



Harnessing the Challenges of Covid-19 Ethics on Students Learning in Chemistry

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Abstract

This paper discusses the challenges of covid-19 ethics on students' learning of chemistry in secondary schools in Anambra State and how to harness the challenges. Three research questions and one null hypothesis guided the study. A descriptive survey design was used. Three hundred (300) SS3 chemistry students drawn from 45 secondary schools out of 258 public schools in Anambra State formed the sample for the study. Twenty (20) item structured questionnaires on a four-point rating scale developed by the researchers were used for data collection. A reliability coefficient of 0.85 was established using Cronbach Alpha techniques. After the administration of the instrument to the respondents, the data obtained were analyzed using mean and standard deviation to answer the research question and z-test to test the null hypothesis at the significance level of 0.05. The results obtained showed that male chemistry students have greater challenges on covid-19 ethics than their female counterparts. They are faced with the following challenges of covid-19 ethics that hinder the inculcation of chemistry learning. Lack of interest in STEM education (chemistry) due to persistence lockdown, lack of E-learning abilities, lack of ICT knowledge, lack of computer or android phone to study at home and tired of being locked indoors. There is no significance difference between male and female chemistry students' level on covid-19 ethics in the learning of chemistry in Anambra State. It was recommended that students should be encouraged to develop interest in chemistry, have access to ICT gadgets and computers, engage in E-learning abilities and inculcate more study habit at home. This should help the government and chemistry teachers to assist in ameliorating the predicaments in STEM education.

Keywords: Harnessing; Challenges; Ethics; Covid-19; Students; Learning; Chemistry; Science; Technology mathematics; Engineering; Education.

1. Introduction

According to Richard and Linda [1] the word ethics is commonly used interchangeably with morality and sometimes it is used more narrowly to mean the moral principles of a particular tradition, group or individual. He stressed that ethics is a set of concepts and principles that guide us in determining what behavior helps or harms sentient creatures. Paul and Elder [2], states that most people confuse ethics with behavior in accordance with social conventions, religious beliefs, the law, and don't treat ethics as a stand-alone concept. They maintained that ethics or moral philosophy is a branch of philosophy that involves systematizing, defending, and recommending concepts of right and wrong behavior. The field of ethics, along with aesthetics, concerns matters of value, and thus comprises the branch of philosophy called axiology. Rushworth [3], states that standard definitions of ethics have typically included such phrases as the science of the ideal human character or the science of moral duty. Ethics is a set of concepts and principles that guide us in determining what behavior helps or harms sentient creatures [1]. Ethics can also be used to describe a particular person's own idiosyncratic principles or habits.

Covid-19 is the pandemic that attached the whole world in the year 2019. COVID-19 pandemic presents serious ethical challenges in the areas of resource allocation and priority-setting, physical and social distancing; public health surveillance, health-care worker's rights and obligations to conduct of clinical trials and these posed some problems in educational system of STEM. These in turn are complicated by the diverse health systems and unique cultural and socio-economic contexts of countries [4]. Consequently, there is a great need for guidance to ensure ethical conduct of research, decision making in clinical care, and public health policymaking at every level of the global covid-19 response.

STEM education is an essential tool for human development and eradication of poverty [5]. According to Eniayeju [6] STEM means Science, Technology, Engineering and Mathematics. The burden of evidence from the qualitative study reported here on STEM attributions, that is, what students perceive as the causes of their performance in STEM shows that students attribute underachievement in STEM to the ways STEM courses are taught. Education is the key to success, that key that breaks the yoke of ignorance and superstition. Fundamentally, the objective of education should be to enable people initiate, understand and even anticipate changes in their

environment and adjust accordingly [7]. This is why Osisioma [8] pointed that, in this competitive global economy, no nation can survive without developing the skills of its workforce. She maintained that, Nigeria is challenged to re-position itself in this new wave of globalization by re-evaluating its education policy to include a well-structured science and technology education that emphasizes knowledge creation and transfer, critical thinking, problem solving, creativity and innovation.

Chemistry is one of the most important branches of science which enables learners to understand what happens around them. It helps them to solve simple problems they encounter daily. According to Nnoli [9], chemistry is a discipline which high standard of conduct must be amplified by teachers and researches in ways that students cannot fail to observe and adopt. She maintained that chemistry is one of the fundamental ingredients of Science. The power of chemistry is what creates a whole and enabling infrastructure that delivers food, medicine and materials that are the hall-mark of modern life [9]. This is why chemistry has been referred to as the oracle of modern science. Chemistry involves experimentation and the learner is required to observe, record, calculate and make intelligent references [10]. Furthermore, it trains the mind of chemists to incline to a scientific method. Chemistry is the nucleus of science which deals with matter and the changes it undergoes.

1.1. Problem Statement

Covid-19 ethics brought so many challenges in STEM educational system due to much social distancing that lead to lockdown of many educational institutions. This makes some students to lose more interest in learning STEM education and prevents them from properly completing their curriculum or course contents. There is need to harness these challenges by making science education in Nigeria more functional and meaningful to both youths and society at large. One of the best ways to achieve this is to make students develop more interest in STEM education and engage in E-learning ability in such a way that STEM teachers shall use the opportunity to inculcate more science skills to them. Finally, the government should ensure that most institutions, including secondary schools should be provided with computers and be ICT compliant. STEM teachers should ensure they cover all they have missed in their various course contents. This would help to maintain the curriculum standard. Therefore, this work sought to ascertain the following: The;

1. Possible level of challenges of covid-19 ethics on students' learning in Chemistry.
2. Strategies for harnessing the level of challenges of covid-19 ethics on students' learning in Chemistry.
3. Gender difference on the level of the challenges of covid-19 ethics on students' learning in Chemistry.

1.2. Research Questions

1. What are the possible challenges of ethics and covid-19 ethics on students' learning in Chemistry?
2. What are the strategies for harnessing the challenges of covid-19 ethics on students' learning in Chemistry?
3. What is the gender difference in the possible challenges of covid-19 ethics on students' learning in Chemistry?

1.3. Hypothesis

This null hypothesis was tested at 0.05 level of significance:

1. There is no significant difference between the mean ratings of male and female students on the possible challenges of covid-19 ethics on students' learning in Chemistry.

2. Material and Method

A descriptive survey design was used for the study. The study was carried out in secondary schools in six education zones in Anambra State. The sample consists of 300 chemistry students drawn from 45 out of 258 public secondary schools in Anambra State. The population comprised of all chemistry education students (numbering 1,826 students) in 258 public secondary schools Anambra State. From each of the six education zones in Anambra State, 8 public secondary schools were drawn by simple random sampling with replacement, except in Otuocha zone from which 5 public secondary schools were selected because Otuocha zone has fewest secondary schools.

This instrument for data collection was 30 items in structured questionnaire on a four-point scale of strongly agreed, agreed, disagreed and strongly disagreed developed by the researcher. The questionnaire has two sections: Section A sought information on the bio-data of the respondents. Section B sought information on the challenges and a way out for the covid-19 ethics among chemistry students. The instrument was validated by two chemistry educators and two experts in measurement and evaluation from University of Nigeria Nsukka. The comments and suggestions of the experts were incorporated in building up the final draft of the instrument. The research question was answered using mean and standard deviation. A mean of 2.50 and above indicated that the respondents agreed with items on the questionnaire while a mean below 2.50 indicated that the respondents disagreed with the items.

3. Results

Table-1. Mean Rating Scores and Standard Deviation of Chemistry Students' Challenges of Covid-19 ethics in Chemistry Learning.

S/N	Questionnaire Items	Mean	SD	Decision
1	Most students due to covid-19 ethics were mandated to learn at home through E-learning.	3.30	0.80	Agreed
2	Pandemic caused Poor pay package of our parents	3.20	1.20	Agreed
3	Insufficient time for teachers to engage in the use of instructional materials for knowledge updates.	2.83	0.71	Agreed
4	Covid-19 ethics of early dismissal in schools leads to excess teaching load.	2.92	0.82	Agreed
5	Lack of interest on students due to series of lockdown.	2.80	0.81	Agreed
6	Lack of knowledge of ICT program	3.50	0.50	Agreed
7	Covid-19 ethics caused cost of learning materials to rise.	3.30	0.90	Agreed
8	Many students do not have access to computer or android phone to study at home.	2.52	0.90	Agreed
9	Many students were tired of staying at home.	2.80	0.81	Agreed
10	Covid-19 ethics caused school fees to rise.	3.40	0.90	Agreed
	Average mean	3.06	0.85	

The data reported on [Table 2](#) shows that all the 10 items were above the cut-off point of 2.50. This shows that respondents agreed with the items in the questionnaire as the challenges of covid-19 ethics among chemistry students.

Table-2. Mean Rating Scores and Standard Deviation of Students' Strategies for Harnessing the Challenges of Covid-19 ethics Among Chemistry Students.

S/N	Questionnaire Items	Mean	SD	Decision
1	World Health Organization has to establish an international Working Group on Ethics and covid-19 in schools.	3.42	0.62	Agreed
2	Providing ethics input into Clinical management guidelines and training in STEM teaching environments.	3.06	0.91	Agreed
3	Enough time for teachers to engage in teaching to cover up missed contents during covid-19 lockdown.	3.00	0.87	Agreed
4	Students should be encouraged build up their interest lost due to lockdown.	2.95	1.04	Agreed
5	E-learning and ICT should be encouraged in schools	3.92	0.85	Agreed
6	Practical guidance on the application of ethical values central to covid-19 in teaching and learning of STEM.	2.76	0.78	Agreed
7	Government should make finances available for the purchase and assembly of instructional materials.	3.30	0.82	Agreed
8	Accessibility of some of the important materials during s teaching like ICT gadgets.	2.82	0.81	Agreed
9	Development of emergency standard operating procedures to facilitate the review of protocols of covid-19 ethics.	2.58	0.58	Agreed
10	Government should monitored emergency use of unregistered and experimental interventions.	2.63	1.01	Agreed
	Average mean	3.04	0.83	

The data reported on [Table 3](#) shows that all the 10 items were above the cut-off point of 2.50. This shows that respondents agreed with the items in the questionnaire as the strategies for harnessing the challenges of covid-19 ethics among chemistry students.

Table-3. Mean Response on the Level of Challenges of Covid-19 ethics in Chemistry Learning Among Male and Female Chemistry Students.

Group	N	\bar{X}	SD
Male Students	165	1.91	0.58
Female students	135	1.30	0.48

[Table 3](#) reveals that male students had a mean of 1.91 and a standard deviation of 0.58 while female students had a mean of 1.30 and a standard deviation of 0.48. This shows that male chemistry students have more challenges than female students.

Table-4. Mean Response on the Strategies for Harnessing the Challenges of Covid-19 ethics Among Male and Female Chemistry Students.

Group	N	\bar{X}	SD
Male Students	165	1.90	0.50
Female students	135	1.14	0.33

Table 4 reveals that male students had a mean of 1.90 and a standard deviation of 0.50 while female students had a mean of 1.14 and a standard deviation of 0.33. This shows that male chemistry students were more in support of the strategies for harnessing the challenges of covid-19 ethics than female students.

Table-5. Z-test of the mean ratings of male and female students on the Level of Challenges of Covid-19 ethics in Chemistry learning among chemistry students.

Group	N	X	Sd	df	z-cal	z-crit	Decision
Male Students	165	1.90	0.50				
				298	0.47	1.96	Accepted
Female Students	135	1.14	0.33				

($P < 0.05$)

Table 5 shows that the z-cal is 0.47. This value is less than the z-critical value of 1.96 at 0.05 level of significance ($d/f = 299$). This led the researcher to accept the null hypotheses that stated that there is no significant difference between the mean responses of male and female students on the level of challenges of covid-19 ethics among chemistry students.

4. Discussion

The findings of this study showed that the chemistry students used in this study agreed that they have challenges on covid-19 ethics in learning chemistry and due to lockdown some students lose interest in STEM education (chemistry). This is in line with the reports by [11] who noted that many students have experienced loneliness during lockdown and in particular, been affected by lack of physical contact with their study mates and peers leading loss of commitment in school activities. Similarly, Goothy, *et al.* [12] reported that the boredom and frustration associated with restrictions in certain school activities contributes to loss of interest in schooling by students. The chemistry students also agreed that they need time to up-date and develop their knowledge and skills. A similar finding was made by Batez [13] who observed that students need to update their ICT knowledge and skills to meet with the demand of virtual education in the covid-19 era.

The respondents agreed that Covid-19 pandemic caused poor pay package for parents and increase in school fees. In agreement, [14] noted that Covid-19 has triggered recession; Anele [15] obtained similar result which shows that economic recession negatively influence teaching-learning process. There are indications that Covid-19 ethics of early dismissal in schools leads to excess teaching load; in response, Austin-Egole, *et al.* [16] proposed workplace flexibility in the Post Covid-19 Era and harped on the efficacy of teleworking as a trend that can lower excess teaching load. The outcome of this analysis also indicated that many students were tired of staying at home; Islam [17] attributed this to possible fear and anxiety about the pandemic which has caused enormous stress for both teachers and students.

The findings showed that the male chemistry students have more challenges of covid-19 ethics and were more interested in the strategies to harness the challenges of covid-19 ethics in learning chemistry than the female counterparts. Reports by Dror, *et al.* [18] demonstrated higher risks for COVID-19 complications, infectivity, and death among males. The abrupt shift to learning from home amid the challenges of the pandemic has made that struggle even harder [19]. There is no significance different between male and female chemistry students on their level of challenges on covid-19 ethics in learning chemistry. The findings of this study also identified the challenges of covid-19 ethics in learning chemistry as lack of interest in STEM education (chemistry) due to persistence lockdown, E-learning problems, lack of ICT knowledge, lack of computer or android phone to study at home and tired of being locked indoors. This finding correlates the earlier observation by Aini, *et al.* [20] who upheld that covi-19 crisis has exposed the challenges for technology in education, including many inequities starting at the lack of access to computers and the internet.

Male chemistry students were found to be more in support of the strategies for harnessing the challenges of covid-19 ethics than female students. Gasser, *et al.* [21], proposed ethical and legal boundaries of deploying digital tools for disease surveillance and control purposes to accommodate male and female folks in the fight against Covid-19 infection.

5. Conclusion

The covid-19 pandemic continues to profoundly impact our global financial system. Disruption of educational system, hinders production of goods, loss of business and employment. Financial distress are becoming economic landmarks of the pandemic and the near-term challenges are never-ending.

The current pandemic with the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has resulted in a major global health crisis. This has put tremendous strain on healthcare systems around the world and naturally raises issues concerning the allocation of scarce resources. It presents a clear and urgent need for research

into management of the disease in individuals and of the epidemic in populations and educational system. Addressing this need around the world raises practical and ethical issues for the scientific research community internationally, more especially to be more concern on harnessing the challenges of the ethics of this pandemic in learning of STEM education.

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

1. Curriculum planners should redesigned science teacher education programme to include E-learning and address some issues on the impact of covid-19 ethics in learning STEM.
2. Curriculum planners should also reform curriculum to be competency based, interactive and problem-solving based teaching and learning which will provide students with necessary skills for self-reliance.
3. Students should be encouraged in the utilization ICT gadgets and be computer literate.
4. Professional development of the science teachers should be encouraged in order to keep the teachers abreast of the current issues in education and help them refine their professional practice with a focus on skills development.
5. The global ethics community should work together to address the ethical implications of the covid-19 pandemic on STEM educational system.

Global Health Ethics team should works to strengthen educational environments communication, collaboration and cooperation in these endeavors.

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