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Impact of online classroom on students' study habits in chemistry in senior secondary schools in Ondo State, Nigeria

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Abstract

The study investigated the Impact of Online Classroom on Students' Study Habits in Chemistry in Senior Secondary Schools in Ondo State, Nigeria. It also determine the level of online classroom usage among Chemistry teachers in the state. Descriptive research design was employed in carrying out the work. The population for the study comprised all Senior Secondary School students in Ondo state. The sample for the study was 420 students selected from Senior Secondary School two in 12 schools in the state. 35 students were chosen from each of the 12 schools selected. The selection of the sample was in two stages. Stage one, simple random sampling technique was used in selecting 12 schools out of the 304 schools in Ondo state. Stage two involved the selection of 35 students from each school earlier selected using simple random sampling technique. A self-designed questionnaire was used in eliciting the required data for the study. The questionnaire was adequately taken through the necessary validation process before been used. The findings of the study revealed that most schools used in this study were fully acquainted with the use of online classroom and that the use of online classroom highly enhanced the students study habits in Chemistry. Base on the findings, it was recommended that all schools in Ondo state should be equipped with digital devises to encourage the use of online classrooms in the teaching of Chemistry. It was also recommended that Chemistry teachers should engage their students more during the online classes.

Keywords: Chemistry; Online Classroom; Digital devices; Senior Secondary School; Study Habits; Technology

1. Introduction

The contemporary world is increasingly dependent on technology in all human endeavors. According to Irungu (2023), technology has become an integral part of our daily lives, revolutionizing various aspects, including education. The implication of this for education is that students are exposed to different forms of technology, which allows them to interact better with abstract and concrete concepts in various disciplines. As noted by Silnels (2023), digital technologies have been seamlessly incorporated into the learning process, enhancing students' engagement with complex subjects. Since technology is playing a critical role in modern education, there is an urgent need for its convenient and efficient integration into the educational process so that well-trained individuals can be produced. Research by Irungu (2023) emphasizes that integrating technology in education is essential for preparing students to meet the demands of the modern world. One such technology is the application of online classrooms, which provides a platform on the internet where instructors and students interact in real-time mode. This application is increasingly being used today in several educational institutions for teaching and learning. The increasing usage is due to its potential benefits such as the provision of new opportunities to learning both within and outside the physical classroom, enhancement of entrepreneurial teaching and learning, increased flexibility of time and opportunity for both students and instructors, improved quality of higher education, and the opportunity for simultaneous support to greater numbers of students from diverse sectors. The introduction of online classroom might specifically have a great impact on the students' commitment to studying the subject.

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The advent of online classrooms has significantly transformed the educational landscape, particularly for secondary school students in Nigeria. According to a study by Olumorin et al. (2019), virtual learning environments have redefined traditional educational settings by removing physical constraints, thereby offering students and teachers the flexibility to engage in learning activities beyond the confines of a traditional classroom. This shift has introduced both opportunities and challenges that directly influence study habits, especially among science students who often rely on hands-on experiments and real-time interactions. The transition to online learning platforms necessitates innovative approaches to practical science education, as highlighted by Adeoye et al. (2020), who emphasize the need for adaptive strategies to effectively conduct experiments in virtual settings. As traditional teaching methods evolve, the role of digital platforms such as Facebook and WhatsApp has emerged as significant factors influencing students' study habits. Research by Okoro and Nwafor (2023) indicates that while WhatsApp usage can positively impact study habits by facilitating academic discussions and information sharing, other platforms like Facebook may not have a significant influence on students' academic performance. The integration of these technologies promises to foster a more inclusive educational environment; however, it also raises questions about their efficacy and the actual impact on learning outcomes. According to Yusuf and Al-Banawi (2013), the effectiveness of e-learning is contingent upon factors such as students' self-discipline, the quality of instructional design, and the level of interactivity provided by the platform. Understanding these dynamics is crucial, especially given the ongoing global push towards digital education. As noted by Nwagwu (2020), addressing challenges such as inadequate infrastructure, limited access to technology, and the need for teacher training is essential for the successful implementation of online learning in Nigerian secondary schools. Thus, this essay aims to explore how online learning influences the study habits of science students, providing insights into both its benefits and limitations.

As Nigeria's education system continues to evolve, the emergence of online classrooms has become a pivotal development in addressing challenges faced by traditional educational structures. According to a study by Jimoh (2009), the rapid growth and demand for education in Nigeria have strained existing infrastructures, necessitating alternative solutions such as online learning platforms. Furthermore, the increasing integration of technology into learning environments complements existing educational frameworks and offers opportunities for personalized learning experiences. For instance, a study by Badamasi and Opara (2024) demonstrated that AI-powered personalized learning platforms significantly improved academic achievement and motivation among computer science senior secondary school students in Abuja. However, this transition brings its own challenges, such as the potential for examination malpractice, which has been a significant concern in Nigeria's academic landscape. Ogunjobi et al. (2021) examined e-invigilation as a means of curbing examination malpractice in Nigerian colleges of education, highlighting the need for robust monitoring systems in online assessments. Addressing these issues is crucial for the effective integration of online learning strategies, ultimately influencing the study habits of science students in secondary schools.

The transition to online classrooms has fundamentally altered study habits among science students in Nigerian secondary schools, fostering both adaptive strategies and significant challenges. As students adapt to digital learning environments, their typical study routines have shifted toward greater reliance on technology, particularly through platforms like WhatsApp and Facebook. According to Onun et al. (2023), WhatsApp usage has been found to significantly influence the study habits of undergraduates in North Central Nigeria, while Facebook usage did not show a significant impact. However, this shift also introduces distractions that can detract from focused studying. The effectiveness of this new online learning paradigm is partially contingent on the physical learning environment, which remains a critical factor in student performance. Studies indicate that a conducive physical climate correlates with teacher effectiveness and student success. For instance, a study by Eimuhi and Ogedegbe (2016) concluded that enriched learning environments lead to greater benefits for academic performance and other student outcomes. Thus, while online classrooms present opportunities for enhanced learning flexibility, they necessitate a reevaluation of existing study habits to maximize academic achievement in this evolving educational landscape.

The shift from traditional study methods to digital learning strategies has become increasingly evident in Nigerian secondary education. As students engage more with technology, conventional educational practices are evolving to incorporate digital tools that cater to modern learning preferences. The potential benefits of Information and Communication Technology (ICT) in enhancing learning outcomes are well-documented; for instance, utilizing ICT facilitates a more interactive and engaging environment, ultimately improving students' comprehension and retention of subject matter, including complex concepts in science courses. Oviawe and Oshio (2011) highlighted that ICT facilities serve as major contributors to effective teaching and learning, emphasizing their role in modern educational settings. However, challenges persist, as access to reliable internet and ICT resources remains limited in many Nigerian schools, affecting students' ability to fully embrace these digital learning strategies. A study by Mamman and Abubakar (2022) identified poor internet connectivity and insufficient ICT skills as significant barriers to accessing and utilizing electronic information resources in higher institutions in Taraba State, Nigeria. Similarly, Oviawe and Oshio (2011) noted that inadequate ICT facilities hinder effective teaching and learning in universities in Edo State. As educators

adapt to these changes, fostering an equilibrium between traditional and digital methodologies may significantly enhance the study habits of science students. Integrating ICT into the curriculum, while addressing infrastructural and training challenges, can provide a more robust and effective educational experience.

In the context of Nigeria's secondary education, online classrooms offer significant benefits that enhance study habits among science students. These platforms provide greater accessibility to educational resources, enabling students to engage with diverse materials essential for their learning. The ability to access a vast array of information online encourages the development of independent study habits, allowing students to explore topics beyond the traditional curriculum. Additionally, online classrooms often incorporate interactive elements such as forums and discussions, fostering collaboration and creating a community of learners. This interaction can alleviate challenges associated with inadequately equipped libraries, as effective online resources can compensate for the lack of physical materials in many schools. Furthermore, by facilitating personalized learning experiences, online classrooms empower students to establish effective reading and study strategies tailored to their unique learning styles. This personalization reinforces the critical relationship between reading culture and academic performance. A study by Katcha, Dajal, and Abubakar (2025) examined the influence of gender on the awareness and utilization of virtual learning resources among pre-service science teachers in Colleges of Education in North Central Nigeria. The study found that both male and female pre-service science teachers are aware of virtual learning resources, but their utilization rates are relatively low. This finding highlights the need for increased engagement with online learning platforms to fully harness their potential benefits.

The transition to online classrooms has significantly enhanced the accessibility of resources and learning materials for science students in Nigerian secondary schools. In traditional settings, students often faced limitations due to inadequate school library resources, with findings indicating a scarcity of essential materials such as electronic gadgets that support modern learning (Agipu et al., 2020). The migration to digital platforms has alleviated some of these constraints, providing students with a wealth of online resources that promote self-directed learning. Additionally, the integration of Information and Communication Technology (ICT) has fostered improved study habits, enabling students to engage with diverse materials and methodologies to enhance their understanding of scientific concepts (Fagbohun et al., 2020). However, challenges such as insufficient ICT infrastructure and training remain impediments that need addressing to fully harness the benefits of enhanced access to educational resources for all science students in Nigeria. Barriers include inadequate funding, lack of internet access, and insufficient ICT skills among educators (Jegede, 2019; Oginni et al., 2016).

Technology breakthroughs have created more diverse options for virtual learning in this digital age evolution. Schools and education stakeholders have the potential to leverage online learning technologies for content delivery since students are already active participants in this digital era. An online classroom possesses both technological and pedagogical elements and is specifically designed and better structured, allowing instructors and students to employ technology with appropriate pedagogical principles that help ensure efficient and effective teaching and learning.

1.1. Statement of the Problem

Most students depend solely on classroom lessons and teacher's notes. They rarely make additional efforts in getting more study materials to study on their own. Also, students don't usually look for other means of study pattern except they are exposed to such by their teachers or the environment. By introducing online classroom, students would be expected to attempt personal studying using online facilities. The study therefore was out to investigate the Impact of Online Classroom on Students' Study Habits in Chemistry in Senior Secondary Schools in Nigeria.

1.2. Purpose of the Study

The purpose of the study was to investigate the impact of Online Classroom on Students' Study Habits in Chemistry in Senior Secondary Schools in Nigeria

1.3. Research Questions

The following questions will be used to test the study habits and study behavior of chemistry students:

- What is the level of online classroom usage among secondary schools in Nigeria?
- Does the introduction of online classroom influences the students' study habits in Chemistry?
- Is the use of the online classroom resource better for students in terms of effective study habits?
- Do students in the online classroom take up the habit of attending each class?

2. Research Method

This study employed a descriptive research design. The design was chosen because it involved collection and analysis of data so as to explain the state of online classroom usage and how it influences students' study habit which consequently would have an impact on their performance in Chemistry in Nigeria. The population of this study consisted of all senior secondary school two students in Ondo state, Nigeria.

The sample for the study consisted of 420 Senior Secondary School students selected from 12 secondary schools in Ondo State using simple random technique. Thereafter, 35 students were chosen from each of the 12 schools using simple random technique as well. The only research instrument used for the study was a self-designed questionnaire titled "Use of Online Classroom and Students' Study Habit. (UOCSSH)". The questionnaire had 20 items of a four-point likert-type scale with scoring system ranging from Strongly Agree = 4, Agree = 3, Disagree = 2 and Strongly Disagree =1which was used to collect data from the respondents. The instrument was given to two University Professors who are experts each in Science and Technology. The instrument also given to two Test, Measurement and Evaluation to ascertain face and content validity of the instrument. The reliability of the instruments was ascertained by using Cronbach's Alpha reliability Coefficient; this was used in order to ensure the internal consistency of the instruments by administering the instrument on 20 students that were not partaking in the research. Reliabilty coefficient of 0.87 was obtained from the analysis. The instrument was administered to the respondents with the help of research assistants who later collected the copies back from the respondent after they were done with it. The data collected were subjected to descriptive statistics to answer the research questions.

3. Results

The research questions were answered descriptively as presented on the tables following

- Question 1: What is the level of online classroom usage among secondary schools in Nigeria?

Table 1 Percentage analysis of level of online classroom usage among secondary schools in Nigeria

	Items	**Agree (%)**	**Disagree (%)**
1	Online facilities are available in our classrooms	365 (86.9)	55 (13.1)
2	Most of our lessons are online based	346 (82.4)	74 (17.6)
3	All students always connect to the internet during the online class	344 (81.9)	76 (18.1)
4	Assignments are given and done via online	344 (81.9)	76 (18.1)
5	Most of our class works are done online	320 (76.2)	100 (23.8)
	Percentage mean	**(81.86)**	**(18.14)**

From table 1, it could be deduced that the level of online classroom usage is 81.86%. This high percentage revealed that most secondary schools in Nigeria are using online classroom as part of their teaching strategies in Chemistry. Activities in Chemistry lessons are carried out through online classroom platforms.

- Question 2: Does the introduction of online classroom influences the students' study habits in Chemistry?

Table 2 Percentage analysis of online classroom influences on students' study habits in Chemistry

	Items	**Agree (%)**	**Disagree (%)**
1	Online classroom encourages me to use online facilities in my personal study	340 (81.0)	80 (19.0)
2	Use of online classroom enhances my personal study	315 (75.0)	105 (25.0)
3	Online classroom and lessons have made my self-study easier	336 (80.0)	84 (20.0)
4	I gain much in my self-studies when using online facilities	336 (80.0)	84 (20.0)
5	My personal studies are well organised under online classroom	320 (76.2)	100 (23.8)
	Percentage mean	**(78.44)**	**(21.56)**

Table 2 showed that the percentage mean of online classroom influence on students' study habits in Chemistry was 78.44%. This indicated that the influence of online classroom platforms on students' study habits in Chemistry is high.

- Question 3: Is the use of the online classroom resource better for students in terms of effective study habits?

Table 3 Percentage analysis of online classroom enhancing effective study habits

	Items	**Agree (%)**	**Disagree (%)**
1	Online classroom enhances my level of understanding concepts during personal studies in Chemistry	325(77.4)	95 (22.6)
2	I am always very active during my self-study periods	321(76.4)	99 (23.6)
3	I enjoy personal studies in Chemistry when using online facilities	321(76.4)	99 (23.6)
4	Access to online materials during my personal study time widens my knowledge in Chemistry	298(71.0)	122 (29.0)
5	I always attend to my assignments during my online self-studies	282(67.1)	138 (32.9)
	Percentage mean	**73.66**	**26.34**

Table 3 revealed that the level at which online classroom platform enhances students' study habits in Chemistry was 73.66%. This showed that students personal study plans were influenced by the use of online classroom been used in their schools.

- Question 4: Do students in the online classroom take up the habit of attending each class?

Table 4 Percentage analysis of online classroom attendance by Chemistry student

	Items	**Agree (%)**	**Disagree (%)**
1	I like to attend online classes than the traditional class	345 (82.1)	75 (17.9)
2	I am one of the first to be at the online class	215 (51.2)	205 (48.8)
3	We normally have full attendance during the online classes	346 (82.4)	74 (17.6)
4	Online classroom is always exciting and keeps me active	345 (82.1)	75 (17.9)
5	Online classroom is always interesting	340 (81.0)	80 (19.0)
	Percentage mean	**(75.8)**	**(24.2)**

The percentage mean in table 4 revealed that 75.8% of the respondents attend Chemistry classes regularly. This indicated that many of the secondary school students find the use of online classroom interesting.

4. Discussion

Findings of the study revealed that most secondary schools in Nigeria are using online classroom as part of their teaching strategies in Chemistry. Activities in Chemistry lessons are carried out through online classroom platforms. This might be due to the efforts of the state government in providing digital facilities to schools in last decade. Almost all the schools in state are averagely provided with online facilities that can enable online classroom teaching. This finding was in agreement with Silnels (2023) who observed that digital technologies have been seamlessly incorporated into the learning process, enhancing students' engagement with complex subjects.

The findings also revealed that the influence of online classroom platforms on students' study habits in Chemistry is high. This could be due to fact that almost all youths in Nigeria are using cellphones to their advantages. They find it easier carrying out their daily activities through digital devices. They also have the privilege of surfing the net for information. This aligns with the findings of Olumorin et al. (2019) who noted that virtual learning environments have

redefined traditional educational settings by removing physical constraints, thereby offering students and teachers the flexibility to engage in learning activities beyond the confines of a traditional classroom

The findings of the study further showed that students personal study plans were influenced by the use of online classroom been used in their schools. This might be as a result of their teachers giving them activities on scheduled basis. Online classroom encourages proper organization of activities and time management. This finding was in agreement with Olumorin et al. (2019) and Fagbohun et al. (2020).who all agreed that the integration of Information and Communication Technology (ICT) has fostered improved study habits, enabling students to engage with diverse materials and methodologies to enhance their understanding of scientific concepts

The findings of the study also indicated that many of the secondary school students find the use of online classroom interesting. The interest in the online classroom might be as a result of interactive and activity-based nature of the digital devices engaged on during the online classroom lessons. Most students enjoys manipulating digital devices rather than mere chalk and talk teaching environment. This finding agreed with Irungu (2023), who emphasized that technology has become an integral part of our daily lives

5. Conclusion

This study investigated the Impact of Online Classroom on Students' Study Habits in Chemistry in Senior Secondary Schools in Ondo State, Nigeria. It was concluded from the findings that most schools in Ondo State Nigeria now employed online classroom strategy in teaching Chemistry in secondary schools. Also it was concluded that online classroom strategy has greatly influenced the study habits of secondary school students in Ondo State

Based on the findings, the following recommendations were made:

- Government should further encourage the use of online classroom in teaching Chemistry by ensuring that all schools in the state are fully equipped with necessary functioning digital devices.
- Chemistry teachers should continue to employ the use of online classroom in their teachings to encourage the digital devices usage among the student during their personal study plans and also in carrying out their assignments through the same medium.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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