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EDITORIAL

Journal of Science Education and Research (JSER) is a peer-reviewed published Bimonthly. It aimed at advancing knowledge and professionalism in all aspects of educational research, including but not limited to innovations in science education, educational technology, guidance and counselling psychology, childhood studies and early years, curriculum studies, evaluation, vocational training, planning, policy, pedagogy, human kinetics, health education and so on. JSER publish different types of research outputs including monographs, field articles, brief notes, comments on published articles and book reviews.

We are grateful to the contributors and hope that our readers will enjoy reading these contributions.

Prof. Patrick C. Igbojinwaekwu
Editor-in-Chief

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**PERCEPTION AND ATTITUDES OF BASIC SCIENCE TEACHERS
TOWARDS THE USE OF VIRTUAL CLASSROOM IN AWKA EDUCATION
ZONE**

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Abstract

The study investigated the perceptions and attitudes of basic science teachers towards the use of virtual classroom in teaching and learning of Basic science in Awka Education zone. The study adopted a descriptive survey research design. The population for the study consists of all 33 basic science teachers in the 19 public secondary schools in Awka Education zone of Anambra State. The sample size involves the 33 Basic teachers, because the population is small and available for the study. The instrument used for collection of data is a structured questionnaire developed by the researchers titled "Basic Science Teachers' Perception and Attitude Towards the Use of Virtual Classroom Questionnaire (BSTPATUVCQ)". The instrument was validated and an internal consistency of 0.85 yielded using Cronbach Alpha technique. Data was collected and analyzed using arithmetic mean. The findings of the study revealed that Basic Science teachers perceive virtual classrooms as a tool that simplifies teaching ($m=3.48$) and enhances teaching efficiency in delivering basic science contents ($m=3.45$). The findings of the study also revealed that teachers have a positive attitude towards the use of virtual classrooms ($m=3.54$), and motivates them to explore new teaching methods ($m=3.42$). Based on the findings, the study recommends that Policy makers should allocate funding to improve digital infrastructure in schools, ensuring reliable internet access and technology resources are available to support virtual classrooms effectively. School administrators should facilitate regular workshops focused on virtual teaching methodologies and tools to help teachers adapt to and utilize virtual classrooms more effectively.

Keywords: Perception, Attitudes, Virtual Classroom

Introduction

Science is the study of nature and natural occurrences in order to find its principles and laws. Science involves all conscious activities that man engages in to understand nature and its components. Science, according to Abimbola (2013), can be seen as a body of knowledge; it could also mean a way or method of investigation and a way of thinking in an attempt to understand nature. Science can also be viewed as a highly skilled technique or practice. In more contemporary terms, science is a system of acquiring knowledge based on the scientific process or method in order to organize a body of knowledge gained through research. Science plays a pivotal role, providing students with the basic conceptual framework and analytical tools necessary to explore and understand natural phenomena together with a better understanding in form of basic science.

Basic science is defined as a cumulative approach of scientific study that synthesizes the prospective of the individual disciplines (Elbakkal, 2020). Basic science encompasses foundational subjects such as biology, chemistry, and physics (Christian-Ike & Okoli, 2021) providing both teachers and students with the fundamental knowledge and skills needed to understand the natural world and engage with scientific inquiry. Basic science education plays a vital role in fostering critical thinking, problem-solving, and scientific literacy, essential for addressing global challenges and developing innovative technologies. According to Bybee (2019), basic science education helps develop "scientific literacy, which is critical for making informed decisions about personal and societal issues". Kennedy (2020) notes that basic science education is crucial for STEM career preparation and citizenship.

Basic science is the foundation upon which technological innovation and economic growth are built (Adebayo, 2018) but faces numerous challenges that hinder its effectiveness and impact. One major challenge is the inadequate infrastructure and resources, including laboratories, equipment, and textbooks (Adebayo, 2018; Obanya, 2017). Additionally, the scarcity of qualified science teachers, particularly in rural areas, exacerbates the problem (Ogunleye, 2020; UNESCO, 2019). Poor teacher training and professional development opportunities also limit the delivery of quality science education (Adeyemo, 2019; Omolewa, 2018). Furthermore, the curriculum has been criticized for being outdated and not aligned with global standards (Federal Ministry of Education, 2014). Students' lack of interest and motivation in science subjects, partly due to the abstract nature of the subjects and inadequate practical

experiences, is another concern (Balogun, 2019; Okebukola, 2017). Finally, assessment methods that focus on rote memorization rather than critical thinking and problem-solving skills hinder the development of scientific literacy (Afolabi, 2020). Addressing these challenges is crucial to improving basic science education in Nigeria.

Nigeria's Basic Education Certificate Examination (BECE) results have consistently shown an unsatisfactory trend in academic achievement, particularly in basic science. The West African Examinations Council (WAEC) has reported a decline in students' performance in science subjects over the years (WAEC, 2020). This poor performance can be attributed, in part, to the ineffective teaching methods employed in basic science classrooms. Research has revealed that traditional teaching methods, such as lecture-based instruction and rote memorization, dominate the teaching landscape (Adebayo, 2018; Obanya, 2017). These methods often fail to engage students, promote critical thinking, and foster deep understanding of scientific concepts. Furthermore, the limited use of hands-on activities, experiments, and technology integration exacerbates the problem (Okebukola, 2017; Adeyemo, 2019). The over-reliance on textbooks and lack of contextual learning experiences also contribute to students' lack of interest and motivation in science subjects. To address this issue, there is a need to shift towards more innovative and student-centered teaching approaches, such as inquiry-based learning, project-based learning, and STEM education, which can enhance students' understanding and retention of scientific concepts.

Observations suggest that the integration of technology in basic science classrooms in Nigeria remains remarkably low, which may significantly contribute to students' poor achievement in the subject. Research has consistently shown that the effective use of technology can enhance teaching and learning outcomes in science education (Adebayo, 2018; UNESCO, 2019). However, studies have revealed that many basic science teachers in Nigeria lack the necessary training and support to effectively utilize technology in their classrooms (Obanya, 2017; Ogunleye, 2020). Consequently, this has resulted in a reliance on traditional teaching methods, which often fail to engage students and promote deep understanding of scientific concepts (Balogun, 2019). As noted by Okebukola (2017), "the absence of technology in science classrooms limits students' opportunities for hands-on learning and experimentation." Furthermore, Adeyemo (2019) found that students' poor performance in basic science is correlated with the inadequate use of educational technologies. Addressing this technology gap is crucial to improving teaching and learning outcomes in basic science education. Thus a virtual classroom is recommended in basic science classes.

Virtual classrooms provide an interactive platform for basic science students to engage with complex concepts, simulations, and experiments remotely. This integration enhances accessibility, flexibility, and engagement, allowing students to explore scientific principles through immersive experiences. Virtual labs, 3D modeling, and augmented reality enable hands-on learning, bridging the gap between theory and practice. Moreover, virtual classrooms facilitate collaboration, real-time feedback, and personalized instruction, catering to diverse learning styles. By leveraging virtual classrooms, basic science education becomes more inclusive, efficient, and effective, preparing students for a technologically advanced and scientifically driven future.

The virtual classroom is defined as a learning system that includes all necessary course materials and provides the same opportunities for the teaching and learning process beyond the physical classroom walls and boundaries (Rufai, Alebiosu, & Adeakin, 2015). A virtual classroom is a technology-enabled learning environment that facilitates remote teaching and learning through digital platforms, tools, and resources. According to Rovai (2015), "a virtual classroom is a web-based learning environment that allows students and instructors to interact in real-time, regardless of geographical location". Alammery et al. (2015) also define virtual classroom as "an online learning space where students and teachers engage in synchronous or asynchronous interactions, using various digital tools and multimedia resources". As noted by Bower et al. (2015), virtual classrooms "leverage video conferencing, social learning platforms, and multimedia tools to create an immersive and interactive learning experience". These digital learning environments offer flexibility, accessibility, and scalability, enabling students to learn anytime, anywhere (Pallof & Pratt, 2015).

In conclusion, the effective integration of virtual classrooms in basic science is crucial for enhancing teaching and learning outcomes, addressing the persistent poor performance in basic science examinations, and preparing students for an increasingly digital world. However, the success of this initiative depends significantly on the perception and attitude of basic science teachers towards virtual classroom technology. Therefore, it is essential to investigate and understand the teachers' perception and attitude towards virtual classrooms, identifying potential barriers, concerns, and motivations that may influence their adoption and effective utilization of this technology. This understanding will inform targeted interventions, training programs, resource allocation, and support systems to facilitate seamless integration of virtual classrooms into basic science education, ultimately ensuring the effective integration of virtual classrooms and improved learning outcomes in basic science.

Statement of the Problem

Basic science refers to the fundamental study of the natural world, encompassing disciplines such as biology, chemistry, physics, and earth sciences. It involves the systematic exploration and investigation of the underlying principles and laws governing the physical universe, living organisms, and the environment. Basic science aims to advance knowledge and understanding of the world around us, fostering critical thinking, curiosity, and innovation. By exploring the underlying mechanisms and processes, basic science lays the foundation for applied sciences, technology, and practical applications.

Despite the potential benefits of virtual classrooms in enhancing teaching and learning experiences in basic science education, there is a lack of understanding regarding the perceptions and attitudes of basic science teachers towards the adoption and utilization of virtual classrooms, hindering effective integration and optimal utilization of this technology. It has been observed that students perform poorly in the BECE exams. So many factors had been attributed to their failure but less empirical evidence was observed on the use of virtual classroom in teaching basic science. As the world is technically developing, there is a great need to determine the perception and attitude of teachers in the use of virtual classroom in teaching and learning of science. Thus, this study seeks to determine the basic science teachers' perception and attitude towards the use of virtual classroom in teaching of Basic science in Awka Education zone.

Purpose of the Study

This study aims to explore the perceptions and attitudes of basic science teachers in Awka Education zone. Specifically, the study seeks to determine;

1. Basic science teachers' perception towards the use of virtual classroom in teaching of Basic science.
2. Basic science teachers' attitude towards the use of virtual classroom in teaching of Basic science.
3. Challenges facing the use of virtual classroom in teaching of Basic science in Awka Education zone
4. The suggestions to improving the challenges facing the use of virtual classroom in teaching of Basic science in Awka South LGA.

Research Questions

The following research questions guided the study:

1. What are the Basic Science teachers' perception towards the use of virtual classroom in teaching of Basic Science
2. What are the Basic Science teachers' attitudes towards the use of virtual classroom in teaching of Basic Science
3. What are the challenges affecting the use of virtual classroom in teaching of Basic Science.
4. What are the suggestions to improving the challenges facing virtual classrooms in teaching of Basic Science

Methodology

The study adopted a descriptive survey research design. The study was carried out in Awka Education zone of Anambra State. The population for this study consists of all 33 basic science teachers in the 19 public secondary schools in Awka Education zone of Anambra State, (Post Primary School Service Commission, 2024). The study involves 33 basic science teachers from 19 public secondary -schools. This is because the population is small and available for the study. The instrument used for collection of data is a structured questionnaire developed by the researchers. The research instrument titled "Basic Science Teachers' Perception and Attitude Towards the Use of Virtual Classroom Questionnaire (BSTPATUVCQ)" consists of 5 research questions and their items. The respondents were required to respond to each of the items using a four-point Likert-like rating scale of Strongly Agree, Agree, Disagree, Strongly Disagree. The teachers were requested to respond to the statement by choosing the most appropriate response from the scale. Validation of the instrument was done by three experts. Two (2) lectures from the Department of science education and one from educational foundation (measurement and evaluation) all in the faculty of Education, Nnamdi Azikiwe University, Awka. They were requested to scrutinize the items in the instrument for clarity, ambiguity in language, repetition ideas and content coverage. Some items were removed or modified owing to the suggestions of the experts to produce the final draft of the instrument.

The reliability of the instrument was that of internal consistency, using Cronbach Alpha. To ascertain this, the questionnaire was administered to twelve teachers in 4 selected schools in Ogidi Education Zone of Anambra State. The data obtained from

the administered questionnaire was analyzed using Cronbach Alpha method. The reliability was found to be 0.85 showing high reliability. The data collected was analyzed using mean and standard deviation. The acceptance point for the mean ($\bar{x}$) of the nominal values assigned was calculated as;

$$\bar{x} = \frac{4+3+2+1}{4} = 2.5$$

Therefore, any item that has a mean rating ($\bar{x}$) such that;

- a) $\bar{x} > 2.5$ are regarded as accepted by the respondents.
- b) $\bar{x} < 2.5$ is regarded as rejected by the respondents.

PRESENTATION AND ANALYSIS OF DATA

Data collected, were presented and the result analyzed based on research questions.

Research Question 1: What are the Basic Science teachers' perceptions towards the use of virtual classroom in teaching of Basic Science

Table 1: Mean and Standard Deviation of Basic Science Teachers' Perception towards the use of Virtual Classroom in Teaching of Basic Science

S/N	ITEMS	SA	A	D	SD	MEAN ($\bar{X}$)	SD A	REMARK
1	Experiences in virtual classroom make basic science teaching easier for me.	21	10	2	0	3.48	0.56	Accepted
2	Virtual classroom allows me to engage students effectively in basic science classes.	19	9	5	0	3.42	0.77	Accepted
3	Virtual classroom is easy for me to use while teaching Basic Science.	16	10	6	1	3.30	0.79	Accepted
4	Virtual classroom promote my relationship with students.	18	7	5	3	3.33	1.06	Accepted
5	Virtual classroom enhances my efficiency in delivering science contents	20	9	3	1	3.45	0.85	Accepted
Grand Mean		3.39						

The analysis in Table 1 indicate that all the items in the table had a mean score that is above the cutoff point of 2.50, with overall Grand mean of 3.39. This implies that the respondents agreed that all the items are the Basic Science Teachers' perception towards the use of virtual classroom in teaching Basic Science.

Research Question 2: What are Basic Science teachers' attitudes towards the use of virtual classroom in teaching Basic Science

Table 2: Mean and Standard Deviation of Basic Science teacher's attitude towards the use of virtual classroom in teaching of Basic Science.

S/N	ITEMS	SA	A	D	SD	MEAN	SD	REMARK
6	I enjoy teaching Basic Science in virtual classroom.	17	12	4	0	3.39	0.68	Accepted
7	I prefer teaching science in a virtual classroom over a traditional classroom.	14	13	6	0	3.24	0.73	Accepted
8	I feel confident using virtual classroom technologies for teaching Basic Science	9	13	9	2	2.87	0.87	Accepted
9	Virtual classroom motivates me to explore new teaching methods	18	9	4	2	3.42	0.81	Accepted
10	I am willing to continue using virtual classroom for teaching Basic Science in the future	22	9	2	0	3.54	0.49	Accepted
Grand Mean		3.29						

The analysis in Table 2 indicates that all the items in the table had a mean score that is above the cutoff point of 2.50, with overall grand mean of 3.29. This implies that the respondents agreed that all the items are the Basic Science teachers' attitude towards the use of virtual classroom in teaching of Basic Science.

Research Question 3: What are the challenges affecting the use of virtual classroom in teaching of Basic Science?

Table 3: Mean and Standard Deviation of challenges affecting the use of virtual classroom in teaching of Basic Science.

S/N	ITEMS	SA	A	D	SD	MEAN	SD	REMARK
11	I often face technical difficulties when using virtual classroom	7	17	8	1	2.90	0.71	Accepted
12	It is usually challenging for me to maintain student participation in virtual classroom	2	8	18	5	2.33	0.80	Rejected
13	Engaging student in hand-on activities and experiment in virtual classroom is difficult for me	4	9	15	5	2.57	0.89	Accepted
14	Assessment of student's learning/performance is difficult in virtual classroom.	5	16	11	1	2.69	0.56	Accepted
15	I struggle to find appropriate digital tools to effectively teach basic science in a virtual classroom	3	13	16	1	2.54	0.60	Accepted
Grand Mean		2.60						

The analysis in Table 3 revealed that the mean score of item 12 is 2.33. This means that the respondent disagreed that the items 12 is not the challenges affecting the use of virtual classroom in teaching and learning of Basic Science, while the agreed that items 11, 13, 14, and 15 with the mean score of 2.90, 2.57, 2.63 and 2.54 respectively with an overall grand mean of 2.60 are the challenges affecting the use of virtual classroom in teaching and learning of Basic Science.

Research Question 4: What are the prospect towards the challenges facing the use of virtual classroom in teaching of Basic Science

Table 4: Mean and Standard Deviation of suggestions to improving the challenges facing the use of virtual classroom in teaching of Basic Science

S/N	ITEM	SA	A	D	SD	MEAN	SD	REMARK
16	I believe that regular technical support would resolve issues faced in virtual classroom.	15	16	2	0	3.33	0.57	Accepted
17	Regular training on virtual classroom technologies would improve my teaching experience.	17	13	3	0	3.39	0.67	Accepted
18	I feel that incorporating more interactive tools (quizzes) would improve my teaching experience.	14	14	5	0	3.27	0.74	Accepted
19	Virtual laboratory simulations would help me to overcome the challenges of conducting hand-on experiments.	15	15	3	0	3.30	0.55	Accepted
20	Ensuring reliable internet access for virtual classroom would reduce technical disruptions encountered in virtual classroom.	15	16	2	0	3.33	0.57	Accepted
Grand Mean		3.32						

The analysis in Table 2 indicates that all the items in the table had a mean score that is above the cutoff point of 2.50, with overall grand mean of 3.32. This implies that the respondents agreed that all the items are the prospects towards the challenges facing the use of virtual classrooms in teaching and learning of Basic Science.

Discussion

The findings of the study are discussed based on the research questions that guided the study:

Basic Science Teachers' Perception towards the use of Virtual Classroom in teaching Basic Science

The findings on Basic science teacher perception towards the use of virtual classroom in teaching of Basic Science revealed that Basic Science teachers perceive virtual classrooms as a tool that simplifies teaching (mean = 3.48, SD = 0.56), enhances student engagement(mean = 3.42, SD = 0.77), , and is easy to use(mean = 3.30, SD = 0.79), . Teachers also reported that virtual classrooms improve their relation with students (mean = 3.33, SD = 1.06), . In summary, their perception towards using virtual classrooms is positive (mean = 3.45, SD = 0.85), . The findings of this study are in consonance with the findings of Hew& Cheung; Alenezi (2020) which indicate that teachers generally have a positive perception of using virtual classrooms for teaching. They noted that virtual classrooms enhance engagement, flexibility, and accessibility in the learning process. Teachers also appreciated the ability to manage the diverse student needs more effectively. However, the highlighted the need for adequate training and resources for successful implementation. This is also in agreement with Mhouth and Nesseh (2022). The study emphasizes that teachers view virtual classrooms positively in the context of teaching basic science. They reported that virtual classrooms improve student interaction, support personalized learning, and make content delivery more flexible and efficient. However, they emphasized the importance of continuous professional development and addressing technical challenges to maximize the benefits of virtual teaching.

Basic Science Teachers Attitude towards the use of Virtual Classroom in teaching of Basic Science.

The findings on Basic science teacher Attitude towards the use of virtual classroom in teaching of Basic Science revealed that Basic Science teachers have positive-attitude toward virtual classrooms. They enjoy teaching in a virtual setting(mean = 3.39, SD = 0.68), , prefer it over traditional methods(mean = 3.24, SD = 0.73), , and feel confident using virtual technologies(mean = 2.87, SD = 0.87), . Virtual classrooms motivate teachers to explore new teaching methods (mean = 3.42, SD = 0.81) and they are willing to continue using them in the future for teaching Basic Science(mean = 3.54,

SD = 0.49), . The finding of this study is in agreement with the findings of Kear, Williams, and Rosewell (2014) which that teacher generally has a positive attitude towards the use of virtual classrooms in teaching. They highlighted that virtual classroom promote flexibility in teaching, enabling teachers to engage students more effectively and cater to different learning styles. Teachers appreciated the ease of access to resources and communication tools that enhance collaborative learning. However, they also stressed the importance of providing adequate training and addressing potential technical challenges to ensure effective use of virtual classrooms

Challenges affecting the use of Virtual Classroom in teaching of Basic Science

The findings on Basic science teacher perception towards the use of virtual classroom in teaching of Basic Science revealed that teachers face significant challenges in using virtual classrooms for teaching basic science. These include technical difficulties (mean = 2.90, SD = 0.71) maintaining student participation(mean = 2.33, SD = 0.80) and difficulties in conducting hand-on activities and experiments(mean = 2.57, SD = 0.89) .Teachers also struggle with assessing student performance (mean = 2.69, SD = 0.56) and finding suitable digital tools for effective teaching (mean = 2.54, SD = 0.60). Despite these challenges, their overall attitude toward using virtual classrooms remains cautious but open to improvement. The finding of this study is in consonance with the findings of Ali (2020) they study highlighted several challenges affecting the use of virtual classrooms in teaching and learning, including inadequate access to technology and reliable internet connections, which create a digital divide. He also pointed out that many teachers lack the necessary training and familiarity with e-learning platforms, making it difficult to effectively engage students. Additionally, issues such as maintaining student motivation and participation, and the limited ability to conduct practical, hand-on activities were emphasized as major obstacles in virtual education, particularly for subject like basic science.

Suggestions to improving the Challenges facing the use of Virtual Classroom in Teaching of Basic Science

The findings on suggestions to improving the challenges facing use of virtual classroom in teaching and learning of Basic Science revealed that teachers believe regular technical support and training on virtual classroom technologies would enhance their teaching experience(mean= 3.33, SD=0.57), . They perceive that incorporating interactive tools, such as quizzes, and using virtual laboratory simulations could help

overcome challenges with hand-on experiments(mean = 3.39, SD = 0.67) . Teachers also emphasized that ensuring reliable internet access would reduce technical disruptions, further improving the effectiveness of virtual classroom for teaching basic science (mean = 3.27, SD = 0.74). The findings of this study is in agreement with the findings of Kebritchi, Lipschuetz, and Santiago (2017) which identified several prospects for addressing the challenges in using virtual classrooms for teaching and learning, particularly in science education. They emphasized the importance of providing regular technical support and professional development for teachers to enhance their comfort with virtual platforms. The use of interactive tools, such as simulations and digital assessments, was seen as key to engaging students and improving learning outcomes. They also highlighted the need for reliable infrastructure and continuous adaptation of infrastructure and continuous adaptation if instructional strategies to suit the online environment, which would help overcome common barriers in virtual classrooms.

Conclusion

The study concluded that Basic Science teachers have a positive perception and attitude towards virtual classrooms, appreciating their flexibility and ability to engage students. However, they face challenges like technical difficulties and conducting hand-on activities. Teachers believe that regular technical support, training, and interactive tools can help address these issues. Overall, they see virtual classrooms as a valuable tool for teaching Basic Science.

Recommendations

Based on the findings of this study, the following recommendations were made;

1. Policy makers should allocate funding to improve digital infrastructure in schools, ensuring reliable internet access and technology resources are available to support virtual classrooms effectively.
2. School administrators should facilitate regular professional development workshops focused on virtual teaching methodologies and tools to help teachers adapt to and utilize virtual classrooms more effectively.
3. Technology providers should collaborate with educators to develop user-friendly, interactive platforms and tools that cater specifically to the needs of science education, enabling more engaging and effective teaching and learning experiences.
4. Educational researchers should conduct further studies on the long-term impacts of virtual classrooms on student learning outcomes and teacher effectiveness in science education to inform future practices and policies.

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