

# *INVESTIGATING CHALLENGES AND ETHICS IN ONLINE TEACHING: IMPACTS ON CHEMISTRY EDUCATION AND STUDENTS' INTEREST*

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## **Abstract**

This research delved into the intricacies of online teaching ethics and their impact on students' interest in learning chemistry at Nnamdi Azikiwe University, Awka, Anambra State. The design of the study was descriptive survey design. The study encompassed 140 students enrolled in the Department of Science Education with a specialization in chemistry. All the population of Science Education students, chemistry option, in the department of science education, Nnamdi Azikiwe University, Awka, was used for the sample. Utilizing a structured questionnaire, the research addressed five key inquiries, guided by the overarching goal of understanding the challenges posed by online teaching and their repercussions on students' engagement with chemistry education. Expert validation and a reliability coefficient of 0.75 ensured the instrument's robustness. Descriptive statistics was applied in data analysis while mean scores and standard deviation illuminated critical insights. Notably, study identified the imperative of upholding academic integrity and curbing dishonest practices as foundational ethics in online teaching. Foremost among the challenges hindering students' interest in learning chemistry online was the lack of access to requisite computer apparatus and equipment. However, despite these hurdles, students exhibited a willingness to embrace online platforms, particularly in the context of their lectures and project work. Furthermore, the study advocated for the implementation of modern online networks to enhance the efficacy of online teaching in chemistry education. Recommendations emphasized the accurate representation of chemical concepts, and ensuring accessibility of online chemistry courses and materials for effective chemistry education in the digital age.

**Keywords:** Challenges, Chemistry, Teaching, Learning, Online, Ethics, Impacts, Students, Interest

## **Introduction:**

In the landscape of human advancement, education stands as a beacon of enlightenment, guiding societies towards progress through the impartation of crucial skills, knowledge, and values. Central to this endeavor is the realm of science and technology, where the pursuit of understanding natural phenomena shapes the very fabric of societal development (Govindasamy, 2019). In recent years, the advent of online teaching has revolutionized educational paradigms, offering unprecedented avenues for learning through electronic resources and virtual platforms. Online teaching, characterized by synchronous and asynchronous interactions facilitated by the internet, has redefined the boundaries of education, offering flexibility and accessibility previously unimaginable (Khah, Hasan, & Clement, 2020). As educators grapple with the challenges and opportunities presented by this digital frontier, it

becomes imperative to examine its implications for disciplines such as chemistry, which underpins myriad aspects of modern life.

Chemistry, as the study of matter, its properties, and transformations, occupies a pivotal position in science education, elucidating fundamental principles governing natural phenomena and technological innovations (Egolum & Benson, 2022). From agricultural advancements to defense technologies, the contributions of chemistry are ubiquitous, underscoring its significance in shaping the trajectory of human civilization (Chikendu, Ejesi, & Abumchukwu, 2021). In this context, the integration of online teaching methodologies into chemistry education holds profound implications for pedagogical practices and student learning outcomes. However, the transition to online teaching necessitates careful consideration of ethical principles that underpin the teaching profession. Ethics, as a guiding framework for moral conduct and professional integrity, assumes heightened importance in the digital realm, where issues of privacy, academic integrity, and equity come to the fore (Paul & Elder, 2021). Moreover, fostering student interest and engagement in online learning environments poses a distinct set of challenges, requiring innovative pedagogical approaches and digital competencies (Chikendu et al., 2021; Oriahi, 2021). Against this backdrop, this study seeks to investigate the challenges and ethical considerations inherent in online teaching within the context of chemistry education. By examining the intersection of online teaching, ethics, and student interest, this research aims to provide insights into the effective utilization of digital technologies for enhancing chemistry education outcomes in the 21st century.

#### **Problem Statement:**

The emergence of the COVID-19 pandemic has precipitated a myriad of challenges in the realm of education, particularly within the domain of chemistry instruction. Amidst the upheaval caused by the pandemic, higher education institutions have grappled with the abrupt transition to online teaching and learning modalities. However, this shift has unearthed significant disparities in technological proficiency among chemistry students, particularly in developing countries like Nigeria.

A key concern lies in the lack of technological confidence among chemistry students, compounded by a general unfamiliarity with online teaching and learning practices. The dearth of requisite e-learning infrastructure, exacerbated by the prevailing economic recession, further exacerbates the situation, hindering access to essential resources and dampening students' enthusiasm for chemistry education (Egbutu & Okoli, 2021). As a consequence, the effective utilization of online teaching and learning platforms becomes compromised, potentially impeding student engagement and academic performance.

Against this backdrop, there exists a pressing need to investigate the challenges posed by online teaching ethics on students' interest in learning chemistry. Addressing these challenges demands a nuanced understanding of the intricate interplay between technological readiness, ethical considerations, and pedagogical strategies within the context of online chemistry education. By delineating the underlying factors contributing to students' disengagement and identifying strategies to

foster meaningful interaction and support in online learning environments, this research aims to elucidate pathways for enhancing the efficacy of chemistry education in the digital age.

### **Purpose of the study**

The study aims to explore the impact of online teaching ethics on student engagement and learning outcomes in chemistry education at Nnamdi Azikiwe University, Awka. Specifically, it seeks to:

1. Evaluate the ethical considerations inherent in online teaching practices at Nnamdi Azikiwe University, Awka.
2. Assess the utilization of online teaching resources and platforms by chemistry lecturers.
3. Identify the challenges hindering the effective implementation of online teaching methods for students' interest in learning chemistry.
4. Investigate students' willingness towards adopting online teaching methods for their lectures.
5. Propose actionable recommendations to enhance the integration of online teaching in the chemistry education program at Nnamdi Azikiwe University, Awka.

### **Scope of the study**

The scope of this study is focused on investigating the challenges posed by online teaching ethics and their impact on student engagement in learning chemistry at Nnamdi Azikiwe University, Awka, Anambra State. Specifically, the study involves students enrolled in the chemistry option within the Department of Science Education at Nnamdi Azikiwe University, Awka.

### **Research Questions**

The research questions guiding this study are as follows:

1. What ethical considerations characterize online teaching practices at Nnamdi Azikiwe University, Awka?
2. To what extent are online teaching facilities utilized by chemistry lecturers at Nnamdi Azikiwe University, Awka?
3. What are the primary challenges hindering the effective implementation of online teaching methods on students' interest in learning chemistry at Nnamdi Azikiwe University, Awka?
4. What are the students' willingness towards adopting online teaching methods for their chemistry lectures at Nnamdi Azikiwe University, Awka?
5. What strategies can be recommended to enhance the integration of online teaching in the chemistry education program at Nnamdi Azikiwe University, Awka?

### **Methods**

The study utilized a descriptive survey design within the field of science education at Nnamdi Azikiwe University, Awka. The population consisted of 140 students spanning across all academic years (from year 1 to year 4) enrolled in the Chemistry option within the Department of Science Education. All students within this population were included in the study. All the population of Science Education

students, chemistry option, in the department of science education, Nnamdi Azikiwe University, Awka, were used for the sample. Data collection was facilitated through the use of a structured questionnaire titled 'Challenges of Online Teaching Ethics on Students Interest in Learning Chemistry questionnaire (COTESILCQ)', comprising twenty-five items developed by the researcher. Respondents were asked to rate each item on a four-point Likert scale, ranging from 'Strongly Agree' (4 points) to 'Strongly Disagree' (1 point).

To ensure the validity of the instrument, feedback from three experts, from the Department of Science Education, Faculty of Education Nnamdi Azikiwe University was sought and incorporated to enhance face validity. Additionally, reliability was established through the test-retest method, yielding a coefficient value of 0.75 using Pearson's Product Moment correlation statistics. Data collection involved distributing 140 copies of the questionnaire directly to the respondents by the researchers, with the assistance of one research assistant. Adequate time was provided for respondents to complete the questionnaire, and the researcher retrieved all completed copies on an agreed-upon date, achieving a high response rate. Data analysis was conducted using weighted mean and standard deviation to address the research questions. Items with mean scores of 2.5 and above were considered as agreed upon by the respondents, while those below 2.5 were regarded as disagreed upon. Valid copies of the questionnaire were utilized for the analysis, reflecting the responses of the study participants.

## Results

**Research Question One:** What ethical considerations characterize online teaching practices at Nnamdi Azikiwe University, Awka?

**Table 1: Mean Scores on the ethics of online teaching in Nnamdi Azikiwe University, Awka**

S/N	ITEMS	$\bar{X}$	SD	REMARKS
1.	and prevent dishonest practices			
2.	Ensuring students have appropriate guidelines in experimentation	2.68	0.67	Agreed and safety measures
3.	Ensuring that chemical concepts, principles and procedures are accurately represented	2.58	0.64	Agreed experimental
4.	Designing online chemistry courses and material in a way that is accessible to students	3.05	0.76	Agreed
5.	Online educators should provide clear and accurate information about the course objectives	2.92	0.73	Agreed

From table one, number four with the mean of 3.05 and standard deviation of 0.76. The respondents agreed that designing online chemistry courses and material in a way that is accessible to students are the major ethics of online teaching in Nnamdi Azikiwe University, Awka.

**Research Question Two:** To what extent are online teaching facilities utilized by chemistry lecturers at Nnamdi Azikiwe University, Awka?

**Table 2: Mean scores on the online teaching facilities currently used by Chemistry lecturers in Nnamdi Azikiwe University, Awka**

S/N	ITEMS	$\bar{X}$	SD	REMARKS
6.	online teaching facilities such as video recording and editing tools like screen cast			
7.	Chemistry teachers seldom make use of online teaching facilities such as zoom	3.07	0.77	Agreed
8.	Chemistry lecturers use online teaching facilities such as WebEx	2.44	0.61	Disagreed
9.	Chemistry teachers are not used to online teaching facilities such as google meet	3.20	0.88	Agreed
10.	Chemistry teachers are not used to online teaching facilities such as blackboard, Canvas and module	3.08	0.77	Agreed Learning Management System (LMS)

From the table 2, number nine with the mean of 3.20 and standard deviation of 0.88. The respondents agreed that online teaching facilities such as goggle meet are not currently being used by chemistry lecturers and students in Nnamdi Azikiwe University, Awka.

**Research Question Three:** What are the primary challenges hindering the effective implementation of online teaching methods on students' interest in learning chemistry at Nnamdi Azikiwe University, Awka?

**Table 3: Mean scores on the challenges of online-teaching on student's interest in learning Chemistry in Nnamdi Azikiwe University, Awka**

S/N	ITEMS	$\bar{X}$	SD	REMARKS
	using online teaching which affects my interest			
12	Lack of possession of computer apparatus and equipment hinders my content knowledge	3.11	0.78	Agreed
13	Online teaching reduces my study habit at home	2.55	0.63	Agreed
14	Online teaching hinders inculcation of scientific skills which affects my interest	2.31	0.58	Disagreed
15	Lack of finances makes me to lose interest in online teaching	2.58	0.65	Agreed
16	Online teaching relies heavily on internet	2.99	0.75	Agreed

access and technology which can pose barrier for students who lack reliable connectivity or suitable devices

17	Online teaching requires thoughtful adaptation of instructional strategies and materials to suit the digital environment	2.75	0.69
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From table 3, number twelve with the mean of 3.11 and the standard deviation of 0.78. It was observed that lack of possession of computer apparatus and equipment is the major challenge of online-teaching on students' interest in learning Chemistry in Nnamdi Azikiwe University, Awka.

**Research Question Four:** What are the students' willingness towards adopting online teaching methods for their chemistry lectures at Nnamdi Azikiwe University, Awka?

**Table 4: Mean scores on the willingness of students towards adopting online teaching for their lectures in Nnamdi Azikiwe University, Awka?**

S/N	ITEMS	$\bar{X}$	SD	REMARKS
	teaching to learn computer programme			
19	I am willing to use online teaching to solve	2.71	0.68	Agreed my assignment issues
20	I am willing to make use of online apps to write my projects	2.63	0.66	Agreed
21	I am willing to use online teaching for learning eg (lockdown)	2.54	0.63	Agreed conventional teaching and learning
22	I am willing to use online teaching for lecture	2.89	0.72	Agreed purposes

From table 4, number twenty-two with the mean of 2.89 and the standard deviation of 0.72. It was observed that Nnamdi Azikiwe University students are willing to use online teaching and learning for their lectures more especially during lockdown.

**Research Question Five:** What strategies can be recommended to enhance the integration of online teaching in the chemistry education program at Nnamdi Azikiwe University, Awka?

**Table 5: Mean scores on the possible ways of improving the integration of online teaching in chemistry education programme in Nnamdi Azikiwe University, Awka S/N ITEMS  $\bar{X}$  SD REMARKS**

24	networks or bandwidth School authorities should employ or train staff in online teaching skills	2.88 0.72	Agreed
25	Ensuring that computers equipments and apparatus are available for online teaching	2.94 0.74	Agreed
26	Qualified computer engineers should be employed to deal with the issue of malfunctioning	2.77 0.69	Agreed
27	Online teaching should be made to be focused on the inculcation of scientific knowledge	2.61 0.65	Agreed

From the table 5, number twenty-three with the mean of 3.05 and standard deviation of 0.76. It was observed that installing modern online networks is an important way of improving the application of online teaching in chemistry education programme in Nnamdi Azikiwe University, Awka.

### Discussion

The study's findings shed light on several critical aspects related to online teaching ethics, utilization of online teaching facilities, challenges faced by students, their willingness to engage in online learning, and recommendations for improvement.

Table one revealed that maintaining academic integrity, ensuring student safety in experimentation, accurately representing chemical concepts, principles, and experimental procedures, as well as designing accessible online courses, are paramount ethics of online teaching. These findings resonate with Staffkova and Laucanova (2019), Nnoli and Onwudinjo, (2023) emphasizing the importance of ethical guidelines in facilitating effective communication and learning in online environments.

The findings from table two indicated a lack of utilization of online teaching facilities by both chemistry lecturers and students at Nnamdi Azikiwe University, Awka. This observation aligns with the concerns raised by Khan, Hasan, and Clement (2020), highlighting the technological and infrastructural challenges hindering the adoption of online teaching in many Nigerian universities.

Table three underscored the challenges faced by students, such as lack of motivation, limited access to computers, and internet connectivity issues, which adversely affect their interest in learning chemistry online. These challenges echo the findings of Elameer and Idrus (2020), Nnoli and Samuel (2023) emphasizing the barriers posed by students' motivation levels and technological limitations in online learning environments.

Table four revealed that students at Nnamdi Azikiwe University are willing to embrace online teaching and learning methods despite the challenges they face. This finding is consistent with Zhang et al (2020) indicating students' receptiveness to online learning opportunities, albeit hindered by financial constraints in acquiring necessary ICT gadgets.

Table five outlined several recommendations to enhance the application of online teaching in chemistry education, including installing modern online networks, providing adequate ICT resources, and training staff in online teaching skills. These recommendations align with Aguyo's (2020) and Shaw et al (2021), suggestions for improving online teaching effectiveness through infrastructure development and staff training initiatives.

In conclusion, the findings underscore the importance of addressing technological challenges, enhancing students' motivation, and providing adequate support for online teaching and learning. Implementing the outlined recommendations can contribute to fostering a conducive online learning environment and improving the quality of chemistry education at Nnamdi Azikiwe University, Awka.

### Recommendations

The following recommendations are based on the findings of this study.

1. Chemistry educators should ensure that they follow appropriate guidelines for student safety in online teaching. They should ensure that chemical concepts, principles and experimental procedures are accurately represented and to also design online chemistry courses and material in a way that is accessible to students.
2. Chemistry educators and students should endeavour to acquire and utilize online teaching facilities.
3. Chemistry educators and the school authorities should endeavour to motivate students towards online teaching ethics so as to awaken their interest in learning chemistry using online teaching facilities.
4. Chemistry students should develop the sheer willingness to use learn through online teaching facilities
5. Chemistry educators and the school authority should install the necessary ICT gadgets for modern online networks. They should also employ or train staff in online teaching skills as well as employing qualified computer engineers thereby improving the application of online teaching in chemistry education programme in Nnamdi Azikiwe University, Awka.

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