ASSOCIATION OF SCIENCE EDUCATORS ANAMBRA (ASEA)

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SCIENCE EDUCATORS AND DIGITAL LITERACY IN THE 21ST CENTURY

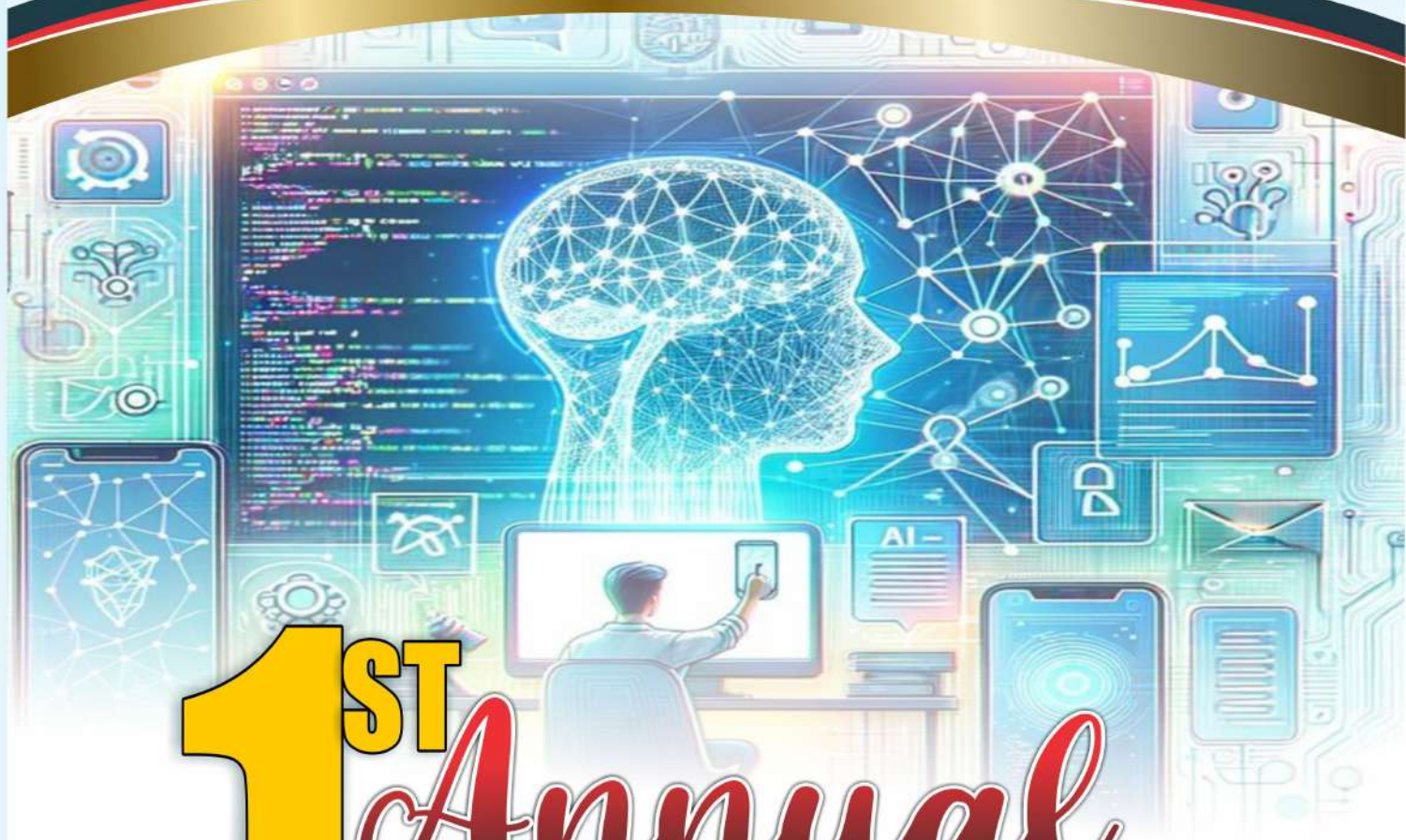# 1ST Annual CONFERENCE PROCEEDINGS 2025

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
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Editor
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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 1

DIGITAL LITERACY COMPETENCE AS A PREDICTOR OF SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN 21ST CENTURY MATHEMATICS CLASSROOM

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Abstract

This study investigated the extent digital literacy competence predicts secondary school students' achievement in 21st century mathematics classroom in Aba Education Zone. The correlation survey design was adopted. The study was guided by three research questions and two null hypotheses which were tested at 0.05 alpha levels. The sample consisted of 984 SS3 students (488 male and 496 female) which was selected using multi-stage sampling procedure from a population of 13,074 Senior Secondary School Three (SS3) students in public secondary school in Aba Education Zone. Digital Literacy Competence Questionnaire (DLCQ) adapted from Moses (2023) with reliability coefficients of 0.77 determined using Cronbach Alpha method and Students' Grade Chart in Mathematics were used to collect data. Data collected were analyzed using mean, standard deviation and multiple regression. The findings from the study showed that digital literacy competence predicts secondary school students' achievement in Mathematics and gender does not significantly influence the predictive validity of digital literacy competence on secondary school students' achievement in mathematics. It was recommended that the Ministry of Education, in collaboration with teacher-training institutes, should organize regular ICT-based workshops for mathematics teachers.

Keywords: Digital literacy competence, Students' Achievement

Introduction

Digital literacy is defined as the ability to effectively and critically navigate, evaluate, and create information using a range of digital technologies (Ng, 2012; UNESCO, 2021). In the 21st century, the global landscape of education has undergone a significant transformation due to the rapid integration of digital technologies. The integration of digital tools in teaching and learning, particularly in subject like Mathematics, has introduced new pedagogical approaches that enhance conceptual understanding, problem-solving skills, and learner engagement (Adebayo & Olatunji, 2023). Hence, in the modern classrooms, digital tools such as interactive whiteboards, virtual manipulative, graphing software, simulations, and online tutorials provide innovative avenues. Despite the growing importance of digital competence in education, many schools in Nigeria, particularly in Aba Education Zone of Abia State, continue to face challenges in adopting and integrating digital tools in classroom teaching. Factors such as inadequate infrastructure, lack of teacher training, inconsistent electricity supply, and limited access to the internet have contributed to a slow uptake of digital practices in public schools and integration into mathematics teaching and learning (Okafor & Eze, 202).

Mathematics, a foundational subject for science and technology, requires learners to engage in abstract thinking, logical reasoning, and procedural fluency (Njoku, & Okigbo, 2021). The

integration of digital tools will make abstract mathematical concepts more concrete and accessible (Mishra & Koehler, 2006). A study conducted by Eze and Ugwoke, (2022) has shown that students with higher digital literacy skills are more likely to utilize these resources effectively, leading to improved learning outcomes. As mathematics education increasingly moves toward technology-enhanced instruction, students' digital literacy competence may have significantly influence on their achievement in mathematics.

The general performance of students in Mathematics in Abia State is not completely good. Abia State government introduced Unified Promotion Examination (UPE) for Secondary School Two (SS2) students in 2024(Education Development Centre Abia State, 2024). The purpose of this examination-UPE was to prepare students well for public examinations like WASSCE, NECO among others. Specifically, CSSE is to organize qualifying examination into Senior Secondary school three (SSS 3) from Senior Secondary School two (SS 2) and to standardize the quality of students that will be presented for WASSCE (Imo State Ministry of Education, 2016). Unfortunately, the achievement of student in Mathematics in UPE has been poor as shown by the analysis of result in Mathematics (EDCAS, 2025).

Studies have established positive correlations between digital literacy and academic achievement, particularly in Science Technology Engineering and Mathematics (STEM) disciplines (Adeoye & Oduwaiye, 2022; Osakwe & John, 2023). The rapid integration of digital technologies into secondary education in Nigeria, has re-ignited debate over whether digital literacy competence can actually predict students' mathematics achievement, rather than simply correlate with it. Although, it has been confirmed that there is a positive association between digital skills and general academic performance (Moses, 2023), there is still scant evidence on the predictive strength of digital literacy competence on mathematics achievement and, importantly, how that predictive power may vary by gender. Gender may moderate this predictive relationship. For example, a 2024 algebra study found no overall gender gap in achievement, yet documented a significant interaction— boys benefited most from technology-rich settings, whereas rural girls benefited least (Iroko, Adesina, & Asanre, 2024). Similarly, UNICEF's 2025 Learning-Passport reported that 78 % of Nigerian youth still lack basic digital-literacy skills, with rural girls being the most excluded group (UNICEF, 2025). Therefore, gender may influence the predictive power of digital literacy competence on mathematics achievement. Whereas some research suggests that male students tend to have higher confidence and exposure in digital environments (Agbaje & Oyelade, 2021), other findings argue that gender differences in digital competence are narrowing due to increased awareness and inclusivity in digital education (Eze & Asogwa, 2023). There is a controversy in findings of the previous researchers. This study seeks to fill the gap.

Despite these studies, limited empirical research has examined how digital literacy competence predicts mathematics achievement across different school locations and genders. Conducting this study is vital, especially in educational zones like Aba in Abia State, Nigeria, where policy efforts are being made to integrate Information Communication and Technology (ICT) in secondary education by the government of Dr Alex Chioma Otti. A predictive study that considers these demographic and contextual variables can offer evidence-based guidance to stakeholders on how to tailor digital interventions equitably and effectively. Therefore, this study seeks to examine digital literacy competence as a predictor of secondary school students' achievement in mathematics, while also investigating the moderating roles of gender in this relationship.

Statement of the Problem

The role of digital literacy in enhancing students' academic achievement has become a central focus in contemporary education discourse. As the 21st-century classroom continues to evolve, digital competence is increasingly recognized as a crucial skill for both teaching and learning—particularly in subjects like Mathematics, which demand abstract thinking, problem-solving, and real-time feedback. Recent research continues to show large digital-divide gaps. In the Aba Education Zone of Abia State—an area tagged for ICT expansion in secondary school, the combined influence of digital literacy and gender on mathematics achievement has never been extensively researched on. Without such evidence, policy makers risk investing in generic ICT programmes that may fail to close gender gaps. Addressing these gaps will provide data-driven guidance for equitable ICT allocation, targeted teacher training, and gender-responsive digital-literacy initiatives in the Aba Education Zone. Therefore, the problem of this study is, does digital literacy competence predict secondary school students' achievement in 21st century mathematics classroom?

Purpose of the Study

The main purpose of this study was to examine *how* digital literacy competence predicted secondary school students' achievement in Mathematics in the 21st-century classroom within the Aba Education Zone. Specifically, the study determined:

1. The digital literacy competence scores of secondary school students.
2. The extent digital literacy competence predicts secondary school students' achievement in mathematics.
3. The influence of gender on the predictive validity of digital literacy competence on secondary school students' achievement in mathematics.

Research Questions

The following research questions guided the study;
1. What is the mean digital literacy competence scores of secondary school students?
2. What is the magnitude of prediction of secondary school students' achievement in mathematics by digital literacy competence?
3. What is the mean digital literacy competence scores of secondary school students based on gender?

Hypotheses

1. Digital literacy competence does not significantly predict secondary school students' achievement in mathematics..
2. Gender does not significantly influence the predictive validity of digital literacy competence on secondary school students' achievement in mathematics.

Methodology

The correlational survey design was adopted in this study. Correlational survey design seeks to establish the relationship that exists between two or more variables without manipulation of variables. It indicates the direction and magnitude of the relationship between the variables (Nworgu, 2018). The sample of the study was 984 (488 male and 496 female) SS3 students. The sample was selected from a population of 13, 074 SS3 students in public secondary schools in Aba Education Zone of Abia State using multi-phase sample technique that involved the use of the purposive, stratified and random sampling techniques. Multi-stage sampling technique is a

probability sampling procedure where sampling is carried out in successive stages, using specific sampling techniques (Cohen, et al. in Njoku and Emeka, 2024). The researchers sought permission to conduct of this study from the school administrators, who served as legal guardians of the subjects in all the schools used for the study. Permission was granted and duly signed letters of informed prior consent were obtained from the legal guardians of these pupils – the school administrators. The instruments used for data collection were Digital Literacy Competence Questionnaire (DLCQ) adapted from Moses (2023) and Students' Grade Chart in Mathematics which was used to obtain Mathematics achievement scores of students. Digital Literacy Competence Questionnaire(DLCQ) is made up of two sections A and B. Section A was used to obtain bio data of the respondents while Section B was drafted to elicit information on the digital literacy competence secondary schools students. Section B also contains 16 items and a 4-point Likert scale with four scale response option of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) and with the weights of 4,3,2,1 assigned to these options respectively. The reliability index of the instrument DLCQ was established using Cronbach Alpha which yielded internal consistency reliability coefficients of 0.77. The choice of Cronbach Alpha reliability coefficient in the establishment of the reliability of the instrument was necessitated by the fact that the items contained in the instrument were polytomously scored. The SS3 students were instructed to write their registration numbers on the instruments which were given to them. This was basically to enable the researchers match DLCQ scores with the obtained SS3 students Mathematics score. During the administration of the instruments, class teachers who served as research assistants administered and collected the instruments after students had completed them under strict supervision. Thereafter, the data obtained were collected for analysis. The data collected from the survey study were analyzed using mean, standard deviation, Pearson Product Moment Correlation Coefficient and regression analysis. In particular, mean and standard deviation were used to answer research questions. The real limits of 2.50 was used as averages to interpret the means. The Pearson Product Moment Correlation Coefficient(R) and coefficient of determination (R^2) were used to answer research questions 2 and 3. For hypotheses, multiple linear regression analysis (ANOVA) was employed in testing of the hypotheses. An equation in the form of the following regression equation $y^1 = b_0 + b_1x_1 + b_2x_2 + \ldots + b_nx_n$ was obtained in each case. In taking decision, if the p-value is less than or equal to the significant value of 0.05($P \leq 0.05$), the null hypothesis is rejected; but if otherwise ($P > 0.05$) it is not rejected.

Results

Research Question 1: What is the mean digital literacy competence scores of secondary school students?

Table 1: Mean and Standard Deviation Ratings of the Digital Literacy Competence of Students in Mathematics

S/N	Items	SA	A	D	SD	Mean	SD	Remarks
1	I have access to a smartphone or computer regularly.	40	30	20	10	3	1.01	Agree
2	I use digital devices (computer, tablet, phone) to study mathematics.	35	40	15	10	3	0.95	Agree
3	I have access to the internet at school or home.	45	30	15	10	3.1	1.0	Agree
4	I use educational websites or apps (e.g., YouTube, Khan Academy) to learn mathematics.	38	32	20	10	2.98	0.99	Agree
5	I participate in online mathematics quizzes or tutorials.	42	34	14	10	3.08	0.98	Agree
6	I can type and edit documents using word processing software.	20	30	40	10	2.6	0.92	Agree
7	I can use search engines effectively to find information.	50	30	10	10	3.2	0.98	Agree
8	I can evaluate which websites are reliable for learning mathematics.	30	40	20	10	2.9	0.95	Agree
9	I can download and install learning materials on my device.	40	35	15	10	3.05	0.98	Agree
10	I can troubleshoot basic problems on digital devices.	42	33	15	10	3.07	0.99	Agree
11	I use messaging apps or platforms to discuss mathematics assignments.	43	32	15	10	3.08	0.99	Agree
12	I have participated in an online class or virtual mathematics lesson.	39	36	15	10	3.04	0.97	Agree
13	I can share documents or links with classmates online.	48	30	12	10	3.16	0.99	Agree
14	I know how to protect my personal information online.	44	33	13	10	3.11	0.98	Agree
15	I understand the importance of citing sources when using online materials.	37	38	15	10	3.02	0.96	Agree
16	I avoid using unapproved sites or content during study time.	41	35	14	10	3.07	0.98	Agree
	Total					3.03		

Table 1 indicates that all the 16 items have mean scores ranging between 2.60 -3.27 with the standard deviation which ranges from 1.04 -1.47. Table 1 shows the cluster mean of 3.00. Based on the real limits of number, it indicates high level of digital literacy of the secondary school students.

Research Question 2: What is the magnitude of prediction of secondary school students' achievement in mathematics by digital literacy competence?

Table 2: Model Summary of Digital Literacy Competence as Predictor of Students' Academic Achievement in Mathematics

Variable	$\overline{X}$	SD	R	R^2	Adjusted R^2	B	Beta
DLCQSCORE	60.97	14.09					
			.878	.770	.770	74.91	.713
Achievement in Mathematics	75.33	17.34					

In Table 2, the correlation coefficient R is 0.878 with an associated coefficient of determination R^2 0.770. The results indicate that digital literacy competence accounted for 77.7% of the variation in academic achievement in Mathematics. In other words, digital literacy competence could account for 77.7% of the variance of academic achievement in Mathematics of students. The regression equation for Mathematics achievement derived from Table 2 is; MATHACHIEVEMENT = 74.91 + 0.713DIGITLITCOM.

Research Question 3: What is the influence of gender on predictive magnitude of digital literacy competence scores on secondary school students Mathematics achievement?

Table 3: **Model Summary of Influence of Gender on Predictive Magnitude of Digital Literacy Competence Scores on Mathematics Achievement**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.028[a]	.001	.000	14.08649	.001	.793	1	982	.374
2	.878[b]	.771	.770	6.75101	.770	3294.424	1	981	.000
a. Predictors: (Constant), GENDER									
b. Predictors: (Constant), GENDER, DLCQSCORE									
c. Dependent Variable: MATHSCORE									

Table 3 shows that the correlation coefficient R is 0.001. This implies that the overall model for gender explains 0.1 percent of the variance. After, the influence of gender was controlled, digital literacy competence explained 77 percent of the variance in mathematics achievement score R^2 change = 0.770. The result shows that digital literacy competence that digital literacy competence alone accounted for 77. % of the variation in academic achievement of secondary school students in Mathematics.

H0₁: Digital literacy competence does not significantly predict secondary school students' achievement in mathematics.

Table 4: **Summary of ANOVA Table for Regression Analysis of Digital Literacy Competence as Predictors of Achievement of Students in Mathematics**

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	150220.424	1	150220.424	3293.204	.000[b]
	Residual	44794.206	982	45.615		
	Total	195014.630	983			

a. Dependent Variable: MATHSCORE b. Predictors: (Constant), DLCQSCORE

In order to test hypothesis 2, regression analysis was used and the result is presented in Table 4. shows that $F_{(1,982)} = 3293.204$, P = 0.0005. This probability value of 0.0005 was compared with (it was found to be significant because 0.005 was less than 0.05. The null hypothesis was therefore and inference drawn was that, Digital literacy competence predicts academic achievement of se school students in Mathematics.

H0₂: Gender does not significantly influence the predictive validity of digital literacy competence on secondary school students' achievement in mathematics.

Table 5: **Summary of ANOVA Table for Regression Analysis of Influence of Gender on Predictive Validity of Digital Literacy Competence on Students' Achievement in Mathematics**

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	157.276	1	157.276	.793	.374[b]
	Residual	194857.354	982	198.429		
	Total	195014.630	983			
2	Regression	150304.431	2	75152.216	1648.938	.000[c]
	Residual	44710.199	981	45.576		
	Total	195014.630	983			

In order to test hypothesis 2, multiple regression analysis was used. The result in Table 5 shows that the obtained F-value was $F_{(1, 982)} = .793$, p = 0.374. This probability value of 0.374 was compared with 0.05 and it was found not to be significant. The null hypothesis was not rejected and inference drawn was that, gender does not significantly influence the predictive validity of digital literacy competence on secondary school students' achievement in Mathematics.

Discussion

The findings of this study revealed that the respondents on average agreed that the students possess digital literacy skills for studying mathematics. The that digital literacy competence is a strong predictor of secondary school students' academic achievement in Mathematics. Perhaps, the reason for this finding is that students who are more proficient in using digital tools tend to perform better academically in mathematics. This supports constructivist theories of learning and the TPACK framework, both of which emphasize the integration of technology in facilitating deeper learning. The implication is clear: digital skills are not just complementary but essential to academic success in a digitally driven world. This is in line with findings by Moses (2023); Udoh and Ekpenyong (2022), who observed that while Nigerian students have basic digital skills, they lack exposure to digital tools specifically designed for academic enhancement.

Conclusion

Based on the findings presented and discussed, it was concluded that digital literacy competence is a strong predictor of student achievement in Mathematics. It was also concluded that gender does not significantly influence the predictive validity of digital literacy competence on secondary school students' achievement in Mathematics.

Recommendations

Based on the findings, the following recommendations were made;

1. The Ministry of Education, in collaboration with teacher-training institutes, should organize regular ICT-based workshops for Mathematics teachers.
2. Governments and school proprietors should equip classrooms with internet-enabled devices, projectors, and subject-specific software like GeoGebra and Desmos.
3. The Nigerian Secondary School Mathematics Curriculum should be revised to explicitly incorporate digital competencies, ensuring that both students and teachers are evaluated on their ability to use digital tools.
4. Schools should create digital literacy clubs or ICT literacy periods within the timetable to support students in developing and practicing digital competencies.

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