

UTILIZATION OF SMART CLASSROOM FOR QUALITY INSTRUCTIONAL DELIVERY IN PUBLIC SECONDARY SCHOOLS IN ENUGU EDUCATION ZONE, ENUGU STATE

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Abstract - This study examined utilization of smart classroom for quality instructional delivery in secondary schools in Enugu Education Zone. The purpose of the study was to ascertain the extent smart classroom can be used to achieve quality instructional delivery. The study adopted a descriptive survey research design. The population of the study was 1609 staff, which comprised of 33 principals and 1576 teachers in the 33 public secondary schools in the three LGAs in Enugu zone. The sample size was 351 respondents; this was made up of the 33 principals of the public secondary schools in the zone and 318 teachers which was obtained through multi-stage sampling technique. The instrument that was used for data collection was a self-designed 26-item questionnaire titled: Smart Classroom Utilization for Quality Instructional Delivery (SCUQID). The questionnaire was structured after the four-point modified Likert rating of Very High Extent, High Extent, Low Extent and Very Low Extent and Strongly Agree, Agree, Disagrees and Strongly Disagree with the rating points of 4, 3, 2 and 1 respectively. The instrument was validated by three experts in Educational Foundations and Science Education departments of Faculty of Education, University of Nigeria Nsukka. The reliability of the instrument was tested using Cronbach Alpha's method to establish the internal consistency of the questionnaire items, and the coefficients of 0.81 and 0.88 were obtained for the two clusters respectively, with an overall coefficient of 0.93, hence, they were adjudged to be reliable for the study. Mean and standard deviation were used to answer the research questions while t-test was used to test the null hypothesis at 0.05 level of significance. Any item with the mean score of 2.50 and above was rated as acceptance while the ones with 2.49 and below were not accepted. The findings revealed that smart classroom to a high extent can be utilized for quality instructional delivery because it aids a better understanding, offers rapid evaluation, boosts students' engagement, and improves teaching and learning experience, among others. The study then recommended that government should make available for schools the facilities and technologies required for smart classroom use as well as organize continuous teacher training in digital pedagogy, and relevant digital content.

Keywords: Smart classroom, quality instructional delivery, secondary education

Introduction

Education is regarded as an instrument per excellence for meeting the needs, aspirations and solving the problems of the wider society. It serves as the indispensable tool for national development, acting as the backbone for economic growth, social cohesion, technological innovation, and overall societal progress (Agbo, 2025). In Nigeria, the secondary school system occupies a critical place in the educational hierarchy, responsible for molding young individuals into informed, skilled, and responsible citizens. Hammill (2025) stated that, secondary education is the stage of education that follows primary education and typically includes middle and high school education and vocational or technical training. Its main focus is to prepare students for further education or for entering college or the workforce. Contextually, secondary education is the education level between primary and higher education, usually serving students aged 12 to 18. The broad

goals of secondary education are to prepare the individual for useful living within the society and higher education (FRN, 2014). Hence, secondary education is the budding ground for future professionals as well as the foundation for the discovering and classification of the specific fields of professions. The objectives of secondary education can only be realized when quality education is achieved. The Nigerian secondary school system is increasingly becoming prone to the application of some new technologies and digital experiences like Artificial Intelligence (AI), and others, driven by the need to enhance quality learning experiences, improve administrative efficiency, and to address educational challenges.

The success of this endeavor heavily depends on the quality of instructional delivery. Quality instructional delivery is the ability to possess teaching skills, competence, development of research techniques and scholarship projects. Quality instructional delivery implies the need for professionally competent teaching staff to have the skills or competences needed in a classroom setting (Ayeni & Afolabi, 2012). Quality instructional delivery occurs when the need for instructional enhancement has been accomplished through teaching and research (Madumere-Obike, Ukala & Nwabueze, 2017). Effective instructional leadership is known to guide and support teachers, enhance teaching methodologies, and stimulate a positive educational environment conducive to learning and growth (Ololube, 2017). Quality instructional delivery is about effectiveness of the instructional delivery process. The process is said to be effective if it achieves its purpose. Quality instructional delivery in secondary schools simply means using diverse, student-centered methods, integrating technology, and implementing active learning to enhance student outcomes. Effective delivery involves student-centered management, technology integration, and active learning, though these are often hindered by low teacher motivation and weak supervision. This requires that teachers are able to teach effectively and efficiently and students, too, are able to learn appropriately, culminating in improved performance of the students and impressive learning outcomes (Bayefa-Asaowei, 2024). This is made possible when instructional conditions are favourable, hence, instructors are expected to play smart when it comes to teaching and learning processes by using adequate resources, infrastructures, and diverse teaching methods especially at this point where the world is plunged into informative age.

Information Age, which is regarded as the computer literacy period has paved the way for this Digital Age that is widely accepted as computer competency era. With the emergence of modern digital technologies, the knowledge-based society has been agitating for digitalization in the education sector in order to equip students with the digital competences they need to be self-reliant in the world of work. More so, the Federal Republic of Nigeria has mandated educational managers to ensure technology-driven classrooms in this 21st century (Federal Ministry of Education, 2015). Hence, this has resulted in seismic shift to digital learning in the education system (Ukala & Adieme, 2025). In other words, this smart age also requires smart leadership in order to bring out the best from teachers. Fallon (2020) posited that there is need for teachers to be digitally competent in using digital tools to facilitate learning in the classrooms. Thus, teachers who are implementers of the school curriculum are required to be adept or well-versed in integrating modern digital devices in the teaching-learning process in order to equip students with the basic competences they need in a digitalized world.

In recognition of the prominent role of Information and Communication Technology (ICT) in advancing knowledge and skills in the modern world, the Nigerian Government stipulated in the National Policy on Education that modern technological devices shall be provided and used in instructional delivery at all levels of the education system in order to

produce computer literate students, who should be able to use computers in various ways of life (Federal Republic of Nigeria, 2014). Similarly, United Nations Educational, Scientific and Cultural Organization (2011) asserted that teachers' digital competencies must revolve around ICT operational skills and continuous teacher professional development. Hence, Rajesh and Lakshmi (2021) observed that advances in digital education have opened up many avenues of learning. Similarly, Hakasson and Pettersson (2019) noted that digital education system has revolutionized the traditional methods of chalk and blackboard process of learning in classrooms. In today's teaching and learning, new methods of teaching have been introduced and today, we witness one of the most talented gifts of science, known as smart classrooms. In the world of competition, quality is the mantra of every educational organization. Clearly, technology is evident in every system in its operation and the success supported through efficient utilization (Nimisha & Chellamani, 2018). Thus, school administrators are expected to adopt digital learning in their schools, and encourage teachers to integrate them in the classroom via smart classrooms. In today's education system, the classrooms are designed on SMART programme which has an interactive whiteboard working on a computer platform (Betcher & Lee, 2009), hence, the emergence of smart classroom.

A smart classroom is a technology-enhanced learning environment that replaces traditional teaching with interactive tools like smartboards, projectors, and audio systems to boost engagement. A smart classroom is a learning space that's been enhanced with educational technology and is designed to improve the teaching and learning experience (Cerullo, 2025). A smart classroom refers to a classroom that is equipped with advanced technology such as computers, specialized software, audience response technologies, networking, and audio/visual components (Dixit, 2023). Similarly, Nimisha and Chellamani (2018) posited that a smart classroom is a classroom of integrating learning with technology, such as computers, specialized software, audience response technology, assistive listening devices, networking, and audio/visual capabilities. A smart classroom an educational ecosystem that integrates advanced technology to enhance the teaching and learning experience. In a smart classroom, teachers use sophisticated advanced technology like interactive whiteboards, collaborative software, and multimedia capabilities designed to enhance student engagement and facilitate active learning (Extramarks Education India, 2026). It uses digital content, AI, and cloud-based resources to create personalized, immersive learning experiences. Smart classrooms foster collaboration and support both in-person and hybrid learning.

In simple terms, a smart classroom is a technology-enhanced learning space that replaces traditional, passive teaching with interactive, digital tools to boost engagement and improve academic outcomes. Thus, Amin and Jan (2018) opined that smart class is a digital initiative in changing the conventional approach and methodology that teachers use to teach student-centered learning in an innovative manner using technology. It is a modern educational setting that integrates electrical components, human interface, technology, and traditional teaching methods to establish innovative, advanced, and flexible learning environments (Dixit, 2023). The scholar further stated that these environments integrate hardware like interactive whiteboards and projectors with software, AI, and cloud-based systems to enable dynamic lessons. Similarly, Nimisha and Chellamani (2018) stated that the environment of the classroom is centered on technology where the teacher and the students interact through a SMART board. The learners' participation is the core aspect of the teaching programme. This programme encompasses infrastructures, methodology of transaction, hardware and software, also, integrating audio, video, animations, images, and other forms of multimedia, smart classrooms aim to

increase student engagement and facilitate a deeper understanding of the subject matter (Dixit, 2023). Smart classes are equipped with variety of engaging educational technology tools, such as laptops, projectors, digital whiteboards, tablets, video conferencing tools, educational apps, among others (Nimisha & Chellamani, 2018). These technological features are used to enhance teaching and learning experiences. This encompasses both the pedagogical tools employed for teaching and learning, as well as the technological knowledge and skills acquired within the classroom.

The efficacy of the smart classroom technique has never been more apparent. The college-level smart classrooms are furnished with advanced technology that facilitates learning for both educators and students. These include docking stations and connectors for laptops, as well as the ability to connect to overhead projectors for presentations (Dixit, 2023). Such technology focused interactive learning environment ignites excitement among the students towards the concept of innovation. The digitalized classroom has not only made learning interesting but also provides an opportunity for students to enhance their performances. Smart classrooms have technology assistance to make teaching and learning more meaningful. Moreover, this environment suits every individual with different learning styles and helps them to understand abstract concepts. It is interactive and builds rapport between teachers and students. Students are engaged in the learning process throughout and teachers get an instant and accurate assessment of learning outcomes achieved at the end of the class (Nimisha & Chellamani, 2018). Hence, utilization of this cutting-edge technology in educational institutions is rapidly becoming imperative. Every educational institution and progressive school in Nigeria will imminently experience the impact if utilized.

The importance of using smart classrooms in teaching and learning processes in schools cannot be overemphasized. This is because there are so many reasons why schools in Nigeria must modify their classrooms. The conventional classroom is being replaced by a smart classroom at educational institutions, including schools, colleges, and primary settings. The use of specialized equipment in every smart classroom transforms a conventional classroom into a smart classroom, even though the visual appearance of the space may remain unchanged. Every classroom is equipped with a diverse range of state-of-the-art technological enhancements that transform it into a smart classroom. The subsequent enumeration comprises a range of diverse technologies that can transform an ordinary classroom into an intelligent classroom. According to Dixit (2023) and Nimisha and Chellamani (2018), there is the presence of multimedia projector with a ceiling mount in a smart classroom which can project images onto a large screen from a computer, Videocassette Recorder, Digital Video Disc, and visual presenter; ceiling-mounted speakers that can project audio from a computer, microphone, DVD player, or VCR; pull-down screen-Used as a projection device display unit; computer-Used to access the Internet and give software presentations in the classroom, despite the fact that modern computers include DVD players. A cable is also made available for simple thumb drive connection. Schools can view projected images on a computer monitor without turning around to face the projection screen. The DVD player enables teachers and instructors to play educational DVDs or other materials to a class full of students. Many of these videos help enhance students learning in the classroom. Smart whiteboards are equally the upcoming trend in educational technology. These whiteboards enable the projection of computer pictures onto a screen so that both students and teachers can interact with them effectively.

The use of technology in the classroom has several benefits, including giving students access to opportunities and experiences they might not otherwise have. The

students are better able to learn new technology as they progress through life when they have access to technology in their daily lives. When kids are connected to the world technologically, they may learn much more. According to Dixit (2023) and Nimisha and Chellamani (2018), it enables for connectivity in multiple locations; this is to say that interactive technology solutions enable connectivity in multiple locations, creating the best conditions for remote collaboration and education. Students demonstrate more collaboration between peers and greater overall participation in the course when employing technological tools. Smart classroom makes way for a better understanding by replacing the lecture-style learning atmosphere in the classroom with one that emphasizes group collaboration. Students are becoming smarter as a result of classrooms becoming smarter. Smart classrooms can transform education by replacing traditional methods with technology-enabled learning, utilizing interactive displays, multimedia content, and internet-connected devices to boost engagement and improve understanding of complex concepts. These spaces enhance teaching efficiency, foster collaboration and allow personalized learning, transforming passive listeners into active participants.

Several empirical studies by some scholars have highlighted how smart classroom utilization has transformed the learning outcomes. Siddiqui and Masud (2016) conducted a study on a model system framework for smart classroom to boost education and management. This study revealed that smart classroom could assist instructors in resolving new challenges and enhance students' capabilities and performance. Similarly, Yaptic and Karakoyun (2016) studied the high school students' attitude towards smart board used in biology classes. The students were found positive in attitude towards the smart class and did not differ statistically with respect to the variables of gender and smart board use time. Talessara (2016) found that the smart class is more effective than traditional class and significantly enhanced the achievement of the higher secondary students. Chacha (2015) equally made a comparative study of schools with and without smart classroom in order to determine the achievement motivation of students and found that there is an increase in student modalities or sensory learning in this technique compared to traditional teaching, a large percentage of students in schools with smart classrooms are highly motivated towards achievement. These empirical findings actually demonstrated the importance of smart classroom use for quality instructional delivery in secondary schools especially at this digital age where many nations have keyed into the use. Some theorists equally lend support to this venture.

This study has some back-ups from some theoretical framework, the social constructivist theory by Lev Vygotsky (1920-1934) and engagement theory (active learning through "relate-create-donate"). Vygotsky developed his social constructivist theory during the 1920s and early 1930s. This study was anchored on constructivist learning theory (social interaction and self-development) theory by Lev Vygotsky (1920-1934) and engagement theory by Greg Kearsley and Ben Shneiderman (1999). The Constructivist Learning Theory is viewed as the foundation of smart classrooms. This theory emphasizes that students build their own understanding through interactions with technology, peers, and instructors, rather than passive reception. It states that learners actively construct knowledge rather than passively absorb information. By integrating new experiences with prior knowledge, learners build their own understanding of reality. Learners are not empty vessels but actively create knowledge through experiences and reflection. On the other hand, Engagement theory developed by Greg Kearsley and Ben Shneiderman (1999) is a framework for technology-based teaching and learning emphasizing that students must be meaningfully engaged through interaction, collaboration, and authentic, project-based tasks. It argues that technology should be used

to facilitate meaningful engagement through collaboration and importantly, project-based. It posits that technology facilitates this engagement, fostering motivation and real-world skill application. Thus, these two theories provide the right framework for understanding how utilization of smart classroom can enhance teaching and learning experiences of students by engaging students in meaningful, relevant, and collaborative learning.

However, there are some factors which pose as constraints to effective utilization of smart classroom in secondary schools in Enugu Education Zone. Some of these constraints include: not all students have access to the same technical resources, students may be exposed to websites and connections that are not appropriate for them, distraction may come along with using technology in the classroom (Dixit, 2023). According to Nimisha and Chellamani (2018), many teachers are not technologically-driven and lack internet literacy to help students surf for only useful materials, many teachers digital competences are poor that they it might not be possible for them to control smart classrooms while many teachers are ill-equipped with the basic digital pedagogical knowledge and skills that will make them competent in technology-driven classrooms. Others, according to the scholars, are that while some teachers may embrace the use of smart classroom in teaching and learning processes, there may be some of them who would perceive it as a substantial altercation that they are unwilling to adopt as well as that most schools are not equipped with the tools or technologies for smart-driven classrooms. Petterson (2021) equally emphasized that there is inadequate provision of digital devices and development of digital learning platforms in most schools in Nigeria. The constraints notwithstanding, it is noteworthy that the issue of digitalizing education system has become a global concern. In fact many nations are reviewing their education curricula so as to better prepare students, who inhabit a virtual world, with digital knowledge and skills they need now and in the future. The Nigerian government has been making concerted efforts through policies, bye-laws, provision of computers, among others, to ensure technology-driven classrooms. However, it appears that teachers' inabilities to engage in an online classroom environment undermine the government's efforts. The seismic shift to teaching with modern technologies has placed new roles and demands on public secondary schools teachers and administration to change from the traditional methods of teaching with textbooks, chalk/blackboards to blended learning in the classrooms, hence, the need for a change.

Statement of the Problem

The issue of digitalizing education system has become a global concern. Many nations are reviewing their education curricula to better prepare students, who inhabit the virtual world, with digital knowledge and skills they need now and in the future. With the utilization of smart classrooms in schools, students would be better placed to manipulate their skills and knowledge to be able to survive in a technology-driven world. The seismic shift to teaching with modern technologies has placed new roles and demands on secondary school teachers to change from the traditional methods of teaching with textbooks, chalk/blackboards to blended and other forms of learning in the classrooms. Also, lessons are no longer enjoyable, engaging, or a useful learning tool for students in the classrooms, hence, many students usually doze off while lessons are going on. This is simply because the traditional method of teaching is no longer impressive and catchy to the students. The use of technology in the classroom can make lessons more engaging and enjoyable for all students. Many researchers have shown that technology has been an effective way of communicating information. Many teachers all over the world have shifted away from the traditional method of teaching and have integrated technology or smart classrooms in their teaching. Educational stakeholders are worried that using 19th

century tools and skills to teach in this 21st century will leave many students in Nigeria, particularly in Enugu State behind in this digital era. Hence, the researcher is worried about the extent smart classrooms can effectively be utilized to enhance quality instructional delivery and learning outcomes. This, however, underscored the problem of this study.

Purpose of the Study

1. Identify the extent to which smart classroom can be used for quality instructional delivery in public secondary schools in Enugu Education Zone?
2. Investigate the constraints to effective utilization of smart classroom in public secondary schools in Enugu Education Zone.

Research Questions

1. The following research questions guided the study:
2. To what extent can smart classroom be used for quality instructional delivery in public secondary schools in Enugu Education Zone?
3. What are the possible constraints to effective utilization of smart classroom in public secondary schools in Enugu Education zone?

Hypothesis

The following null hypothesis formulated and tested at 0.05 level of significance guided the study:

H₀₁: There is no significance difference between the mean ratings of the principals and teachers on the extent to which smart classroom can be used for quality instructional delivery in public secondary schools in Enugu Education Zone.

Methods

This study adopted a descriptive survey research design. The population of the study was 1609 staff, which comprised of 33 principals and 1576 teachers in the 33 public secondary schools in the three LGAs in Enugu zone. The sample size was 351 respondents; this was made up of the 33 principals of the public secondary schools in the zone and 318 teachers which was obtained through multi-stage sampling technique. Firstly, Taro Yamane's sampling formula was used to determine the sample size of 318 out of the 1576 teachers' population, Secondly, stratified proportionate random sampling technique was used to distribute the sample of 318 respondents in the 3 local government areas and across the 33 public secondary schools accordingly. All the 33 principals in the zone were used. The instrument that was used for data collection was a self-designed 24-item questionnaire titled: Smart Classroom Utilization for Quality Instructional Delivery (SCUQID). The questionnaire was structured after the four-point modified Likert rating of Very High Extent, High Extent, Low Extent and Very Low Extent and Strongly Agree, Disagree and Strongly Disagree, with the ratings of points of 4, 3, 2 and 1 respectively. The instrument was duly validated by three experts in Educational Foundations (Educational Administration and Planning Unit) and Science Education (Test and Measurement), all from the Faculty of Education, University of Nigeria, Nsukka. The reliability of the instrument was tested using the Cronbach Alpha's method to establish the internal consistency of the questionnaire items, and the coefficients of 0.81 and 0.88 were obtained for the two clusters respectively, with an overall of 0.93 hence, they were adjudged to be reliable for the study. Mean and standard deviation were used to answer the research questions while t-test was used to test the null hypothesis at 0.05 level of significance. Any item with the mean score of 2.50 and above was rated as acceptance while the ones with 2.49 and below were not accepted.

Results

Research Question One: To what extent can smart classroom be used for quality instructional delivery in public secondary schools in Enugu Education Zone?

Mean and standard deviation on the extent to which smart classroom can be used for quality instructional delivery in public secondary schools

S/N	Items	Principals Mean	SD	Decision	Teachers Mean	SD	Decision
1.	Smart classrooms enable connectivity in multiple locations, creating the best conditions for remote collaboration and education.	2.77	0.97	HE	2.81	1.13	HE
2.	Teachers can experiment with pedagogy thereby gaining more knowledge on how to successfully plan and carry out a class that uses technology.	3.53	0.45	VHE	2.72	1.18	HE
3.	It aids a better understanding by replacing the lecture-style learning atmosphere with one that fosters group collaboration.	2.58	1.04	HE	2.84	1.07	HE
4.	The technological solution in smart classroom offer rapid evaluation so that students can get feedback right away.	3.10	0.95	HE	2.89	1.12	HE
5.	In smart classroom, different technologies can be integrated to enhance the learning process.	2.84	0.88	HE	2.73	1.08	HE
6.	It strengthens the relationship between students and teachers by promoting dialogues and uncovering novel and unconventional ideas.	3.42	0.83	HE	3.75	1.00	VH E
7.	It increases or boosts students' engagement through multimedia tools which are more relevant to students.	3.57	0.51	VHE	3.75	0.48	VH E
8.	It improves teaching and learning experience from many different learning styles supported by these technologies.	3.10	0.93	HE	2.67	1.02	HE
9.	It can automate a lot of a teacher's tiresome tasks.	2.75	1.06	HE	3.21	0.89	HE

10.	It replaces passive instruction with interactive technology-driven experiences, giving teachers a completely new methods of presenting knowledge to students.	3.44	0.82	HE	3.74	1.04	VH E
11.	In smart classroom, students who have internet connections are given tremendous exposure and access to information since it allows them to think and feel beyond the box.	3.20	0.93	HE	3.10	0.93	HE
12.	In smart classroom, teachers and students can pinpoint one's strengths or shortcomings in a variety of academic areas and highlight areas or topics that require further attention or revision	3.55	0.82	VHE	3.75	1.07	VH E
Cluster Mean		3.15	0.85	HE	3.16	1.00	HE

Table 1 shows the mean and standard deviation of principals' and teachers' responses on the extent to which smart classroom can be used for quality instructional delivery. From the table, the principals' mean ratings ranged from 2.58 to 3.57, while the teachers' mean ratings ranged from 2.67 to 3.75. With mean values of 3.53, 3.57 and 3.55 for principals for items 2, 7 and 12 and 3.75, 3.74 and 3.75 for items 6, 7, 10 and 12 for teachers, these indicate Very High Extent and the cluster mean indicate High Extent. The principals' cluster mean of 3.15 with a standard deviation of 0.85 indicates High Extent, whereas the teachers' mean values of 3.75 for item 12 indicates Very High Extent in consonance with the principals which is 3.55. The principles cluster mean of 3.15 and teachers' cluster mean of 3.16 with a standard deviation of 0.85 and 1.00 respectively also indicate a High Extent that smart classroom can be utilized for quality instructional delivery.

Ho₁: There is no significant difference between the mean ratings of principals and teachers on the extent to which smart classroom can be utilized for quality instructional delivery in public secondary schools in Enugu Education Zone.

Table 2: t-test calculation of the difference between the mean ratings of principals and teachers on the extent to which smart classroom can be utilized for quality instructional delivery in public secondary schools in Enugu Education Zone

Status	N	Mean	SD	Df	t-value	P-value
Principals	31	3.15	.85	333	-0.06	0.95
Teachers	304	3.16	1.00			

Data in Table 2 revealed that the principals have mean and standard deviation scores of 3.15 and 0.85 while teachers have mean and standard deviation scores of 3.16 and 1.00 respectively. The results from the test shows $t(333) = -0.06$, $P(.095) > 0.05$. Thus, the null hypothesis of no significant difference was not rejected since the p-value (.95) is greater than 0.05 level of significance. Therefore, there is no significant difference between the mean ratings of principals and teachers on the extent to which smart classroom can be utilized for quality instructional delivery in public secondary schools in Enugu Education Zone.

Research Question Two: What are the possible constraints to effective utilization of smart classroom in public secondary schools in Enugu Education Zone?

Mean and standard deviation on how smart classroom can be utilized for quality instructional delivery in public secondary schools in Enugu Education Zone

S/N	Items	Principals Mean	SD	Decision	Teachers mean	SD	Decision
13.	It is possible that many students may not have access to technical resources.	3.03	0.91	A	3.76	0.45	SA
14.	Providing students access to anonymous profiles and limitless contact options is a recipe for cyberbullying catastrophe.	2.61	1.07	A	2.69	0.95	A
15.	The technology might influence students negatively by making them always glued to their devices thereby giving rise to a whole new set of social problems.	3.74	0.35	SA	3.67	0.48	SA
16.	It might lead to continual cheating since having quick access to materials can really cause issues when taking tests.	2.71	1.06	A	3.64	0.91	A
17.	Technology can be a distraction since having so many enticing social media sites available can make students to easily lose focus	3.36	1.02	A	3.71	0.93	A
18.	Students can get improper information by being exposed to some websites and connections that are not appropriate for them because internet connectivity is around-the-clock.	3.26	0.76	A	2.88	0.98	A
19.	It might impact on the educational system since many students might lose focus thereby lowering the education standard.	3.59	0.52	SA	3.84	0.96	A
20.	Many teachers' digital competences are poor that controlling smart classrooms might be impossible.	2.95	0.89	A	3.76	0.22	SA
21.	Many teachers are not technologically-driven that they lack the internet literacy to help students surf for only useful materials.	2.97	0.93	A	2.90	0.90	A
22.	So many teachers are ill-equipped with the basic digital pedagogical knowledge and skills that will make them competent in technology-driven classrooms.	3.87	1.13	SA	3.88	0.20	SA
23.	Most schools are not equipped with the tools or technologies for smart-driven classrooms.	3.26	0.76	A	3.67	0.43	SA
24.	While some teachers may embrace the use of smart classroom in teaching and learning processes, there may be some of them who would perceive it as a substantial	3.59	0.52	SA	3.59	0.62	SA

	altercation that they are unwilling to adopt.						
25.	The technologies are costly for schools or parents to purchase them for use in the smart classroom.	3.74	0.32	SA	3.84	0.91	A
26.	Supply of electricity in Nigeria is too poor to conveniently accommodate or support smart classroom	3.27	0.45	A	3.56	0.64	SA
Cluster Mean		3.28	0.76	A	3.53	0.75	SA

Table 3 presents the mean and standard deviation of responses from principals and teachers on the possible constraints to effective utilization of smart classroom in public secondary schools in Enugu Education Zone. The results reveal that the principals' mean ratings ranged from 2.61 to 3.87, while the teachers' mean ratings ranged from 2.69 to 3.88. The cluster mean for principals is 3.28 with a standard deviation of 0.76, and that of teachers is 3.53 with a standard deviation of 0.75. Both means fall within the range of 2.50–3.49, indicating that respondents Agreed that there are several constraints to effective utilization of smart classroom in public secondary schools in Enugu Education zone.

Discussion of Findings

With reference to research question one which dealt with the extent to which Smart Classroom can be utilized for quality instructional delivery in secondary schools in Enugu Education Zone, the findings revealed among others, that smart classroom to a high extent enables connectivity in multiple locations, teachers can experiment with pedagogy, it aids a better understanding, offers rapid evaluation, boosts students engagement, improves teaching and learning experience, students are given tremendous exposure and access to information, replaces passive instruction with interactive technology-driven experience, teachers and students can pinpoint one another's strengths and shortcomings. The findings are consistent with that of Dixit (2023) and Nimisha and Chellamani (2018), who stated that it enables connectivity in multiple locations; this is to say that interactive technology solutions enable connectivity in multiple locations, creating the best conditions for remote collaboration and education. Students demonstrate more collaboration between peers and greater overall participation in the course when employing technological tools. Smart classroom makes way for a better understanding by replacing the lecture-style learning atmosphere in the classroom with one that emphasizes group collaboration. Also, the findings are in consistent with Siddiqui and Masud (2016) whose study revealed that smart classroom could assist instructors in resolving new challenges and enhance students' capabilities and performance. Moreover, Yapic and Karakoyun (2016) studied high school students' attitude towards smart board used in biology classes and found that students were found positive in attitude towards the smart class and did not differ statistically with respect to the variables of gender and smart board use time. Talessara (2016) also found that the smart class is more effective in achieving quality instructional delivery than traditional class and significantly enhanced the achievement of the higher secondary students. Chacha (2015) equally found out in his study that there is an increase in student modalities or sensory learning in smart classroom compared to traditional teaching and that a large percentage of students in schools with smart classrooms are highly motivated towards achievement.

The hypothesis tested revealed that there is no significant difference between the mean ratings of principals and teachers on the extent to which smart classroom can be utilized for quality instructional delivery in public secondary schools in Enugu Education zone. This implies that both categories of respondents were of similar opinion, to a high

extent, that smart classroom can be used for quality instructional delivery in public secondary schools. Therefore, utilization of smart classroom for instructional delivery promotes quality teaching and engages students more than the conventional classroom and this makes way for continuous improvement in education quality.

Moreover, the findings of the study also confirms the Constructivist Learning Theory which emphasizes that students build their own understanding through interactions with technology, peers, and instructors, rather than passive reception and that learners actively construct knowledge rather than passively absorb information. Also, the Engagement theory by Greg Kearsley and Ben Shneiderman(1999), emphasizes that students must be meaningfully engaged through interaction, collaboration, and authentic, project-based tasks. It further stated that technology should be used to facilitate meaningful engagement through collaboration and more importantly, project-based, technology facilitates engagement as well as fosters motivation, hence, the need for the use of smart classroom in secondary schools.

The findings of the study also revealed that there are some possible constraints to effective utilization of smart classroom in public secondary schools in Enugu Education Zone and these among others, include: Many students may not have access to the technical resources, the technology might influence students negatively by making them always glued to their devices thereby giving rise to a whole new set of social problems, most schools are not equipped with the tools or technologies for smart-driven classrooms, the tools or technologies are costly for schools or parents to purchase them for use in the smart classroom, supply of electricity in Nigeria is too poor to conveniently accommodate or support smart classroom, many teachers are ill-equipped with the basic digital pedagogical knowledge and skills that will make them competent in technology-driven classrooms.

The findings are in consonance with the articulations of Dixit (2023) who stated that some of the constraints are that not all students have access to the same technical resources, students may be exposed to websites and connections that are not appropriate for them, distraction may come along with using technology in the classroom. Similarly, Nimisha and Chellamani (2018) found in their study, among others, that many teachers are not technologically-driven and lack internet literacy to help students surf for only useful materials, many teachers digital competences are poor that it might not be possible for them to control smart classrooms while many teachers are ill-equipped with the basic digital pedagogical knowledge and skills that will make them competent in technology-driven classrooms. Petterson (2021) equally emphasized that there is inadequate provision of digital devices and development of digital learning platforms in most schools in Nigeria. Despite these constraints, it is still pertinent that secondary schools in Nigeria join the digital era by utilizing smart classrooms in instructional delivery.

Conclusion

The results reveal that smart classroom is more effective in efficient learning processes. Its environment ignites excitement among the students and makes learning interesting. Smart classrooms have technology assistance to make teaching and learning more meaningful and suit every individual with different learning styles and help them understand abstract concepts. It is interactive and builds rapport between teachers and students and students are actively engaged in the learning process throughout. Hence, technology-based smart classrooms need to be used in schools.

Recommendations

Based on the findings of the study, the following recommendations were made:

- 1) Utilization of smart classroom requires reliable infrastructure, government should make available for schools the facilities and technologies required so that our secondary schools can join the trend
- 2) There should be continuous teacher training in digital pedagogy, and culturally relevant digital content
- 3) Administrators should also bridge the urban-rural digital divide to ensure equitable access for all students.

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