed that irregular power and lack of high-tech devices hinder effective digital teaching (Aarul, 2023; Johannes, 2023.)

Thus, the findings of the study summarily revealed a nuanced understanding of how Basic science teachers integrated digital tools into their lesson activities. It revealed their digital competence in using basic digital tools such as google search, YouTube, Microsoft word, WhatsApp, ChatGPT for lesson planning and instructional communication.

Conclusion

From the findings, Basic Science teachers in Anambra State possess digital literacy skills in Microsoft word, PowerPoint presentation, internet browsing, WhatsApp communication, Google form, Excel and have the ability to join a meeting or training virtually. They agreed that their digital literacy skills help them to deliver lessons effectively, simplify complex scientific concept, engage students, support individual differences, gives timely feedback, helps in collaborative learning and improves more in their digital literacy skills. It was also revealed that most frequently utilize digital tools are Google search, Youtube, Microsoft word, WhatsApp and AI tools (e.g., ChatGPT) which are used for instructional purposes. Despite the effectiveness of digital tools in basic science teaching, various challenges are encountered during the integration of technologies in class activities. These include lack of reliable internet in school, insufficient training on digital tools, inadequate digital devices, frequents power outages, large class sizes, preparing digital lessons with digital tools, and lack of personal digital devices by the students. Thus, the need for targeted interventions to improve digital education in Anambra State is imperative.

Recommendations

The following recommendations were made based on the findings
1. Lesson plan submission and supervision should be done online weekly by the school management.
2. Digital gadget like phone tablet should be one of the prospectuses for students' admission packages in secondary schools in Anambra State.
3. Curriculum developers should develop a tech-driven Basic Science Curriculum for effective teaching
4. Government should provide technical training for both teachers and students.
5. There should be adequate security personnel to guide technical gadgets and tools in schools.

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