

Investigating The Problems Encountered By Senior Secondary School Students in Learning Chemistry

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Abstract

The study aimed at investigating the Problems Encountered by Senior Secondary School Students in Learning Chemistry in Awka South Local Government Area, Anambra State. Five research questions were raised and answered to achieve the purpose of this study. The population of this study consist of all the 1890 senior secondary (SS2) chemistry students in the 18 public secondary schools in Awka South L.G.A. of Anambra State. A sample of 288 SS2 chemistry was randomly selected. The instrument for data collection was a 20 item questionnaire titled "Problems Encountered by Senior Secondary Chemistry Students in Learning of Chemistry(PESLC) which was validated by two lecturers in the Department of Science Education, Nnamdi Azikiwe University, Awka. The reliability of the instrument was determined using Cronbach alpha method which yielded a reliability coefficient of 0.83. Mean was used in data analysis. Methodologically, this study is purely quantitative and the research design adopted for the study is survey research design. The findings of the study revealed that teaching approach used in the basic science classes such as stimulus variation and the extent of the students' previous knowledge in basic science have positive impact on the students' perception and interest in learning chemistry. Availability of educational resources such as qualified teachers, textbooks, laboratory equipment's and a conducive learning environment, motivates students to learn chemistry. The study recommended that government at all levels and all stakeholders should give more serious attention to the teaching and learning of basic science in junior secondary school levels. Government at all levels and all stakeholders should make adequate provision of basic educational resources in terms of instructional materials and quality human resources to ensure effective teaching and learning of chemistry.

Keywords

Investigating; senior secondary; students; learning chemistry



I. Introduction

Education could be described as the body of knowledge, skills, attitude, values, norms, believes and so on, which a generation gives to its young ones which make them to become responsible members of the society and enable them contribute positively to the socio-economic development of the society in which they live. This definition, no doubt incorporates the functional character or quality of education, which is basically anchored on acquisition of knowledge, skills and positive behavior and enables the individual to contribute to the development of his or her community and society at large and also to be

able to function effectively as a responsible member of the society (Udofia, and Ekong, 2017). The introduction of scientific method in teaching and learning process in particular and as a major component of any effective educational system no doubt promotes the functionality as a character in that educational system. Therefore, deployment of scientific methodology in teaching and learning process is at the heart of science education. Science education exposes students to the development in science skills. As a discipline, science education is considered as the most valuable tool for human development; therefore, the reason it was included in the curriculum was to meet up certain goals of the nation's development (Nnoli, 2022).

Science education is technically a product of a fusion between the elements of science and education, geared towards producing a simplified and comprehensible concept of science that can be understood by individuals not traditionally part of the scientific community. Ellah, & Achor, (2018) opine that the conceptualization of science education goes beyond mere presentation of or acquisition of scientific facts and skills, but covers the development of new ways of thinking, reacting and behaving; a development that reveals its self in increased skills, knowledge and thinking capacities to tackle the problems of life, in improved character- albeit by some controlled or regulated and thus systematized process. One of the major merits of scientific method in the teaching and learning process and in education generally is the ability to transform the typical teacher-centered classroom lecture into a learner-centered, discovery and problem-solving arena. This makes teaching and learning process a fun filled problem solving activity, helps to arouse the interest of the learner to learn, stimulates and encourages creativity and originality. Furthermore, the importance of science education to the socio-economic development of any nation cannot be overemphasized. In fact, it is unarguably, the foundation of socio-economic and technological development of any nation. In other words, Kambu, Libata, & Usman, (2019) describe science education as very important to the development of any nation in many areas especially in the area of scientific and technological advancement. Therefore, any nation that is serious in scientific and technological development and advancement must take science education very seriously and invest heavily in it at all levels of their educational system. Conceptually speaking, what constitutes science education is a tripod which comprises mainly of three subjects namely Biology, Chemistry and Physics; and if well-developed will represent a catalytic process for educational training, public awareness, values, behavior and lifestyles required for a sustainable human and capital development (Ezirim, & Ezirim, 2021).

Chemistry has been identified as a very important science subject, and its importance in scientific and technological development of any nation has been widely reported, it is as a result of the recognition given to chemistry in the development of the individual and the nation that it was made a core subject among other science related courses in Nigeria Education System (Nnoli, 2020). In other words, the importance of Chemistry education and Chemistry as a senior secondary subject can never be over stressed. Chemistry being one of the major subjects that make up science education, it is regarded as a pure science that has its usefulness/relevance in different areas of knowledge and human endeavors such as healthcare, biology, agriculture, technology, space science, archaeology, defense and so on. Chemistry stands as a scientific discipline with the potential to facilitate and secure the intellectual advancement of students by fostering an exploration aimed at comprehending the characteristics and alterations of nature, especially in relation to heavy metals and their intricate behaviors (Henron, 2015; Ogwu et al., 2021). The quest and the

interest in the teaching and learning of Chemistry are as a result of its relevance to the need of the society. Chemistry helps to instill scientific knowledge and stimulate science-oriented attitude in learners. According to Eilks and Hofstein (2015), many studies and education policy paper present a gloomy picture with respect to the learning of chemistry especially at secondary education particularly in chemistry is unpopular among many students.

Chemistry is a fundamental subject in the senior secondary school curriculum, providing students with a foundational understanding of matter and its interactions. However, students often encounter various problems when learning chemistry. One of the key challenges faced by senior secondary school students in learning chemistry is the lack of digital education skills (Mansour & Yassin, 2022; Anike, 2023; Purba, 2022). In an increasingly digitalized world, students need to navigate online resources and educational platforms to access supplementary materials and engage in interactive learning experiences. Chemistry is a practical science, and students often struggle with abstract concepts when they lack hands-on laboratory experience (Panjaitan et al., 2021; Ananda et al., 2021). The absence of well-equipped laboratories and practical resources can limit students' understanding of chemical reactions and phenomena. Chemistry requires critical thinking and problem-solving skills. Students may encounter difficulties in connecting theoretical knowledge with real-world applications (Hadi et al., 2022; Siregar et al., 2019). This limitation can hinder their ability to analyze complex chemical problems and make meaningful connections. Understanding chemistry often involves mastering technical language and terminology (Osorio & Vargas, 2020; Manalu & Harahap, 2021). For students with limited language proficiency, comprehending complex chemical concepts can be challenging. Hence, students interested in learning chemistry are not enough. One of the reasons mentioned frequently being that learners do not perceive chemistry and chemistry education as relevant both to themselves and the society in which they live forgetting that our daily activities are as a result of chemistry and science

1.1 Statement of the Problem

There is no doubt whatsoever that Chemistry, as a course of study and as a senior secondary school subject just like Biology and Physics, is both theoretical and practical in nature, hence it requires both serious and steady theoretical and practical class. Despite the inestimable value of chemistry in human and national development, the learning of chemistry, especially in the senior secondary schools has for many years now been experiencing many problems and challenges that have adversely affected the interest of secondary school students.

Unarguably or arguably, the quality of education has declined to the extent that Nigeria educational system, its products and certificates have over the years continued to be a laughing stock in the international community Kambu, Libata, & Usman, 2019). This could be attributed to the continuous neglect and gross underfunding of this most important sector in any nation that is interested in human capital and national development. Therefore, this study aims to ascertain the problems encountered by senior secondary students in the learning of chemistry in secondary schools.

1.2 Purpose of the Study

The purpose of this study is to investigate the problems that senior secondary chemistry students encounter in learning chemistry in Awka South Local Government Area. Specifically, this study sought to determine

1. depth of students' prior knowledge in Basic Science in terms of content coverage and method of teaching.
2. opinion of senior secondary chemistry students on how adequate their state of readiness is for learning chemistry in secondary schools.
3. students' perception of their teachers' instructional activities.
4. students' perception of their learning environment.
5. The nature of relationship that exists between chemistry students and their teachers.

1.3 Scope of the Study

This study specifically investigates the problems or challenges encountered by senior secondary school chemistry students in learning of chemistry in senior secondary schools. The geographical scope of this study covers SS-2 secondary schools in Awka South Local Government Area.

1.4 Research Questions

1. What is the depth of the students' prior knowledge in Basic Science in terms of content coverage and method of teaching?
2. What is the opinion of senior secondary chemistry students on how adequate their state of readiness is for effective learning of chemistry in secondary schools?
3. How does chemistry students perceive their teachers' instructional activities as a factor on their learning and understanding of chemistry?
4. How does chemistry students perceive their learning environment as a factor on their effective learning of chemistry in secondary schools?
5. How does the nature of relationship that exists between chemistry students and their teachers affect their general performance in chemistry?

II. Research Methods

This study adopted the survey research design. The area of study was Awka Educational Zone. Population of the study was the government owned secondary schools in Awka South Local Government Area. The sample of the study sixteen public schools out of the eighteen state government owned secondary schools in Awka South Local Government Area Anambra State Nigeria. Simple random sampling technique was adopted in the course of selecting the eighteen (18) senior secondary school students and one (1) chemistry teachers from each school. Therefore, the researchers made use a total of 288 SS2 chemistry students and 18 chemistry teachers. The instrument used for data collection was questionnaire on the Problems Encountered by Senior Secondary School Chemistry Students in Learning of Chemistry (PESLC). This PESLC Questionnaire was designed and developed by the researcher but under the strict supervision of an expert in educational measurement and evaluation. The questionnaire was divided into two sections namely section A and Section B. Section A part of the questionnaire contains personal information of the respondents while the section B contains statements that required the respondents to respond to the problems encountered by senior secondary school students in learning of chemistry. Therefore, the questionnaire contains five research questions, with questions developed from each question. Four alternative columns were provided indicating the level or the degree of the respondent agreement or disagreement. The questionnaire was subjected to face validity and was found to have measured what it is supposed by an experienced expert in educational measurement and evaluation and science education chemistry option. These experts read through the questionnaire and made some necessary corrections. To obtain the reliability of the instrument, the data obtained was

analyzed using Cronbach Alpha Method. The reliability was found to be 0.83 which shows that the instrument was highly reliable. The researcher gave the respondents at least ten (10) minutes to respond to the questions on the questionnaire before retrieving the filled questionnaire. 288 questionnaires were distributed and all collected or retrieved. The data obtained from the questionnaires which were responded to by the respondents were first collated, tallied and analyzed using the statistical tool of the mean score. The collated and tallied responses were rated using 4-point scale of Strongly Agree (SA) which carries 4 points, Agree (A) rated 3 points, Disagree (D) was rated 2 points while Strongly Disagree (SD) was rated on 1 point scale. Any mean score that was 2.50 and above is agreed, while any mean score below 2.50 was disagreed.

Research Question 1: What is the depth of the students' prior knowledge in Basic Science in terms of content coverage and method of teaching?

Table 1. Mean response on the depth of the students' previous knowledge in Basic Science, in terms of volume of content, quality and method of teaching in Awka South Local Government of Anambra State.

Table 1.			
S/N	ITEMS	MEAN SCORE	DECISION
1.	The amount of content covered in the previous knowledge in basic science classes has a significant impact on the students' understanding of chemistry.	3.42	Agree
2.	The teaching approach used in the basic science classes has an impact on the students' perception and interest in chemistry.	3.55	Agree
3.	The extent of students' prior knowledge in basic science has a significant impact on the level of challenges they encounter in their study of chemistry.	3.48	Agree
4.	Students who have a solid foundation in basic science find it easier to understand, learn and apply scientific principles in their studies.	3.48	Agree
Overall Mean Score		3.48	Agree

Table 1 has four items, and all items were agreed on by the respondents. Therefore, this shows that the extent of the depth of students' previous knowledge, in terms of content coverage and method of teaching has a great influence on the extent to which students learn and understand chemistry in their senior secondary school level. In other words, the teaching approach used in the basic science classes has an impact on the students' perception and interest in learning chemistry.

Research Question 2: What is the opinion of senior secondary chemistry students on how adequate their state of readiness is for effective learning of chemistry in secondary schools?

Table 2. Mean response on the opinion of senior secondary chemistry students, on the adequacy of their state of readiness for effective learning of chemistry in secondary schools in Awka South Local Government of Anambra State

Table 2.			
S/N	ITEMS	MEAN SCORE	DECISION
5.	Students' opinion on their state of Readiness for effective learning of chemistry is uniform across all students.	1.67	Disagree
6.	Readiness is affected by students' individual learning styles, preferences and personality.	3.60	Agree
7.	Motivating students by arousing their interest to learn through stimulus variation, affect their state of readiness for effective learning of chemistry.	3.68	Agree
8.	Availability of resources such as textbooks, laboratory equipment and conducive learning environment influence students' state of readiness to learn.	3.75	Agree
Overall Mean Score		3.18	Agree

Table 2 shows that items 5 was disagreed while item 6, 7, and 8 were agreed by the respondents. The interpretation of the data presented on the table shows that chemistry students require adequate readiness in order to understand and effectively learn chemistry.

Research Question 3: How does the chemistry students' perceive their teachers' instructional activities as a factor that affect their learning and understanding of chemistry?

Table 3. Mean response on Chemistry students' perception of their teachers' instructional activities as a factor that affect their learning and understanding of chemistry.

Table 3.

S/N	ITEMS	MEAN SCORE	DECISION
9.	Teachers' instructional activities influence chemistry students' extent of learning and understanding of chemistry.	3.66	Agree
10.	Chemistry teachers' teaching experience, mastery of the subject and teaching methodology influence the students' interest and participation in chemistry classes.	3.84	Agree
11.	The clarity and effectiveness of instructional activities can impact the chemistry students' ability to learn or retain information in the subject.	3.63	Agree
12	The use of interactive and variety of instructional activities has no impact on the chemistry students understanding of the concepts in the subject	1.71	Disagree
Overall Mean Score		3.21	Agree

Table 3 shows that item 9, 10, and 11 were agreed while item 12 was disagreed by the respondents. The data presented on this table shows through the high mean scores generated that chemistry students' perception of their teacher's instructional activities is a great factor that affects their learning and understanding of chemistry. This assertion or fact is anchored on the high overall mean score of 3.21. Therefore, teachers' instructional activities either promote or mar the teaching and learning process in chemistry lessons.

Research Question 4: How does the chemistry students' perceive their learning environment as a factor that affect their effective learning of chemistry in secondary schools?

Table 4. Respondents mean response on Chemistry students' perception of their learning environment as a factor that affects their effective learning of chemistry in secondary schools

Table 4.

S/N	ITEMS	MEAN SCORE	DECISION
13.	Well designed and equipped classrooms and chemistry laboratories make learning of chemistry easier for students.	3.80	Agree

14.	A positive and supportive learning environment enhances the chemistry student's engagement, interest and participation in the subject	3.52	Agree
15.	The availability of adequate and current learning resources and facilities, such as textbook, laboratories positively impact chemistry students learning experience and outcomes	3.69	Agree
16.	Chemistry students' perception of their learning environment especially the location of school, classrooms and laboratories has an effect on their effective learning of the subject.	3.54	Agree
Overall Mean Score		3.64	Agree

Table 4 contains items on chemistry students 'perception of their learning environment as a factor that affects their effective learning of chemistry in secondary schools. It shows that all items were agreed on by the respondents. Therefore, learning environment plays a significant role in the promotion of learning of chemistry. This assertion is heavily supported by the result on the table.

Research Question 5: Does the nature of relationship that exists between chemistry students and their teachers affect their general performance in chemistry?

Table 5. Respondents mean response on the relationship existing between chemistry students and their teachers affect their general performance in chemistry

Table 5.

S/N	ITEMS	MEAN SCORE	DECISION
17.	Students are more likely to learn easily under a teacher they love, that is teachers that are democratic and maintain a cordial relationship with them.	3.66	Agree
18.	Students hardly learn under teachers that they fear, that is those that are authoritative and often make use of corporal punishment to correct students.	3.29	Agree
19	Students learn more effectively under teachers that they feel free to discuss their personal problems with and are ready to assist them.	3.65	Agree

20	Students learn more under teachers they respect consider intelligent, admire, that dresses neatly, communicate well and maintain a sound moral lifestyle.	3.73	Agree
Overall Mean Score		3.58	Agree

Table 5 contains items on how the relationship existing between chemistry students and their teachers affect their general performance in chemistry. It shows that all items were agreed on by the respondents. This shows that the relationship existing between the chemistry students and their teachers to a great extent affect their general performance in chemistry. Therefore, the findings of this research show that the teachers' relationship to a great extent promotes or impedes learning.

III. Discussion

The result from research question one revealed that the teaching approach used in the basic science classes such as stimulus variation and the extent of their previous knowledge have an impact on the students' perception and interest in learning chemistry. Ellah and Achor (2018) in their study observe that achievement in basic is a major factor in science students' performance in science subjects. Therefore, there is great need for student to have a solid foundation especially in core science subjects especially chemistry in their junior secondary school level, as this will surely eliminate by half some of the problems, they might encounter in learning of chemistry in their senior secondary school level.

Availability of instructional resources such as textbooks; laboratory equipments and conducive learning environment, to a great extent positively influence students' state of readiness to learn. Nnoli (2014) confirms the importance instructional resources when he says that instructional materials make learning more engaging and capture students' attention and help them to better understand and retain information presented to them. Unavailability and inadequacy of well-designed and equipped classrooms and chemistry laboratories in most secondary schools. There is no doubt that well designed classrooms and well-equipped laboratories, make learning of chemistry very effective and easier for students. The sufficient availability of meticulously planned and well-furnished classrooms, laboratories, and libraries plays a crucial role in enhancing the academic performance of students. When these resources are strategically employed throughout the teaching and learning journey, they contribute to an efficient and purposeful educational experience. Empirical evidence underscores that a notable distinction exists in the academic achievements of science students who have access to adequately equipped laboratories compared to those who have access to laboratories with insufficient resources (Katcha and Wushishi, 2015; Azonuche, 2021).

Chemistry teachers' teaching qualification, teaching experience, mastery of the subject and teaching methodology influence the students' interest and participation in chemistry classes. In support of this very finding, Xhaferi (2017) in his empirical observation, asserts that quality teaching depends on knowledge of the subject matter and teaching skill, as these factors have been found to have a positive impact on students' academic achievement and performance. Chemistry students learn effectively when they have cordial relationship and communicate effectively with the teachers they respect, admire, consider intelligent, dress neatly, and live a sound moral lifestyle. Teachers having

a positive relationship with their students helps them become more successful and also makes the classroom a safe and welcoming environment for all. (Kambu, Libata, & Usman, 2019) In other words, teachers in general, science and chemistry teachers in particular who maintain a healthy and cordial relationship with their students and also democratic, fair and just in dealing with their students are great source of motivation to their student to learn chemistry effectively.

IV. Conclusion

The study investigated the problems encountered by students in the learning of chemistry in secondary schools in Awka South Local Government Area of Anambra State. The importance of chemistry as a science subject in secondary schools cannot be overstressed, as its contributions to advancements in science and technology for the benefit of man and his environment, creation of employment and source of livelihood and above all a catalyst for national development. Therefore, any obstacle, challenges or difficulties facing the learning of chemistry especially in secondary schools must be given a serious attention with the aim of dismantling it, in order to enhance the interest of students in the subject, thereby promoting the teaching and learning of chemistry as an important science subject in secondary schools.

Recommendations

Based on the research findings, the researcher make the following recommendations:

1. Government at all levels and all stakeholders should give more serious attention to the teaching and learning of basic science formerly called integrated science in junior secondary school levels. Qualified and well trained and highly motivated teachers who are well grounded in the subjects that make up basic science should be recruited to basic science and quality teaching and learning environment should be put in place.
2. Quacks or unqualified teachers' chemistry should be flushed out of the teaching profession and educational system, as inability to motivate, reinforce and ensure the readiness of students to learn chemistry have been traced to the presence of unqualified teachers who do not employ appropriate teaching techniques which are capable of ensuring the readiness of students to learn chemistry.
3. Federal and state ministries of education, local governments educational authorities and all stakeholders should as a matter of urgency and necessity make adequate provision of basic educational resources in terms of instructional materials for effective teaching and learning of many subjects especially chemistry.
4. Teachers especially science and chemistry teachers should be well trained and financially motivated in order to ignite and sustain their passion for the teaching profession which will lead to effective teaching and learning of chemistry.
5. Government at all levels and indeed all stakeholders should consider it extremely necessary to organize from time to time workshops, seminars, symposia, conferences and refresher courses for all teacher especially science and chemistry teachers. This will afford them the opportunity to equip them with the skills and other personal qualities that are needed in ensuring effective teaching and learning of chemistry.

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