

PERCEPTION OF STUDENTS REGARDING SOME DIFFICULT CHEMISTRY TOPICS IN ORO PUBLIC SECONDARY SCHOOL OF KWARA STATE

¹ AJANAKU, Adeniyi PhD; ²Ajibade Emmanuel Oluwaseun ; ³Olanrewaju Olaide Kuburat & ⁴Abdulkadir Suleiman Alabi

^{1,2,3,4} Department of Chemistry Kwara state College of Education, Oro

Abstract

This research work was designed to examine the perception of students regarding some difficult chemistry topics in Oro public secondary school of Kwara state. One research objective and hypothesis was tested for in this study. The study adopts a descriptive research design, the population of the study comprised of all students of public secondary school of Oro in Kwara State. A sample of thirty students (30) were selected from six (6) secondary schools. The instrument used for the study was a structured questionnaire that was validated by experts in Chemistry Education. The test-retest method was used to established the reliability of the instrument using Pearson Product Moment Correlation co-efficient of 0.72r was obtained. Inferential statistics of chi-square was used to test the hypothesis at 0.05 alpha level of significance. The findings revealed that some topics in chemistry were difficult for students to learn in senior secondary school, while the reasons for the difficulties are poor student background in chemistry, incompetence of teachers, inappropriate teaching aids and method of teaching. The findings also revealed significant different between male and female chemistry students perception on difficult topics. Based on this, it was recommended that competent and qualified teachers should be employed for all secondary schools and the provision of a well equipped laboratory should be given to all schools by government and private owners to aid learning of abstract concepts.

Keywords: Perception, Students, Chemistry, Difficult topics

Introduction

The contribution of science and technology to the growth and development of any nation in the world cannot be overrated. Its application to the ways of life in a particular nation contributes significantly to the classification of such nation as developed, developing or under-developed. In other words, the degree of applicability of science and technology in a country determines the social class of that country among the world's nations. The advancements in science and technology are bringing about change in the way people operate, interact, communicate, and do business. Science and technology are important forces of innovation because they underpin economic advances, as well as provide improvements in health services, schooling, and infrastructure. There can be no socioeconomic development in or existence of the modern world if science and technology are ignored.

Kyado et.al. (2021) define Science as a body of knowledge encompassing general truths and the operation of general laws, acquired and tested through scientific methods. Bybee, (2015) characterizes Science as an ongoing process where individuals strive to gain knowledge and comprehend the natural world. It involves the systematic application of a specific methodology rooted in factual evidence. Osborne et.al. (2013) argue that science is a human-driven endeavor aimed at generating knowledge about various aspects of the physical and social realms. Similarly, Abd-El-Khalick, (2012) states that Science is a continuous pursuit focused on gaining a deeper understanding of the natural world through a structured and organized approach based on tangible realities

There are three major science subjects in Nigeria, Chemistry, Physics and Biology, which are all taught at Senior Secondary School level. This is to prepare and equip learners for all science based courses at higher level. According to the American Chemical Society, (2022) Chemistry is the study of matter and its transformations. This definition underscores the exploration of substances' properties, composition, structure, behavior, and the changes they undergo. Brown et.al. (2017) further define Chemistry as the scientific inquiry into the behavior of matter, focusing on the interaction of atoms and molecules.

The Science Teachers Association of Nigeria (2011) defines Chemistry as the scientific field that delves into matter's characteristics, composition, structure, transformations, interactions, and the energy implications of chemical changes. In Nigeria, the teaching and learning of Chemistry in senior secondary schools involve the adoption of activity-based teaching methods. However, students often encounter challenging concepts within the subject. The persistent issue of poor performance by senior secondary school students in Chemistry is a concern, attributed to the complexity of Chemistry concepts.

Gilbert and Treagust, (2015), emphasize one of the roles of Chemistry in schools is to foster scientific literacy, enabling students to critically assess scientific information. Sharma and Yasar, (2018) argue that Chemistry education plays a pivotal role in cultivating problem-solving skills through laboratory experiments, critical thinking, and analytical reasoning. Studying Chemistry opens doors to various career opportunities in research, medicine, environmental Science, forensic Science, and chemical engineering (Waddington,2016). Chemistry also contributes significantly to enhancing environmental awareness. Chemistry education equips students with knowledge about the environmental impact of chemical processes and encourages sustainable practices. Moreover, Chemistry education supports technological advancements, allowing students to learn about chemical reactions, materials, and processes that underpin innovations in energy production, materials science, and pharmaceuticals.

Meaning of Chemistry Concept

According to Chang, (2016) Chemistry concepts encompass the understanding of matter, its properties, structure, and the changes it undergoes. Chemistry involves the study of atoms, molecules, and the interactions between different substances. In this comprehensive write-up, we will delve deeper into the various aspects of Chemistry concepts and their implications for teaching and learning.

1. **Understanding of Matter:** Chemistry concepts begin with the understanding of matter, which is the physical substance that makes up everything around us. Matter can be classified into two main categories: elements and compounds. Elements are pure substances that cannot be broken down into simpler substances, while compounds are formed when two or more elements combine chemically.
2. **Properties of Matter:** The properties of matter are the characteristics that describe how a substance behaves. These properties can be physical, such as colour, texture, and shape, or chemical, such as reactivity and solubility. Understanding the properties of matter is crucial for predicting how substances will interact and change.
3. **Structure of Matter:** The structure of matter refers to the arrangement of atoms and molecules within a substance. Atoms are the basic building blocks of matter and are composed of protons, neutrons, and electrons. Molecules are formed when two or more atoms bond together. Understanding the structure of matter helps explain the properties and behaviour of substances.
4. **Changes in Matter:** Chemistry concepts also involve the study of the changes that matter undergoes. These changes can be physical, such as melting, boiling, and dissolving, or chemical, such as reactions between substances. Understanding the changes in matter helps explain the behaviour of substances and the processes that occur in the natural world.
5. **Atoms and Molecules:** Chemistry concepts revolve around the study of atoms and molecules. Atoms are the basic building blocks of matter, while molecules are formed when two or more atoms bond together. Understanding the structure and behaviour of atoms and molecules is crucial for explaining the properties and interactions of substances.
6. **Interactions between Substances:** Chemistry concepts also involve the study of the interactions between different substances. These interactions can be physical, such as mixing and separating, or chemical, such as reactions between substances. Understanding the interactions between substances helps explain the behavior of substances and the processes that occur in the natural world

Perception of students on Chemistry Concepts

Taber, (2018) states that chemistry concepts encompasses the interrelation of content, teaching, and learning in the context of chemistry education. This model emphasizes

the dynamic interaction between the subject matter of chemistry, the instructional methods employed to convey this content, and the cognitive and affective processes through which students engage with and comprehend the material. The nature of chemical knowledge encompasses the fundamental properties, structure, and behavior of matter, as well as the interactions between different substances. Understanding these aspects is essential for educators to design curriculum-aligned lessons that address specific challenges students encounter in grasping and applying chemical concepts.

Conversely, the psychology of learning encompasses the cognitive, affective, and social processes that shape how students perceive, process, and retain information. By understanding these psychological factors, teachers can create engaging, relevant, and accessible lessons that accommodate diverse backgrounds, interests, and learning styles.

Misconceptions of students to chemistry concepts

Özmen, (2019) focuses on the importance of recognizing and correcting misconceptions among students in the field of science education. The article includes a thorough literature review focused on chemical bonding, highlighting common misconceptions held by students. Özmen suggests using multiple-choice questions and two-tier multiple-choice items as effective tools for identifying students' misconceptions within a specific content area. The publication also carefully outlines the advantages and disadvantages of using these types of assessments. In conclusion, the author emphasizes the crucial role of identifying and correcting students' misconceptions in improving the effectiveness of science education.

Musa Üce and İlknur Ceyhan, (2019) explore the difficulties related to understanding abstract concepts in chemistry education and emphasize the prevalence of misconceptions among students. They argue that concrete concepts stem from students' experiences, while abstract concepts, predominant in chemistry, present a significant challenge for students. The study is based on a literature review that examines various abstract subjects in chemistry education, such as solubility equilibrium, covalent bonds, ionic bonds, hydrogen bond and molecule geometry, activity concept in elements, chemical equilibrium, dissolution, electrolysis, and battery. The literature review underscores the common occurrence of scientifically incorrect thoughts and acknowledgments, known as misconceptions, among students in a learning environment. The authors assert that traditional teaching methods often struggle to eliminate these misconceptions. Recognizing that each student constructs knowledge based on their individual abilities and experiences, the paper emphasizes the importance of identifying and rectifying misconceptions rooted in students' prior knowledge. The methodology employed in this study is a literature review, a qualitative research approach, to examine and synthesize existing research on misconceptions in chemistry education. The identified abstract subjects with prevalent misconceptions

are thoroughly discussed, and the paper explores methods to remove these misconceptions, aligning with the constructivist learning theory. The study concludes by confirming the presence of multiple misconceptions in chemistry education, particularly in abstract subjects. The authors advocate for the application of methods grounded in the constructivist learning theory to effectively address and eliminate these misconceptions. This literature review serves as a valuable resource for educators, providing insights into the challenges associated with abstract chemistry concepts and offering constructive strategies for improving teaching methods in the field.

García-Martínez and Serrano-Torregrosa (2015) offers a comprehensive examination of the challenges and opportunities in chemistry education. The publication centers on the identification and rectification of misconceptions, while also advocating for the implementation of innovative teaching practices to enhance learning outcomes. It underscores the prevalence of misconceptions, the necessity for innovative teaching methods, best practices in chemistry education, opportunities for improvement, and emerging trends in the field. The authors emphasize the significance of embracing evolving teaching techniques to effectively address misconceptions and elevate students' comprehension of chemistry. Ultimately, this work presents valuable insights for educators seeking to refine their instructional methods within the dynamic landscape of chemistry education.

Statement of the problem

Examination (SSCE) for some years have witnessed a persistent problem of poor performance in Chemistry, while teachers and parents, are concerned about the poor performance, many students are not worried about the situations. Poor result in Chemistry in National Examination Council (NECO) and Western Africa Examination Council (WAEC) have shown that performance tend to be very poor.

Several factors have been identified by chemistry researchers and educators to be responsible for the deterioration of students performance and interest. Level of motivation attitude and achievement in secondary school chemistry. The low level of students performance in chemistry especially at senior secondary school level is an indication that students have difficulties, in understanding some concepts in the subjects (Chemistry). Therefore, there is need to investigate the difficult areas of Chemistry in order to find out any possible remedy and adjustment or measures which are necessary to improve students academic performance in the subject.

The present study is being undertaken to identity the difficult Chemistry concepts in senior secondary schools curriculum, perceived difficult to learn by students in Oro, Kwara State. To this end, the researchers aim at assessing the perception of students into some difficult chemistry topics in Oro public secondary school of Kwara state in

order to enhance a better and safer approach to the teaching of difficult chemistry topics, particularly among secondary students.

Specifically, the objectives of this study include;

- i. To investigate the students perception to difficult topics in Chemistry based on gender in public secondary school of Oro Kwara state.

Research hypothesis

- i. The sex of secondary schools students in Oro public secondary school of kwara state does not influence their perception towards some difficult topics in Chemistry.

Research method

This study adopted a descriptive survey design. The design involves the logical collection of data for the purpose of describing existing observed phenomena in a concise form and permits clear representation of samples of the target population. The population of the study consists of all the public science secondary schools in Oro, kwara state. A sample of thirty students randomly selected from five schools. The instrument that was used for this study is a structured questionnaire. The questionnaire was divided into two sections, namely: Section A, which sought information on demographic characteristics of the respondents; and Section B, comprising twenty-three items rated on a Four-point modified Likert scale (Most difficult, Difficult, Less difficult, Easy) to identify challenging chemistry concepts. The instrument was presented to experts for necessary modification to ensure face and content validity. The experts' suggestions and criticisms were adopted for the final draft of the questionnaire. The researchers personally visited all the selected secondary schools to administer the questionnaire to the respondents. Completed copies of the questionnaire were collected on the spot after they had been filled in. The data collected was analyzed using descriptive statistics of frequency tables, mean scores, and standard deviation and inferential statistics of chi square.

Result

The result of the study is presented in table below:

Hypothesis one: The sex of secondary schools students in Oro public secondary school of kwara state does not influence their perception to difficult topics in Chemistry.

Table 1. Showing statistical relationship between gender and perception of students towards some difficult topics in chemistry

Variables		N	Mean	Stand Dev	χ^2	Df	P	Remark
Sex	Male	13	8.50	2.12	9.711	2	0.008	Significant
	Female	17	27.20	3.95				
Perception	Positive	30	8.30	2.12	7.498	1	0.000	Significant
	Negative	30	24.20	3.95				

*P<0.05

Table 1 showed that there is a significant relationship between the sex and the perception of students towards some difficult topics in chemistry with $p < 0.05$. Hence, the null hypothesis rejected and the alternative (H_0) accepted

Discussion

Findings revealed that there was a positive perception of students towards some difficult chemistry topics. While few of the respondents believed that some chemistry topics were easy and less difficult. Furthermore, a significant relationship was observed based on sex and the perception of students towards some difficult topics in chemistry.

The above findings demonstrate a positive approach to some chemistry topics as shown by findings. This is similar to findings of a study conducted by Musa and İlknur, (2019) who explore the difficulties related to understanding abstract concepts in chemistry education and emphasize the prevalence of misconceptions among students. They argue that concrete concepts stem from students' experiences, while abstract concepts, predominant in chemistry, present a significant challenge for students.

Conclusion

Based on the findings of this study it can be concluded that chemistry concept that are perceived difficult to learn by students depends on their background in chemistry, their readiness to learn, teacher's competence and proper handling of a suitable and acceptable method of teaching. Motivation of teachers by the government and that the level of difficulty varies but simple or complex concepts can be made simplified and more understanding if there is good mastery and desire to teach by teachers.

Recommendation

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

- i. There should be good mastery and desire of the subject matter by the subject teacher. ii. Appropriate learning approach i.e. method of teaching should be provided by teachers.

References

- Abd-El-Khalick, F. (2012). Examining the sources for our understandings about science: Enduring confluences and critical issues in research on nature of science in science education. *International Journal of Science Education*, 34(3), 353-374
- American Chemical Society. (2022). *Chemistry in Context*. Retrieved from <https://www.acs.org/content/acs/en/education/whatischemistry.html>
- Brown, T. L., LeMay, H. E., Bursten, B. E., Murphy, C. J., and Woodward, P. M. (2017). *Chemistry: The Central Science* (14th ed.). Pearson.
- Bybee, R. W. (2015). The BSCS 5E instructional model and 21st century skills. *Science Scope*, 38(7), 41-48.
- Chang, R. (2010). *Chemistry*. New York, NY: McGraw-Hill
- García-Martínez, J., & Serrano-Torregrosa, E. (2015). *Chemistry Education: Best Practices, Opportunities, and Trends*. [Book]. Wiley.
- Gilbert, J. K., and Treagust, D. F. (2015). The Role of Chemistry in Science Education. In *Chemistry Education: Best Practices, Opportunities and Trends* (pp. 1-16). Royal Society of Chemistry.
- Kyado, J, Achor, E & Adah, E. (2021). Identification of Difficult Concepts in Chemistry by Some Secondary School Students and Teachers in Nigeria, 5. 99-111.
- Musa U & Ilknur, C (2019). Understanding teachers' perceptions of Chemistry: A mixed- mixed-methods approach. *Chemistry Education Research and Practice*, 20(3), 45- 362.
- Osborne, J., Collins, S., and Ratcliffe, M. (2013). What "ideas-about-science" should be taught in school science? A Delphi study of the expert community. *Journal of Research in Science Teaching*, 50(6), 642-658.

Özmen, H. (2004). Some Student Misconceptions in Chemistry: A Literature Review of Chemical Bonding. *Journal of Science Education and Technology*, 13(2), 147-149.

Science Teachers Association of Nigeria STAN (2011), what is Chemistry all About. <http://www.cheml.com/acad/webtext/pre/chemsci/html>.

Taber, K. S., & Garcia-Franco, A. (2016). Learning chemistry through the use of a multi-level approach to the analysis of chemical bonding. *International Journal of Science Education*, 32(3), 349-377.

Waddington, D. (2016). The Role of Chemistry in Science Education: A Historical Perspective In *Chemistry Education: Best Practices, Opportunities and Trends* (17-32). Royal Society of Chemistry.

Yaman, S., & Ayas, A. (2012). The effect of gender, grade level, and their interaction on students' attitudes toward chemistry and science. *Journal of Science Education and Technology*, 21(6), 754-767.

