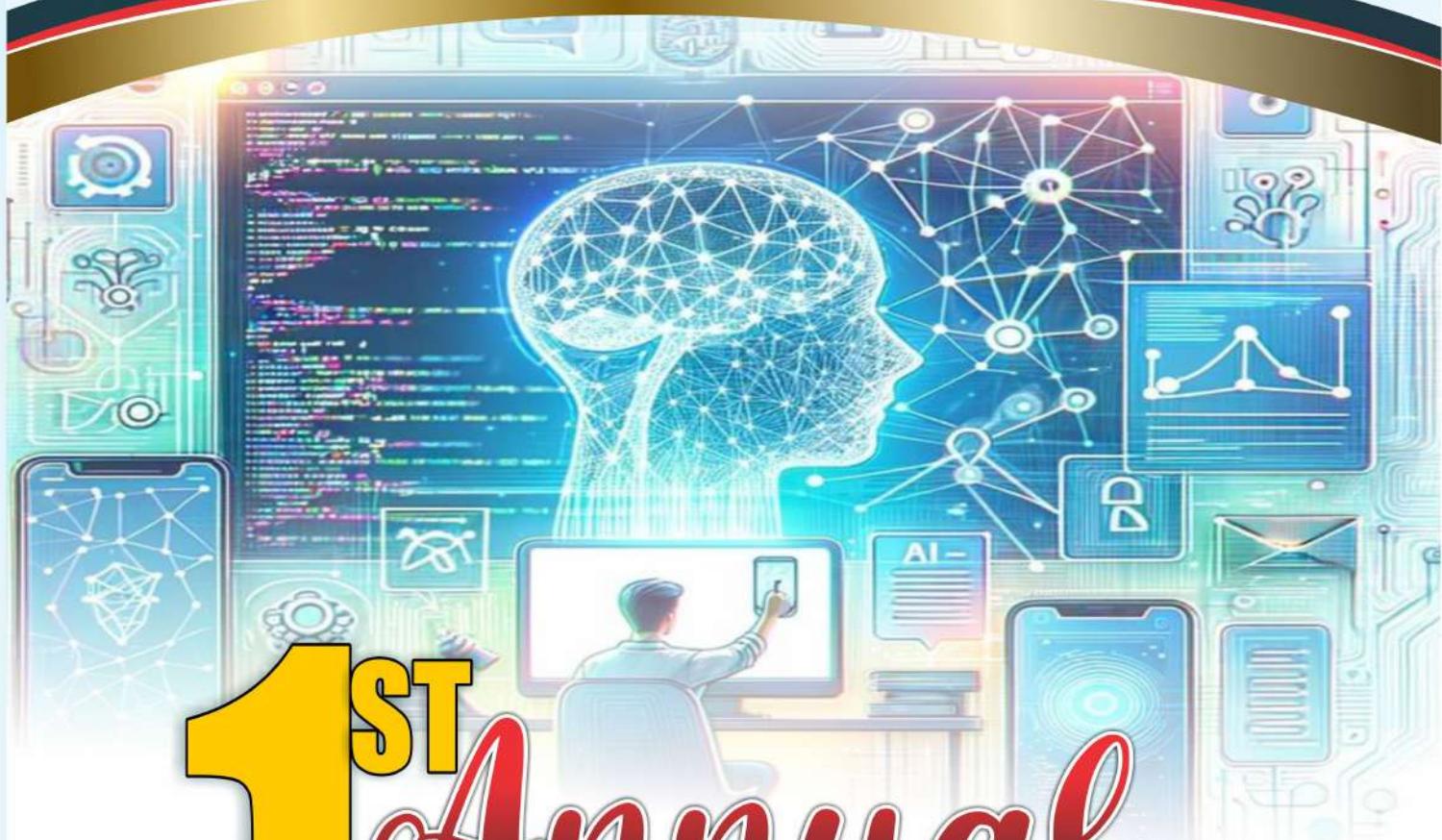




ASSOCIATION OF SCIENCE EDUCATORS ANAMBRA (ASEA)

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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

Prof. Josephine, N. Okoli

Printed in Nigeria by:



Love Isaac Consultancy Services
No 1 Etolue Street, Ifite Awka, Anambra State, Nigeria
+234-803-549-6787, +234-803-757-7391

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Published in June, 2025

ISBN: 978-978-695-937-5

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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 7

ASSESSING THE EFFECTIVENESS OF ONLINE PLATFORMS IN EDUCATION FOR TEACHING AND LEARNING FOR SUSTAINABLE NATIONAL DEVELOPMENT

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Abstract

In recent years, the use of online platforms in education has gained significant attention worldwide, especially in developing countries like Nigeria. The development of digital technologies has had a profound effect on society, the economy and everyday life in recent decades. The role of technology in education is becoming more and more important. As technology continues to advance, educators are finding new ways to use it to promote engagement, collaboration, assessment, and personalized learning experiences for students of all ages. This paper aims to assess the effectiveness of online platforms in teaching and learning computer education in Nigeria. With the ever-increasing demand for computer literacy, it is crucial to evaluate the efficiency and effect of online platforms in meeting educational objectives. As computer science education becomes more crucial for fostering technological literacy, it is essential to assess the effect of online platforms in providing quality education in this domain. This paper explores various aspects such as the advantages and challenges of online platforms, their effects on student engagement and achievement, and the role of online platforms in promoting equitable access to enhance computer science education and ways that online platforms can contribute to sustainable national development in Nigeria. Additionally, pedagogical strategies and best practices associated with online platforms are examined, alongside suggestions for educators and policy-makers to enhance the effectiveness of online learning experiences in computer science education.

Keywords: Online platforms, Teaching and learning, Sustainable National Development

Introduction

The integration of technology in education has become imperative given the transformative nature of the digital age. As Nigeria seeks to bridge the digital divide, online platforms have gained momentum as a feasible solution to educate individuals in computer literacy. Online learning refers to the delivery of educational content and courses through digital platforms, such as online learning management systems, video conferencing, and webinars. This mode of education has become increasingly popular in recent years, driven by technological advancements, changes in student preferences, and the need for flexibility and accessibility in education. Due to how quickly things change in the world today, it is important for all cultures, both old and new, to start using online platforms. Online education has become a good option to more traditional ways of going to school, (Zaghoud,2020) points out. This is because the Internet has become more popular and multimedia technology has improved. However, the traditional educational methods in Nigeria may not fully meet the demands of computer science education due to limited resources, outdated curriculum,

and lack of experienced teachers, insufficient practical and hands-on learning opportunities for students and absence of a centralized platform to facilitate online platforms in teaching and learning in Nigeria. However, there is a need to assess the effectiveness of these platforms in enhancing students' understanding and performance in teaching and learning. To investigate the challenges faced by educators and students in utilizing online platforms for teaching and learning.

To explore the potential benefits and limitations of online platforms in the context of Nigeria's educational system. To analyze the use of online platforms for teaching and learning in Nigeria. As technology evolves rapidly, traditional classroom-based approaches may not suffice in meeting the growing demand for computer science education. Online platforms have emerged as a potential solution, providing educators and learners with interactive and flexible tools to enhance the teaching and learning experience. (Jawad, 2021) saw it as a new way to provide a learner-centred, well designed, predesigned interactive environment for anyone, anywhere, and at any time. These platforms provide an avenue for learning, often offering a variety of subjects and topics that can be accessed at any time and from anywhere. Online platforms refer to digital tools and websites that facilitate learning and education through virtual means. These platforms provide a range of resources, such as courses, lectures, videos, assessments, and interactive activities, enabling learners to access educational content remotely. Electronic learning or e-learning is used to offer instructional programs to distant learners (Arkorful & Abaidoo, 2015). It is an online learning platform that emerges in a formal context and utilizes a variety of multimedia technologies. Electronic hardware and software support this system either offline or online. (Basilaia & Kvavadze, 2020) says that online education is a planned process with a specific goal that uses electronic tools like video, audio, and text to make it easier for students, teachers, and course materials to talk to each other in real time. Other communication technologies deliver learning based on tutorials, learning support systems, and online lectures (Kattoua, Al-Lozi & Alrowwad, 2016). It is based on technology for improving classroom engagement through positive environment, where students are deliberately engaged in online tutorials for completing a task assigned to them. Online platforms also called E-learning ensures that students are completely involved as learning takes place together with texts, videos, sounds, collaborative sharing, and interactive graphics. The effectiveness of these platforms necessitates assessment to determine their effect on teaching and learning for a sustainable national development. Sustainable national development in Nigeria Ugoh and Ukpere, (2010), views national development as a qualitative and quantitative improvement in the living conditions of people of a state in line with national objectives, as indicated in its national development plans. According to him, other key objectives of the development plans include: Reduction in the level of unemployment; equitable distribution of income; reduction in the incidence of poverty; improvement in the quality of life of the people; more employment opportunities; greater access to and ownership of houses; and access to basic necessities of life such as qualitative health services, potable water, education and electricity. It is when these objectives are achieved that one can talk of national development. Development is a process of bringing about fundamental and sustainable changes within society. He notes that development transcends as well as encompasses growth and embraces aspects of quality of life such as social justice, equal opportunity for all citizens, equitable distribution of income and democratization of the development process.

A review by Angehrn, Maxwell and Wild (2020) reveals several benefits associated with using online platforms for teaching and learning computer science. Firstly, these platforms offer

interactive learning experiences, allowing students to engage actively in the learning process through various multimedia materials, simulations, and collaborative activities. Research studies have also shown that online platforms can create an inclusive learning environment, catering to different learning styles and preferences. Several studies have shown the positive effects of online platforms/e-learning from the insights of learners or students (Gautam & Tiwari, 2016; Martínez-Caro, Cegarra-Navarro & Cepeda-Carrión, 2015; Chang, 2016). For instance; e-learning allows to observe much flexible learning ways to go for classes with much reduced need for travel. Learners are allowed to get deeper insights of the information through activities that are carried-out in the classroom through interactive video facility (Gautam & Tiwari, 2016; Martínez-Caro, Cegarra-Navarro & Cepeda-Carrión, 2015). This allow learners to respond promptly toward the activities.

Dhawan (2020) identified in his study the strength of online platforms which shows that time and location flexibility, reach to wider audience, easy availability of course & content, and immediate feedback are all advantages for online learning. The limitations such as technical issues, time management, distractions, anxiety & confusion, lack of personal/physical attentions are issues to be addressed in online mode of learning. The study indicates that the online learning presents opportunities to both teachers and students such as scope of innovations & digital development, designing flexible programs, strengthening problem solving skills, developing innovative thinking skills & adaptability skills etc. Teachers can device appropriate pedagogical approaches and EdTech start-ups that have the potential to make revolutionary changes in the field of education. In addition Dhawan (2020) also mentioned some of the main challenges of online learning such as digital illiteracy, unequal distribution of ICT infrastructure, technology cost & obsolescence that require attention from the authorities.

It is also observed that e-learning systems allow enhanced communication between students, and instructors. Part time and full-time students can actively participate in the online degree courses selected from any location or place, providing people who are traveling or relocated, an easily accessible resource for experience and learning (Radu, Radu and Croitoru, 2015). The integration and use of e-learning offers disabled people an opportunity for advancing their education from any location.

Statement of the Problem

Traditional methods of teaching and learning are no longer responding to the needs of students nor increase their achievement and performance of students. Major stakeholders in education believe that using the traditional ways in teaching is the main reason of the backwardness, weakness, low interest and poor achievement of many students. According to available reports, schools and colleges which do not utilize digital technologies in learning and teaching will be left behind in the educational market Muoneke, (2013). Additionally, in the worlds of education, business, and governance, knowledge about the use of new technologies in the classroom is growing to the point, where using words alone just to express ideas, skills, and attitudes to educate students is fruitless (Olatunji, 2020). The growing complexity of instructional methods, as well as the need for innovative, varied, and expected responses to national and school-based problems, necessitate a new, more comprehensive approach to science education (Edeh, 2016). The Chemistry students in colleges of education are not very technologically confident, and therefore need much technological support, they are not used to the e-learning culture which makes the requirements for interactivity, presence and support extremely important.

Objective of the Study

To analyse the effectiveness of online learning and identify the benefits that the use of e-learning platforms brings to students and teachers

Types of Online Platforms

Among the digital technologies and applications that can contribute to the effectiveness of the educational process;

1. **Moodle** - has several features considered typical for an educational platform plus some original innovations (such as its filtering system). Moodle is very similar to a learning management system and can be used in many types of environments such as: in the educational environment, for training and development.
2. **Google Classroom** - Classroom is a tool in the Google Apps for Education suite with which teachers can quickly create and organize assignments, provide effective feedback, and easily communicate with students. The Classroom application - works with Google Docs, Drive, and Gmail. Thus, teachers can create and collect assignments, without them being on paper. They can also see who has completed their assignment, as well as provide direct and real-time feedback to each student.
3. **Microsoft Teams** - a complete platform for collaboration and communication, integrating video conferencing, chat, and document sharing functionalities. Teachers can organize online lessons, group sessions, and interactive activities, all in one place. Teams is particularly useful for managing group projects and for quickly communicating with students and colleagues. Cristea, Marchitan, (2020)
4. **Udemy** :This online learning platform provides video courses on a range of topics, such as technology, design, photography, and business. Furthermore, they also collaborate with many renowned universities from all across the globe to curate courses that are industry-relevant and engaging. Udemy is a great platform for teaching and selling courses. Teachers create courses, share them with students, and get paid for the courses they create.
5. **Zoom**: has become an essential tool for online lessons and seminars, offering features such as screen sharing, separate chat rooms, and session recording. Teachers can use Zoom to create an interactive learning environment and maintain eye contact with students, which is important for student engagement.

Benefits of E-Learning/Online Platforms over Conventional/Face-To-Face Learning

1. According to Park, & Choi, (2018). Students Gain More Knowledge than In Standard Classes: Students in online learning courses incorporating multimedia content learn five times more material than students in traditional face-to-face classes. Because online courses provide students with full control over their studies, they can work at their own pace. Pupils, on average, work faster and absorb more information in online courses than they would otherwise. They can move faster through parts of the course that they are familiar with, but they must move slowly through areas that need more time.
2. There Is A Higher Rate Of Retention With Online Learning: Many offline courses struggle to maintain student interest throughout the semester. According to the Research Institute of America, this is not the case with eLearning. On the other side, online courses have increased student retention rates by anywhere from 25–60%. More engaging multimedia content, more flexibility in how individuals consume the curriculum, and a lower likelihood

of classes conflicting with other commitments have all been suggested as contributing factors to this growth.

3. Online Learning Needs A Less Time-Consuming Commitment: individuals spend 40–60% less time on this kind of learning than they would in a traditional classroom setting. It's also worth mentioning that the majority of eLearning options allow students to divide their course time in any way they see fit. They don't need to be able to dedicate a large amount of time to the course, just half an hour each day over their lunch break would suffice.
4. More Frequent Evaluations Can Help Decrease Distractions: One of the advantages of online courses is that assessment can become a more continuous process. This is fantastic news for students because interspersing multimedia content and learning materials with regular short exams can help pupils become more engaged. In fact, Harvard researchers found that adopting these short, regular examinations reduced student distraction, quadrupled note-taking, and enhanced overall content recall. It's also worth remembering that the more frequently students are evaluated, the better their tutors can follow their development. Tutors are able to intervene early when help is needed because of improved student tracking.
5. e-Learning Is A More Eco-Friendly Option: Online learning is not only more effective for students, but it is also better for the environment. Online courses consume 90% less energy and release 85% less CO₂ per student than traditional in-person courses, according to the Open University in the United Kingdom. Online learning and multimedia material become more effective instructional tools as a result of this. Individuals and businesses can profit from helping the environment and sticking to their own personal environmental goals by encouraging and engaging with this form of learning.
6. It Helps Employees Work More Efficiently: Companies that adopt technological training methods have 26% higher revenue per employee according to a recent study. Because eLearning helps employees broaden their professional growth opportunities while simultaneously enhancing employee happiness, it is a win-win situation. Employees will feel more appreciated, which will result in a lower turnover rate because they will be less likely to resign for another job due to a lack of training.

Advantages of Online Platforms

The implementation of e-learning in education has been favourable in multiple contexts. Previous studies, have presented several advantages associated by the implementation of e-learning technologies into educational sector (Raspopovic, Cvetanovic, Medan & Ljubojevic, 2017). Which are listed below;

1. Flexibility: Online platforms allow learners to access educational content at their own pace and convenience, enabling them to balance their studies with other commitments.
2. Accessibility: Online platforms eliminate geographical barriers, making computer accessible to individuals in remote areas or those with limited access to traditional educational institutions.
3. Interactive Learning: Online platforms often incorporate interactive elements such as quizzes, simulations, and virtual labs, enhancing engagement and understanding of computer science concepts.
4. Personalized Learning: Online platforms can adapt to individual learners' needs, providing personalized learning experiences and targeted feedback.

5. Assessment and feedback - Online courses often include assessments that allow participants to measure their progress. The feedback received can be valuable in identifying strengths and areas that need improvement;
6. Communication and collaboration - Numerous online platforms offer opportunities for interaction between learners, promoting collaboration and the exchange of ideas.

Disadvantages of Learning with Online Platforms

1. Limited personal interaction: Online learning can lack face-to-face interaction with teachers and peers, reducing the opportunity for immediate feedback, collaboration, and social interaction.
2. Self-discipline and motivation: Some learners may struggle with staying motivated and disciplined in a self-paced learning environment, potentially resulting in procrastination or incomplete coursework.
3. Technical issues: Internet connectivity problems and technical difficulties with online platforms can disrupt learning, making it challenging to access and complete assignments.
4. Limited hands-on and practical experience: Certain subjects or skills require hands-on experience, which may be difficult to replicate through online learning alone.
5. Lack of accreditation: Not all online platforms offer accredited courses, so learners need to be cautious when choosing platforms and programs to ensure the acquired knowledge holds value in their desired fields (Arkorful & Abaidoo, 2015)

Ways in Which Online Platforms in Teaching and Learning can Contribute to Sustainable National Development

- Bridging the Digital Divide: Online platforms can provide access to computer education for individuals in remote or underserved areas. Assessing the effectiveness of these platforms will help identify their reach and impact, allowing policymakers to focus resources and efforts on bridging the digital divide. This can lead to increased digital literacy across the country, which is crucial for economic growth and development.
- Enhancing Workforce Skills: By assessing the effectiveness of online platforms in teaching computer science, policymakers and educators can identify the gaps and tailor the curriculum to meet the demands of the labor market. This will help create a pool of skilled professionals, who can contribute to various sectors, including technology-driven industries. Consequently, this can drive innovation, increase productivity, and promote economic growth.
- Promoting Entrepreneurship and Job Creation: Access to quality computer education can empower individuals, particularly youth, to develop entrepreneurial skills and create job opportunities. By assessing the effectiveness of online platforms, policymakers can determine the impact on entrepreneurship development and design strategies to promote the establishment of startups and small businesses focused on technology.
- Improving Educational Equity: Assessing the effectiveness of online platforms can help identify whether these platforms are inclusive and cater to diverse learners, irrespective of socioeconomic backgrounds. This information can guide policymakers to ensure the availability of resources and support for all students, minimizing educational disparities and promoting social equity.
- Strengthening ICT Infrastructure: Assessing the effectiveness of online platforms in education will bring attention to the need for robust ICT infrastructure in the country. This

can drive investments in improving internet connectivity, providing reliable power supply, and creating conducive learning environments. A strong ICT infrastructure is essential for sustainable development and can attract investments in other sectors as well.

Benefits and Challenges of E-Learning

1. Convenience: Learners can access educational content at any time and from anywhere, as long as they have an internet connection. This flexibility allows individuals to fit learning into their own schedules and eliminates the need for physical travel to a learning institution.
2. Wide range of subjects and topics: Online platforms offer a vast variety of subjects and courses, catering to different interests and skill levels. Learners have the freedom to choose from a diverse set of online courses and study materials that align with their personal goals.
3. Interactive and engaging content: Many online platforms employ multimedia elements, such as videos, quizzes, discussions forums, and gamification, to enhance the learning experience. These interactive features can improve engagement and knowledge retention.
4. Personalized learning: Online platforms often use algorithms to track individual progress and provide personalized recommendations for further study based on learners' strengths and weaknesses. This adaptive learning approach can help learners focus on areas they need to improve while skipping content they already understand.
5. Cost-effective: Online learning platforms are generally more affordable than traditional educational institutions. The absence of physical infrastructure costs, reduced overheads, and the ability to reach larger audiences often make online courses more accessible and affordable for learners (Nnajiofor & Achukwu, 2011)

Challenges of Online Platforms

1. Infrastructure and Connectivity: Limited internet access or insufficient internet connectivity and power supply constraints and unreliable infrastructure pose challenges to the widespread adoption of online platforms in Nigeria.
2. Technical Support: Learners may face difficulties in navigating online platforms or encounter technical issues, requiring adequate technical support to ensure a seamless learning experience.
3. Pedagogical Adaptation: Educators need to adapt their teaching methods to effectively utilize online platforms, ensuring that the learning objectives are met.
4. Assessment and Evaluation: Developing effective assessment methods for online learning can be challenging, as traditional methods may not be suitable for evaluating computer science skills acquired through online platforms.

Infrastructure Limitations

5. Unequal distribution of resources exacerbates the digital divide, limiting the reach of online education.
6. The absence of practical hands-on experiences commonly found in traditional computer science courses can create gaps in understanding.

Conclusion

Online learning has opened up new opportunities for students to access education from anywhere in the world. It has made it possible for learners to study at their own pace and on their own schedule, without the need to commute to a physical campus. This has not only made education more accessible to a wider range of people but also enabled institutions to reach a larger and more

diverse audience. Moreover, online learning has provided instructors with new tools and technologies to engage with their students and offer personalized learning experiences. With the use of digital platforms, learning analytics, and adaptive learning technologies, instructors can tailor their teaching to the needs of each student and provide them with feedback and support in real-time. While challenges such as infrastructure limitations and pedagogical adaptation exist, the advantages of online platforms, including flexibility, accessibility, and interactive learning experiences, outweigh these challenges. By leveraging online platforms effectively, Nigeria can bridge the digital divide and promote inclusivity in computer science education. Furthermore, Assessing the effectiveness of online platforms in education for teaching in Nigeria can inform policy decisions, drive investments, and promote sustainable national development by empowering individuals, enhancing workforce skills, and bridging the digital divide and to address the challenges and maximize the benefits of online platforms in education.

Suggestions for the Integration of Online Platforms in Education

- 1.Improving internet connectivity and infrastructure in Nigeria to ensure smooth access to online platforms.
- 2.Training and supporting educators in effectively utilizing online platforms for computer science instruction.
- 3.Developing and adapting computer science curriculum to align with online learning environments.
- 4.Collaborating with educational technology experts to design user-friendly and engaging online platforms specifically tailored for computer science education.
- 5.Monitoring and evaluating the implementation of online platforms to ensure continuous improvement and address any challenges faced by educators and students.
- 6.Encouraging collaboration and peer-to-peer learning through online platforms to enhance student engagement and knowledge sharing.
- 7.Conducting further research to continually assess the effectiveness of online platforms and identify any emerging issues or trends.
- 8.Continuous professional development for educators and quality assurance mechanisms and accreditation standard.

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