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IMPROVISING INNOVATIVE TECHNOLOGY IN SECONDARY IN NIGERIA: A PRAGMATIC APPROACH TO STRENGTHENING FOUNDATIONAL SCIENCE EDUCATION

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Abstract: *Science education is the bedrock of technological breakthrough; and technological breakthrough is the bedrock of modernization, transformation and sustainable national development. Science education is important in secondary education because it offers students the opportunity to in build bridge to different fields and sectors such as engineering, manufacturing, medicine, agriculture, chemistry, physics, mathematics and information sciences which are all important parts of national economy. Through science education, students are developed into more responsible citizens who would help to build stronger economy, contribute to a healthier environment and bring about a brighter future for local, national and global development. Knowing this, Nigeria has, over the years, designed elementary and secondary science curriculum for primary and secondary schools with the aim of equipping younger children with scientific knowledge and skills on which they can build scientific careers in later life. Despite these efforts, there are a lot of challenges facing implementation of science education curriculum in primary and secondary schools in Nigeria such as inadequate funding, lack of motivation for teachers; poor infrastructural facilities; lack of scientific equipment and materials, poor attitude of students to learning; lack of teaching skills and competence among science teachers. This paper examines the prospects of improvising innovative technology in strengthening foundational science education in Nigeria.*

Keywords*: Improvising, Innovative Technology, Strengthening, Foundational, Science Education*

Introduction

Globally, education has been recognized not only as a fundamental human right but also as a catalyst for sustainable development and a vehicle for confronting the challenges facing societies in terms of socio-economic, environmental and ecological realities, considerable attention is shifting towards it (Hanachor & Wordu, 2021). However, science education is the bedrock of technological breakthrough. Science subjects in school curriculum are designed to produce individuals, some of whom may or may take scientific studies in their professional pursuits. Science is an important aspect of education because it exposes students to real life experiences and helps them understand the underlying laws and principles of the nature. Science subjects are offered by many students in the secondary schools and it is a building bridge to chemistry, physics, mathematics, information science and other disciplines.

Ogunmade (2006) argued that for any nation including Nigeria to attain sustainable development; there is the need to recognize science education as a priority area of education for her citizens. However, Gabriel (2019) cited Aina (2012) observed that one of the key problems in evolving a development strategy for a developing country like Nigeria is lack of the capacity for appreciation and application of science and technology through developmental efforts. Omoifo (2012) asserted that quality science education is effective science teaching which occurs when students learn and achieve many scientific goals and not just being able to repeat scientific knowledge.

Technologies are indispensable tools for effective and correct study of science. According to Simon (1983), knowing and using the technology (in science education) is thought to be important. Technology is considered as a tool that can be used in different areas and play an important role in facilitating the work of individuals (Saettler, 1968). According to Seckin-Kapucu and Turk (2020), contemporary and innovative technologies can be included in the curriculum and students are offered the opportunity to be intertwined with technology. Technology is used as a teaching tool and can play an auxiliary role in teaching, especially in areas like science where technology is considered to adapt easily (Commission on Instructional Technology, 1970). Adopting innovative and effective approaches for learning and teaching processes of the new generation, which is born

into and growing in the digital age, is of great importance for the efficiency of education (Seckin-Kapucu and Turk, 2020).

Science education is one of the areas that can easily adapt to technology and the reflections of technology are frequently encountered in science education. The reason for this harmony between technology and science education is; the students consider science course as a course difficult to understand, abstract concepts are quite common in science education, and biology-based topics such as cells, systems and organs, DNA and genetic code require 3-D examinations. However, technologies used in science education varied from past to present, depending on the development of technology. Computers, which we saw in classroom settings years ago, which was forming one of the first steps of education-technology integration, are considered quite ordinary today. In the following years, considering the advantage of computers in education, the projectors took their place in the classroom settings. These were followed by various technologies such as simulations, 3-D printers, web 2.0 tools, industry 4.0 tools, and virtual laboratories that are used in the field of education (Seckin-Kapucu and Turk, 2020).

Conceptual Clarification

Concept of Science and Science Education

There is no single universally accepted definition of either science or science education. This is because of its broader nature and interconnection with other disciplines that makes it subjective to different interpretations. According to Urevbu (2001), science is a study of nature and natural phenomena in order to discover their principles and laws. To Gottlieb (2004), science is an intellectual activity carried out by human that are designed to discover information about the natural world in which humans live and to discover the ways in which this information can be organized into meaningful patterns. In its simplest definition, science education is the application if scientific knowledge, skills, theories, principles, techniques and approaches in the field of education with the aim of discovering, analyzing and interpreting phenomena. According to Danjuma, & Adakole, (2019), science it is the process of penetrating nature with the aim of discovering the laws that aid man to live sustainably. In view of this, Pember & Humbe (2009) defined science education as a process of teaching or training especially, in school to improve one's knowledge about environment and to develop one's skill of systematic inquiry as well as natural attitudinal characteristics. Science education identifies natural phenomena appropriate to child interest and skills. It equips teachers, learners and the society with knowledge, skills, equipment and freedom to perform noble task useful for improving socioeconomic standard. Hence, science education courses (subjects) are designed to produce capable scientists who contribute meaningfully to academic excellence of the society to raise the economic level of nations (Lewis, 2015). Omoifo (2012) noted that core science subjects expose students to natural phenomenal and help students understand the underlying principles of the world. Therefore, effective science education will help students understand their local, national and international milieu thereby preparing them for both man-made and natural environmental challenges; and measures to be taken while caring for environment(s).

Agbowuro, Oriade & Shuaibu (2015) identified five key aims and objectives of science education as follows:

1. To excite and enthuse children with a sense of awe and wonder at the natural world;
2. To give pupils enough evidence-based knowledge to be able to make informed personal judgments in order to live healthy, safe, comfortable and environmentally sustainable lives;
3. To develop pupils' understanding and experience of the scientific method, to understand its value and limits, and to enable them to apply the method;
4. To be proficient at practical work and use of scientific equipment and;
5. To know, understand at an abstract level, and be able to apply important scientific theories.

Despite the potential of science subjects in exposing learners, especially primary and secondary school pupils and students to natural phenomenal and help students understand the underlying principles of the world, Danjuma & Adakole (2019) affirmed that Nigeria have not harnessed the benefits of science since independence and as a result, science education has not been able to serve

as a tool for sustainable development. This is because science education has failed to produce skilled human resources needed for sustainable development. The implication of this is that Nigeria does not have scientific and technological prowess to be among the leading scientific nations in the world- acquisition of obsolete technology (Momeke 2007).

Concept of Innovative Technology

Like the concept of science, it is a hard nut to crack to conceptualize a universally acceptable definition of innovative technology. This is because of its applicability to all field of studies. Abernathy and Clark (1985) state that:

> innovation is not a unified phenomenon: some innovations disrupt, destroy and make obsolete established competence; others refine and improve. Further, … different kinds of innovation require different kinds of organizational environments and different managerial skills. … An innovation is the initial market introduction of a new product or process whose design departs radically from past practice. It is derived from advances in science, and its introduction makes existing knowledge in that application obsolete. It creates new markets, supports freshly articulated user needs in the new functions it offers, and in practice demands new channels of distribution and aftermarket support.

Oslo Manual (2005) views innovation as an activity that produces new or significantly improved goods (products or services), processes, marketing methods or business organization. According to Frascati Manual (OECD, 2002), technological innovations comprise new or significantly modified technological products and processes, where technological novelty emerges, unlike improvements, from their performance characteristics. Technological innovation is underpinned in technology, which can be defined as a complex system composed of more than one entity or sub-system of technologies and a relationship that holds between each entity and at least one other entity in the system for achieving specific goals (Coccia, 2019a, 2019b; Coccia and Watts, 2020).

Kapucu and Turk (2020) note that considering the advantages that augmented reality, virtual reality and digital hologram technologies, which are called innovative technologies today, bring to the education process, these technologies should be included in education and accordingly the desired efficiency is expected to be obtained from education. This is because innovative technologies can provide the users with the opportunity to make 3-D observations and materializing abstract concepts through 3-D images, which can provide a great advantage to students and teachers, especially in subjects that are difficult to understand in science education (Kapucu and Turk, 2020). In addition, innovative technologies have several advantages such as enriching learning environments, contributing to students' imagination, saving time in the education and training process, being a simple and cheap source that every student can reach, increasing motivation for learning, thus they are expected to be compatible with education-technology integration (Chen & Wang, 2015; Huang, Chen & Chou, 2016; Squire & Jan, 2007). Furthermore, the use of innovative technologies in education enriches learning environments and helps to prepare the appropriate infrastructure for different learning activities. In addition, they are effective in saving time allocated for teaching and learning and they can be easily used as textbooks as they can be moved easily into the classroom settings (Cakıroglu, Gokoglu & Cebi, 2015; Kol, 2012). Innovative technologies appeal to more than one sensory organ, different types of intelligence existing in students can be revealed and the efficiency of the education can increase. In addition, augmented and virtual reality technologies that provide the opportunity to have fun in the lessons, are the technologies that provide easy access for the teachers (Kapucu and Turk, 2020).

Innovative Technologies Used in Science Education

Globally, there are numerous innovative technologies used in science education today. However, the commonly utilized innovative technology in science education Iiclude:

1. **Educational Apps and Games**

There are numerous mobile applications and games available that aim to enhance science learning by making it more interactive and enjoyable. These tools provide gamified experiences, allowing

students to engage with scientific concepts in a fun and immersive way (Yilmaz, 2023). Gamification and Artificial Intelligence education techniques effectively improves anatomical learning. Students expressed satisfaction with the use of gamified components and achieved higher scores, indicating that these elements contribute to acquiring knowledge in anatomy. Gamification has the potential to introduce a new approach to anatomy education, but its implementation should be approached with caution and adequate teacher preparation (Ang, Chan, Gopal, & Li Shia, 2018).

2. 3D Printing

According to Yilmaz (2023), the utilization of 3D printing technology, augmented reality, and gamification strategies empower students to construct tangible replicas of scientific structures. This approach enriches their comprehension of intricate concepts in fields such as physics, biology, and chemistry by creating interactive learning experiences that combine virtual elements with hands-on experimentation (Yang, Chen, & Hsieh, 2019). Students can significantly enhance their understanding and retention of complex scientific concepts by utilizing 3D printing technology to create physical models (Chatzikyrkou, Manavis, Minaoglou, & Efkolidis, 2020; Francés et al., 2021). This hands-on, tactile learning experience provides a more immersive educational approach that engages multiple senses. It allows students to interact with the subject matter tangibly, promoting deeper comprehension and retention of information. In addition, this innovative approach fosters creativity and problem-solving skills as students 43design and manufacture their own three-dimensional representations of scientific structures or phenomena (Yilmaz, 2023).

3. Interactive Whiteboards and Smartboards

According to Yilmaz (2023), interactive whiteboards and smartboards not only facilitate dynamic presentations but also provide teachers with interactive ways to engage students in discussions related to science concepts. By incorporating digital content and utilizing these tools, educators can create a more engaging learning environment for their students (Yilmaz, 2023). The utilization of smart boards is most commonly seen during specific units, such as 'Living Organisms and Life,' and teachers often acquire the necessary skills through in-service training (Yilmaz, 2023). The interactive whiteboards and smartboards significantly enhance teaching science concepts by promoting engagement, enabling multimedia presentations, and fostering interactive learning sessions (Gündüz & Kutluca, 2019; Karadag, Koc, & Kalkan, 2017; Perinpasingam, Arumugam, Subramaniam, & Mylvaganam, 2014).

4. Online Simulations and Virtual Labs

Haleem, Javaid, Qadri, & Suman (2022) observed that digital simulations and virtual laboratory exercises have emerged as highly effective pedagogical tools in science education, offering students interactive and captivating learning opportunities. According to Yilmaz (2023), these technological resources create a dynamic and immersive environment where students can actively explore scientific concepts, conduct experiments, and observe outcomes within a virtual realm. Yilmaz (2023) identified the benefits of online simulations and virtual labs to include ability to reproduce experiments that may be challenging or costly to perform in a traditional lab setting. This accessibility empowers students to engage directly with scientific principles, thereby fostering enhanced comprehension of intricate ideas. Moreover, virtual simulations available online offer a level of engagement and critical thinking that is often lacking in traditional teaching methods. These tools also provide flexibility as students can repeat experiments, learn from mistakes without any real-world consequences, and study at their preferred pace (Efe & Efe, 2011; Valdez, Ferreira, Martins, & Barbosa, 2014). In addition, virtual laboratories offer a cost-effective alternative to traditional labs while still providing students with a realistic laboratory experience. They have the potential to reduce the reliance on physical lab facilities in the future (Potkonjak et al., 2016).

5. Augmented Reality (AR)

Augmented reality, which is one of the innovative technologies, is considered as the technology that can create a realistic simulation and experimental environment for its users and offer the opportunity to make observation in this environment (Azuma, 1997). Augmented Reality is a technology that superimposes digital content such as graphics, text, or 3D models onto the real-world environment (Dargan, Bansal, Kumar, Mittal, & Kumar, 2023). By seamlessly integrating

computer-generated elements with the physical world, AR enhances the user's perception and immersive experience. It allows users to interact with both physical and digital elements in real-time (Yilmaz, 2023). Perez-Lopez & Contero (2013) identified other augmented reality applications that can be used in mobile and desktop technological devices, that students can access easily and free of charge to include LearnAR, ZooBurst, BuildAR are desktop applications while Aurasma, Anatomy 4D, Spacecraft3D, Quiver - 3D ColoringApp, Zoo-AR, Fetch! LunchRush, Fectar are mobile applications.

The use of augmented reality and virtual reality in teaching science allows for a more interactive and engaging learning experience (Veide & Strozheva, 2021). Students can explore and manipulate virtual objects, conduct experiments in a simulated environment, and visualize abstract concepts more tangibly. This innovative approach not only enhances students' understanding of complex scientific concepts but also promotes critical thinking, problem-solving skills, and collaboration (Yilmaz, 2023). AR and VR can bridge the gap between theoretical knowledge and practical application by providing students with hands-on experiences in a safe and controlled environment (Yilmaz, 2021). Furthermore, AR and VR can also be used to address the challenges of accessibility and inclusivity in science education. These technologies have the potential to provide equal opportunities for students with disabilities or limitations, as they can create customized learning experiences tailored to individual needs (Yilmaz, 2023).

6. Virtual Reality

Kipper & Rampolla (2013) defined virtual reality as a completely virtual and digital setting, created by using computer hardware or software to give the feeling of a real-like environment to the users and to provide the image of the relevant setting. According to Yair (2001), virtual reality applications are thought to make scientific knowledge existing in nature more understandable. Kapucu and Turk (2020) identified different virtual reality applications that students and teachers can easily access. These applications are; Solar systemscope is Skyview, Solar walk 2, Stellarium, NASA, Google SkyMap, Celestia, Redshift-Astronomy, Earth viewer, Star chart, ISS detector, Sky Guide AR, Sky Safari 6, Star walk 2.

7. Digital Hologram

According to Katsioloudis & Jones (2018), Hologram is defined as a tool that can transfer 3-D images of the selected objects to different locations and ensure the continuity of the images even in the absence of these objects. It is especially used in the teaching of subjects and concepts that are difficult to understand in science education and is also preferred as a teaching tool in the materialization of abstract concepts and subjects. Digital holograms can be prepared as videos in programs such as Powerpoint or Camtasia and images can be created with hologram pyramids (Turk and Kapucu, 2020). Holograms that were used in areas such as architecture, tourism and entertainment, medicine, industry have recently been started to be used in the field of education as well (Rahim, Abdullasim, Saifudin & Omar, 2018; Turk, 2020). According to Kapucu and Turk (2020), in science education the use of hologram is preferred in the topics requiring a microscope to observe, such as cells, genes and chromosomes.

Issues and Challenges Facing Science Education in Nigeria

Since independence till date, science education in Nigeria at all levels of education is faced with cultural, technological and methodological challenges. Corroborating this fact, Bello (2021) noted that over the last two decades, there have been repeated calls for reforms and innovations aimed at improving science education in Nigeria. A study carried out by Ayodeji et.al., (2018) on Science Education in South-West Nigeria found that many factors such as inadequately equipped laboratories, inadequate access to ICT by the in-school youth, low ratio of teacher to students are challenges in majority of the schools. Okebukola (1997) identified class sizes, inadequate funding, insufficient curriculum resources, poor teaching skills and lack of supports for teachers among other factors as the challenges facing the quality of science teaching and learning in Nigerian schools. This suggests that there are issues in science education in Nigeria that require urgent attentions both collectively and individually (Bello, 2021). However, the major challenges facing science education in Nigeria include:

1. Lack of Science Teaching Materials

Science teaching materials are scientific facilities, equipment or materials that can be utilized to simplify, clarify, illustrate, emphasize and explain lesson contents to students for better understanding. Obviously, one of the major teaching challenges facing science educators in Nigeria is lack of scientific teaching materials, especially, models, apparatus, equipment etc which hinders effective teaching of science education. According to Bello (2021), some aspects of science are full of abstract concepts which pose problems to the students in their understanding. Therefore, availability and use of instructional materials in teaching such difficult concepts will make for better understanding and thus enhance the objectives of science education. Experiments also allow students to observe non-intuitive phenomena they can then study in the course of resolving the gap between their intuition and the underlying physics or chemistry of an experiment (Bello, 2021).

2. Shortage of Competent and Qualified Science Teachers

Indisputably there is shortage of competent and qualified science educators in Nigeria, especially in public primary and secondary schools. Sufficient qualified and competent teachers is key to effective teaching of any subject, not only science subjects. Shortage of teachers leads to increase in workloads, ineffective teaching and poor teaching and learning outcomes. In view of this, Bello (2021) stated that teacher-to-pupil ratio is a key challenge to teachers of science education. According to the Federal Republic of Nigeria (FRN, 2004), the teacher–pupil ratio should be 1:35. This is contrary to the 1:60 most schools have in most developing countries including Nigeria. For science teachers to pass the message across effectively, they should be able to encourage the pupils positively, show love, recognize individual differences and plan cooperative teaching with the pupils (Bello, 2021). However, Mbakwe (2005) argued that the type and quality of interaction that exists in the classroom does not only determine the effectiveness of teaching and learning situation but also the attitudes, interest and even the personality of learners.

3. Inadequate Training and Retraining of Teachers

According to Bello (2021), lack of teachers' training and development is a serious threat to the sustainability objectives of science education in Nigeria. Scientific knowledge, ideas and concepts are dynamic and witnessing changes constantly, as such it is imperative for teachers to be constantly trained and re–trained so as to keep abreast with the new and emerging facts and principles. It is assumed a teacher with adequate materials, enough time and sound content knowledge still requires further training on classroom and science experimental management skills in order to provide students with an excellent science education with remarkable achievements (Bello, 2021).

4. Obsolete Teaching Methodology

Teaching methodology is the way, manner and strategy through which the teacher inculcate knowledge, skills and ideas to students. It includes everything a teacher does to help the students understand lesson contents. Majority of science teachers in Nigeria, particularly at primary and secondary levels employ "mechanical method" instead of scientific method to teach science subjects which makes science education difficult and uninteresting for pupils and students. According to Bello (2021), one of the qualities of a professional teacher is the use of appropriate and up-to-date teaching methods. He asserts that methodology of teaching is what makes a teacher a professional and old method only presents students as mere spectators listening to all that comes from the teachers. Therefore, in order to achieve the objectives of science education, teachers should employ teaching strategies that will enable learners to develop adequate learning strategies which will eventually assist them to acquire basic knowledge, values and skills with some degree of freedom that allow learners to initiate and complete learning with minimal interference (Bello, 2021).

5. Lack of Scientific Tools and Equipment

Science by nature is largely practical that requires exploration, experimentation and manipulation of phenomena to discover, analyze and explain phenomena which is only possible through the use of scientific tools and equipment. Evidently, most public primary and secondary schools in Nigeria lack these tools and equipment. There are no science laboratories in many public primary and secondary schools let alone of tools and equipment. This poses a big challenge on effective

teaching and learning of science education at elementary level as the larger part of science education are taught theoretically, instead of scientifically. Without adequate tools and equipment, practical activities cannot be conducted, concepts become difficult to explain by the teachers and incomprehensible for the pupils and students, scientific analysis and observations cannot be correctly made.

Potential of Innovative Technology in Strengthening Foundational Science Education in Nigeria

According to Yilmaz (2023), technology has become a transformative force in education, reshaping the way students engage with and understand scientific concepts. The integration of current technologies in science education provides educators and learners with innovative tools to explore, experiment, and comprehend the intricacies of the natural world (Doyan, Makhrus, & Zamrizal, 2021; Goumas, Symeonidis, & Salonidis, 2016). The dynamic combination of science and technology not only closes traditional accessibility gaps but also introduces a range of engaging experiences that cater to various learning styles (Yilmaz, 2023). From augmented reality to online simulations, these technologies have the potential to transform science education by promoting curiosity, critical thinking, and a deeper understanding of the scientific principles that form the basis of our comprehension of the world (Kim, Hannafin, & Bryan, 2007; Mishra, 2017). Technology in science education has come a long way and continues to evolve, providing new opportunities for teachers and students alike. The integration of technology in science education is crucial to prepare students for the demands of the modern world (Yilmaz, 2023).

1. Innovative Technologies Promote Engagement and Interactivity in Classroom Setting

Technology has revolutionized the way we approach science education by offering interactive and immersive learning experiences. Through virtual simulations, interactive software, and multimedia presentations, students are captivated and engaged in a way that traditional teaching methods cannot achieve (Yilmaz, 2023). These tools not only capture their attention but also stimulate their curiosity by presenting complex scientific concepts in an accessible and exciting manner. By incorporating technology into science lessons, educators can create a dynamic learning environment that fosters exploration and deepens understanding (Daaif et al., 2019; Hockicko, 2010).

Innovative Technologies Promote Visualization of Complex Concepts

Technology integration in education has revolutionized the way abstract and complex scientific concepts are taught (Yilmaz, 2023). By utilizing tools such as animations, simulations, and virtual reality, educators can provide students with dynamic and visual representations that enhance their understanding of challenging, topics (Elmal & Kıyıcı, 2022; Harbali, 2016). These innovative approaches allow for a more engaging and interactive learning experience, enabling students to grasp difficult concepts that may be otherwise hard to comprehend through traditional teaching methods (Yilmaz, 2023).

2. Improvising Innovative Technologies Promotes Accessibility to Resources

Yilmaz (2023) stated that the internet and digital platforms have revolutionized education, offering students and teachers a wealth of educational resources at their fingertips. With just a few clicks, students can access articles, videos, research papers, and more to delve deeper into specific scientific topics (Yilmaz, 2023). Online databases and educational websites provide an interactive platform for research and exploration that enhances the learning experience. Students now can explore various perspectives on a subject matter with ease, fostering critical thinking skills and encouraging them to engage in independent inquiry (Yilmaz, 2023). Furthermore, these online resources offer up-to-date information that is constantly evolving as discoveries are made in the scientific field. In this way,, technology integration has paved the way for educators to create dynamic learning environments that promote curiosity and facilitate a deep understanding of complex concepts (Yilmaz, 2023).

3. Improvising Innovative Technologies Promotes Collaborative Learning

Technology plays a crucial role in fostering collaborative learning environments, providing students with opportunities to collaborate on projects, share information, and engage in meaningful discussions (Altowairiki, 2021). Online platforms and communication tools not only

facilitate collaboration within the classroom but also open doors for global connections, allowing students to interact and work together with peers from different parts of the world (Yilmaz, 2023).

4. Innovative Technologies are Catalysts of Personalized Learning

The integration of technology in education has opened up new possibilities for personalized learning experiences (Yilmaz, 2023).. With the help of adaptive learning platforms, students can benefit from tailored instruction that caters to their individual needs and pacing (Srinivasa, Kurni, & Saritha, 2022). These platforms can adjust the difficulty of tasks based on student's progress, ensuring that each student receives targeted support throughout their learning journey.

5. Innovative Technologies Connect Students to Real-world

Technology plays a crucial role in bridging the gap between classroom learning and real-world applications of science (Yilmaz, 2023). It offers various tools such as virtual field trips, video conferences with scientists, and access to real-time data that enhance students' understanding of scientific principles by providing them with more authentic and practical experiences (Rapanta, Botturi, Goodyear, Guàrdia, & Koole, 2020; Scanlon, Morris, Di Paolo, & Cooper, 2002).

6. Innovative Technologies Facilitate Quick Assessment and Feedback

Technology provides a wide range of tools that allow teachers to assess students' understanding and progress in real-time (Yilmaz, 2023). With the use of online quizzes, interactive assessments, and automated feedback mechanisms, educators can easily identify areas where students may require additional support (Ala-Mutka, 2005; Gaytan & McEwen, 2007). These innovative methods not only save time but also ensure that every student's needs are met effectively.

Conclusion

Science is an important aspect of education because it exposes students to real life experiences and helps them understand the underlying laws and principles of the nature. Science subjects are offered by many students in the secondary schools and it is a building bridge to chemistry, physics, mathematics, information science and other disciplines. Therefore, for Nigeria to attain sustainable development; there is the need to recognize science education as a priority area of education for her citizens. However, quality science education is effective science teaching which occurs when students learn and achieve many scientific goals and not just being able to repeat scientific knowledge. To achieve this, there is a need for adoption of innovative technologies in the teaching and learning of science, especially at foundational level of education. The integration of current technologies in science education provides educators and learners with innovative tools to explore, experiment, and comprehend the intricacies of the natural world innovative technologies have the potential to transform science education by promoting curiosity, critical thinking, and a deeper understanding of the scientific principles that form the basis of our comprehension of the world which is the ultimate goal of science education.

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