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Perception of difficult concepts in B. Ed chemistry programme in Ignatius Ajuru university of education, Port Harcourt

Chinda Worokwu
Department of Chemistry, Faculty of Natural and Applied Sciences, Ignatius Ajuru University of Education, PMB, Rumuolumeni, Port Harcourt, Rivers State, Nigeria

Abstract
The study investigated the perception of difficult concepts in B.Ed Chemistry programme in Ignatius Ajuru University of Education Rivers State Nigeria by Chemistry students. Three research questions and two hypotheses guided the study. The study adopted the descriptive survey design. The sample size was 85 Chemistry undergraduate students of Ignatius Ajuru University of Education, Rivers State. The instrument for data collection was a researcher made questionnaire titled Perception of Difficult Concepts in Chemistry Questionnaire (PDCCQ). Mean, standard deviation and t-test were the statistical tool used for data analysis. The result of the study reveals that ten out of fifteen concepts were perceived difficult by the students which includes thermodynamics, redox reaction enthalpy, thermochemistry, quantum number, chemical kinetics, electrolysis, chemical equilibrium stoichiometry and energetics. The difficulties were attributed to teaching process, nature and language of Chemistry, mathematical efficiency, lack of prior knowledge, lack of practical activities and Chemistry lecturers' qualification. There is no significant difference between male and female Chemistry students perception of difficult concept. The study recommended among others that Chemistry undergraduates and teachers should pay attention to these concepts to enhance their performance.

Keywords: perception, difficult concept, curriculum, chemistry

Introduction

Chemistry is one of the branches of pure and applied sciences. It is involved in every phases of our lives. It is the bedrock of technological advancement and a gateway to all the courses in the sciences. However, despite the fact that it is of immense benefit to mankind it is dreaded by must students. Chemistry is cursed as much as it is praised by students (Gafoor & Shilna, 2013) [6]. The reason for the widely perceived difficulty has been attributed to it specialized language, mathematical and abstract nature of its concepts and the number of content to be learned (Gabel, 1999) [5]. In the same vein Osborne and Collins (2001) [16] assert that Chemistry curriculum is abstract, difficult to learn and understand. Many students sees Chemistry as a difficult, complex and an abstract subject that requires special intellectual talents and a too much effort to be learned (Gabel, 1999; Johnstone, 1991; Nakhleh, 1992) [5, 9, 12]. Chemistry content has so many abstract, non- intuitive and dreaded concepts which are not directly related for the world they live in.

However, more than other sciences, understanding Chemistry relies on making sense of the invisible, abstract and untouchable (Kozma & Russell, 1997.) [11]. The sources of students' difficulties in chemistry is attributed three origins of science as opined by Johnstone (1999). These are the nature of the science, the traditional methods of teaching and the methods by which students learn science. These origin of science poses a problem which the learner cannot solve. Science teaching and learning must make paradigm shift from traditional methods to innovative methods that are learner friendly to dispel the concept of difficulty accorded to it.

Another barrier to understanding Chemistry is the special language that chemists uses. Chemists communicate in a highly elaborated alphabetic, numeric and symbolic language (Sliwka, 2003,) [18]. According to Johnstone (2000) [10] chemistry can be seen at least at three levels: There is the level at which we can see and handle materials, and *describe* their properties in terms of density, flammability, colour and so on. A second level is the *representational* one in which we try to represent chemical substances by formulae and their changes by equations. This is part of the sophisticated language of the subject. The third level is atomic and molecular, a level at which we attempt to *explain* why chemical substances behave the way they do. These three levels are what is regarded as the famous Johnstone's triangle (Johnstone, 1991) [9].

The process of teaching Chemistry is a major source of difficulty in Chemistry learning (Chinda, 2018) [4]. The method used by the teacher to engage learners with task is a determinant whether meaningful learning will take place or not. According to Cardellini (2012) [3], the common assumption that the lecture is an efficient way to transfer knowledge in tertiary institution accurately, is wrong. In the average 50 minutes lecture, the lecturer delivers about 5000 spoken words, of which students record only about 10%. Students on average transcribed about the 90% of the information written by the lecturer on the blackboard. Some students do not understand the meaning of words used to teach or to test students in chemistry. This method of teaching does not encourage student participation and hence motivation does not exist. According to Herron (1996) [7] students find the Chemistry difficult because of lack of understanding of familiar words used to convey meaning in chemistry; a lack of understanding of technical terms introduced in the study of chemistry and using every day

meaning to draw incorrect inferences about chemical events. In this context, content of the textbooks plays a major role as they often become the chemistry curriculum (Niaz & Maza, 2011) [13]. No wonder, Bent (1984) in Cardellini (2012) [3] considered that besides the textbooks, the most important models in teaching chemistry are chemistry teachers themselves. These models, of course, can be strengthened by providing teachers with an overview of the philosophy of Chemistry. It is concluded that introduction of some elements of history and philosophy of chemistry is conducive towards a better understanding of scientific progress. The history and philosophy of Chemistry can only be practiced and taught by a teacher that is an expert in Chemistry education.

Tkachyk (2017) [19] opines that experiment is a strong educational tool, which plays a crucial role in science education. He goes on to say that this is due to the decisive role of experiments in science research and the cognitive importance of experiments in science education. That is why science teachers' professional competence in using science experiments for teaching/learning science is a very important part of their education. Chemistry is a practical subject, thus the theory and practical aspects of chemistry should be taught simultaneously. Students retain more what they have seen and touched than what they were told. Lack of adequate Chemistry practicals makes the study of chemistry un-interesting, difficult and even frustrating (Uchegbu. Oguoma Elenwoke& Ogbuagu, 2016) [20] Despite the importance of experiment most schools do not have a functional laboratory where meaningful practical can be carried out. This is due to the fact that Chemistry laboratory is capital intensive in terms of equipment and resources.

Prior knowledge of student in Chemistry is a major cause of difficulty in learning Chemistry. According to Adesoji, Omilani, and Dada (2017) [1] students who have a poor grasp of concepts in Chemistry at the secondary school level, it becomes a great challenge for them to study Chemistry related courses at tertiary institutions. Gagne theory of learning advocates that for a new concept or skill to be learned it depends upon the mastery of pre- requisite concepts which are hierarchically arranged (Sabiru, 2013) [17]. This implies that prior knowledge is determinant to further learning, which means that materials meant for learning must be sequentially structured by the teacher.

Caleb (2018) [2] carried out a study to determine areas of students' difficulty in Chemistry curriculum a case study in Qatar. The study was an exploratory study. The sample size was thirty students obtained through simple random sampling. The instrument for data collection was a researcher made questionnaire. The finding of the study revealed that topic such as mole concept calculation, electrolysis chemical and ionic equation, chemical equilibrium oxidation-reduction, drawing of displayed formula were perceived as difficult. The study also revealed that cause of difficulty was attributed to nature of concept, prior knowledge language of instruction teaching process and mathematical efficacy.

Uchegbu, Ahuchaogu and Amanze (2017) [21] investigated tertiary institution students' perception of difficult topic in organic Chemistry curriculum in Imo State. The study adopted the descriptive survey design. Two hundred and fifty-one final year Chemistry students from three colleges of education in Imo State. The instrument for data collection was a researcher made questionnaire. The findings of the study revealed that twelve topics were perceive difficult by students which include organic reaction mechanism, stereochemistry, spectroscopy petroleum, petrochemicals and alternative fuels, nitro-alkanes, diazo-alkanes and azide, Amino acids peptides and proteins, Aromatic compounds, aromatic amines and diazonium salts, polynuclear aromatic hydrogencarbon, heterocylic compounds and synthesis polymers. The study also revealed that the reason for difficulty are too much molecular structures, ill equipped laboratory and non-availability of laboratory, teacher factor and lack of excursion/field trips. The finding of the study also reveals that gender and school location has no influence on students' perception of difficult topic in Chemistry curriculum.

Jack, Danjuma and Abdul-kadir (2017) [8] studied the assessment of conceptual difficulties in chemistry syllabus of the Nigeria science curriculum as perceived by High School College students. The study was carried out in Jalingo Taraba State Nigeria. The study adopted the survey design with one hundred and ninety-eight SS3 students constituting the sample. The result of the study shows that 12 concepts out of 19 concepts were perceived difficult which includes symbols, formula and equation, acid bases and salts, organic chemistry, structure and energy level, quantitative analysis, chemical equation, non-metals and their compounds, thermochemistry metals and their compounds, applied Chemistry nuclear, Chemistry and astronomical Chemistry. The finding of the study also reveals that there was significant difference of gender, school nature and school location on students' perception of difficult concepts in Chemistry syllabus.

Bello (2015) investigated difficult concepts in Chemistry and their effect on the achievement of students. The study adopted the survey design. A researcher made questionnaire was used for the study. One hundred and twenty-five (125) students constituted the sample size. Frequencies and percentages were used to answer the research questions while t-test statistics was used to test the hypotheses. The result of the study revealed that students perceived thermodynamics, chemical kinetic, dipole moments, redox reaction isomerism polarizability stoichiometry atomicity and enantiomer as difficult concepts. The study also reveals that the perceived difficult concept affects student achievement in Chemistry. The result reveals that gender of the students has no significant influence on their perception of difficult concepts in Chemistry.

Adesoji, Omilani, and Dada (2017) [1] investigated the comparison of perceived and actual students' learning difficulties in Physical Chemistry the design for the study was the survey design using the ex-post facto type. Two hundred Chemistry students via purposive sampling technique from thirteen Senior Secondary School Three classes in Ido local government of Oyo State, Nigeria where involved in the study. Three research question and a hypothesis guided the study the instruments for the collection of data were Students' Learning Difficulty in Physical Chemistry Questionnaire (SPLDPCQ) with a reliability coefficient of 0.98 and Physical Chemistry Learning Difficulty Diagnostic Test (PCLDDT) reliability coefficient of 0.87. The data collected was analysed using simple percentage and chi-square analysis. The result showed that many areas of Physical Chemistry where students perceived no difficulty were actually difficult for them to solve. The result of the study reveals that there is a

significant difference in the observed frequency of students' perceived difficulty and actual difficulty in electrolysis, it was recommended among other things, that students' perceived difficulty should not be used as the basis for understanding the learning difficulties in electrolysis

The study carried out by Njoku and Nzewi (2010) [15] was on difficulties experienced in the learning of electrochemistry concepts in University of Nigeria, Nsukka. The research design used in the study was ex-post- facto. A total of 400 grade II students were randomly selected from four secondary schools in the area. They used group embedded figure test to categorize the students into two cognitive styles; field depending group (266) students and field independent group (134 students). After they have exhaustively thought electrochemistry concepts for six weeks, the students or respondents were administered with electrochemistry diagnosis test. It was found that six broad areas of concepts posed considerable difficulties to majority of students. It was based on this conviction that the study investigated perception of difficult concepts in B. Ed Chemistry programme in Ignatius Ajuru University of Education, Port Harcourt

Purpose of the Study

The main purpose of this study is to identify difficult concepts in B.Ed Chemistry curriculum of Ignatius Ajuru University of Education. Specifically:

1. To explore the concepts in Chemistry which students perceive difficult to learn.
2. To investigate if gender is a factor in students' perception of difficult concept in Chemistry.
3. To identify the cause of difficulties experienced by students in Chemistry.

In order to carry out this investigation in line with the topic of interest, the following research questions and hypotheses guided the study.

Research Questions

The following research questions were raised in the study.

1. What concept in Chemistry do students perceive as difficult?
2. To what extent is gender a factor in the perception of difficult Chemistry concepts by students?
3. What are the causes of the difficulties experienced by student in Chemistry?

Research Hypotheses

1. There is no significant difference between male and female Chemistry students' perception of difficult concepts.
2. There is no significant difference between male and female Chemistry students' perception of the causes of difficulties in understanding chemistry concepts.

Research Design

The design for the study is a descriptive survey, a strategy adopted to find out the perceived difficult cncepts in B.Ed Chemistry programme in Ignatius Ajuru university of Education Port Harcourt, Rivers State Nigeria. The population of the study comprises year one with fourth three (43) students, year two fourth five (45) students year there thirty one (31) students and final year thirty (30) students, making a total number of one hundred and fourth nine (149) students in Chemistry undergraduate students of Ignatius Ajuru University of Education Port Harcourt, Rivers State.

The sample size for this study consist of (85) chemistry undergraduate student of Ignatius Ajuru University of Education Port Harcourt. Obtain from year 2, year 3 and year 4, students. The sampling technique that was used to reached this sample size was be stratified proportional sampling technique. Thereafter simple random technique was to select the number of student that will part in the study. The instrument for data collection was a researcher designed questionnaire titled: Perception of Difficult Concepts in Chemistry Questionnaire (PDCCQ). The researcher preferred to use the questionnaire method because it affords collection of reliable data the questionnaire was administered by the researcher in person to the respondents. The researcher assured the respondents of the confidentiality of their responses so that they would be free to give all necessary information. The instrument was collected after their response. The data collected for the study were analyzed using mean, standard deviation to answer the research questions, while t-test was used to test the formulated hypotheses at 0.05 level of significance**.**

Presentation of Results

Research question 1: What concept in chemistry do students perceive as difficult?

Table 1: mean and standard deviation analysis of perceived difficult concept in chemistry

Item No	Item statement	X	SD	Reference mean	Remark
1	Mole concept	2.15	1.04	2.50	Not Difficult
2	Thermodynamics	2.87	0.96	2.50	Difficult
3	Redox reaction	2.98	1.05	2.50	Difficult
4	Radioactivity	2.39	1.06	2.50	Not Difficult
5	Enthalpy	2.51	1.18	2.50	Difficult
6	Periodic Table	2.40	1.09	2.50	Not Difficult
7	Isomerism	2.05	0.93	2.50	Not Difficult
8	Atomicity	2.25	1.01	2.50	Not Difficult
9	Thermochemistry	2.59	0.69	2.50	Difficult
10	Quantum Number	3.0	1.05	2.50	Difficult
11	Chemical Kinetics	2.96	0.98	2.50	Difficult
12	Electrolysis	2.85	1.06	2.50	Difficult
13	Stoichiometry	2.98	1.05	2.50	Difficult
14	chemical equilibrium	2.60	0.85	2.50	Difficult
15	Energetics	3.50	1.10	2.50	Difficult

The result in Table 2 shows that out of the fifteen concepts ten were considered as difficult concept by the students. These concepts include thermodynamics, redox reaction, enthalpy, thermochemistry, quantum numbers, chemical kinetics electrolysis, stoichiometry, chemical equilibrium and energetics

Research question 2: To what extent is gender a factor in the perception of difficult Chemistry concept by students**?**

Hypothesis 1: There is no significant difference between male and female chemistry students perception of difficult concepts.

Table 2: t-test analysis of perception of difficult concept base on gender

Gender	N	X	SD	df	t-value	Sig	Decision
Male	42	19.00	4.59	83	1.336	0.185	NS
Female	43	20.00	2.95				

P (0.185) > 0.05 level of significance
NS = Not Significant

Table 3 revealed that, the mean and standard deviation for the male student was 19.00 and 4.59 respectively while that of the female student was 20.12 for mean and 2.95 for standard deviation. This means that there was mean difference in the perception of male student from that of the female counterpart. On further statistical analysis that value (1.336) at df = 83 was found not to be significant hence the null hypothesis is accepted. The result is that there is no significant difference between male and female Chemistry students' perception of difficult concepts.

Research question 3: What are the causes of the difficulties experienced by students in chemistry?

Table 3: mean and standard deviation of the perceived causes of difficulties experience by chemistry students.

Item no	Item statement	X	SD	Reference mean	Remark
1	Teaching process affect understanding of chemistry concepts	3.06	1.08	2.50	A
2	The abstract nature and language of chemistry concepts make it difficult and uninteresting	2.60	1.14	2.50	A
3	Mathematical efficacy	3.21	0.85	2.50	A
4	Lack of prior knowledge affects the understanding of chemistry concepts	3.34	0.78	2.50	A
5	Lack of practical's activities affects the understanding of chemistry concepts	3.39	0.66	2.50	A
6	Chemistry lecturer qualification may affect the understanding chemistry concepts by student	3.04	1.05	2.50	A

A = Agree

Table 4 revealed that all the items have mean values above 2.50. This indicated that factors such as teaching process, the abstract nature and language of Chemistry mathematical efficacy, lack of prior knowledge affects the understanding of chemistry concepts, lack of instructional materials, lack of practical activities and chemistry lecturer's qualification are all contributory causes of difficulties experienced by students in chemistry.

Hypothesis 2: There is no significant difference between male and female Chemistry student perception of the causes of difficulties in understanding chemistry concepts.

Table 4: t-testing summary of causes of difficulties as perceive by Chemistry students.

Gender	N	X	SD	df	t-value	Sig	Decision
Male	42	18.17	3.519	83	-1.379	0.172	NS
Female	43	19.09	2.617				

P (0.172) > 0.05 level of significance
NS = Not Significant

Table 5 shows mean of 18.17 and standard deviation of 3.519 for male students and 19.09 for male and 2.617 for standard deviation for their female counterpart.
The mean value revealed that, female student had a high mean value than that of male students. On further statistical analysis, the t-value (-1.379) was found not to be significant. Therefore, the null hypothesis is hereby accepted. The result of that, there is no significant difference between male and female chemistry students' perception of the causes of difficult in understanding chemistry concepts

Discussion

The result of the study revealed that out of the fifteen concepts ten were considered as difficult concept by the students. These concepts include thermodynamics, redox reaction, enthalpy, thermochemistry, quantum numbers, chemical kinetics electrolysis, stoichiometry, chemical equilibrium and energetics. The findings of the study reveals that the students perceived (66.6%) of the concept in the chemistry curriculum as difficult. Perhaps this is attributes to the low performance in their semester examinations. The result of the study is in agreement with, Calab (2018) who found all the concept mentioned are also perceived difficult by students in Qatar. Similarly, Uchegbu, Achuchaogu and Amanza (2017), Jack, Danjuma and Abdul-Kadir (2017) [8], Adesoji1, Omilani, and Dada (2017) [1] and Bello (2015) asserted that students had difficulties in comprehending and understanding these chemistry concepts.
The result in table 2 revealed the effect of gender on perception of chemistry concept as difficult. The finding revealed that there is no significant difference on the perception of difficult concept by male and female undergraduate chemistry student in IAUE. The male and female students preceive the ten concepts as difficult. This result is consistent with Uchegbu, Achuchaogu and Amanza (2017) Bello (2015) who opined that gender has no influence on perception of difficult concept in chemistry curriculums. The result of the study is inconsistent with Jack, Danjuma and Abdul-Kadir (2017) [8] who revealed that

there is significant difference on gender and perception of difficult concepts in Chemistry.

Table 4 revealed that, teaching process abstract nature and language of chemistry, mathematic efficacy, lack of prior knowledge, lack of practical activities and lecturer's qualification are the cause of students' perception of Chemistry concept as difficult. The result in table 5 reveals that there is no significant different between male and female chemistry students on the causes of perception of difficult concept in Chemistry.

This result is agreement with Gabel (1999) [5] Johnston (2000) [10] who opined that the abstract nature and teaching process Chemistry makes it difficult for students to comprehend chemistry concepts. In the same vein Gafoords & Shilna, (2013) [6] Uchegbu, Achuchaogu and Amanza (2017) Caleb (2018) [2] and Bello (2015) agrees with the result of the study that these factors are causes of perception of Chemistry concepts as difficult. Similarly, Cardlini (2012) that the most important method in teaching Chemistry is the Chemistry teacher themselves this can be strengthened by providing teachers with overview of the philosophy of Chemistry. The philosophy of Chemistry can only be learnt and practiced by a lecturer that has a teaching qualification.

Conclusion and Recommendations

The study investigated perceived difficult concepts in B.Ed. Chemistry programme in Ignatius Aguru University of Education Rumuolumeni Port Harcourt Rivers State Nigeria. It was observed that student perceived concepts such as thermodynamics, redox reaction enthalpy, thermochemistry, quantum number, chemical kinetics, electrolysis, chemical equilibrium stoichiometry and energetics as difficult. The reason for this difficulty was attributed teaching process, abstract nature and language, mathematical efficacy, lack of prior knowledge, lack of practical activities and chemistry lecturer qualification. Gender difference has no significant influence on student's perception of difficult concepts in chemistry programmes.

Based on the findings the following recommendations were made;

1. The teacher and students should pay more attention in the teaching and learning of these difficult concepts to enhance their performance.
2. Chemistry undergraduates should take more of mathematics courses as electives to increase their mathematical efficacy.
3. Practical activities should be organized in these difficult concepts to enable the students get real life experience of these concepts.

References

1. Adesoji1 FA, Omilani AN, Dada SO. A Comparison of Perceived and Actual; Students' Learning Difficulties in Physical Chemistry**.** International Journal of Brain and Cognitive Sciences. 2017; 6(1):1-8.
2. Caleb O. investigating the areas of Student Difficulty in Chemistry Curriculum. A Case Study in Qatar. Texua International Journal of Academic Research. 2018; 5(2):1-8.
3. Cardellini L. Chemistry: Why the Subject is Difficult**?** Educación Química. 2012; 23:305-310.
4. Chinda W. Gender and teaching strategies on Chemistry students' achievement in organic compounds nomenclature. Elixir International Journal. 2018; 118:50569-50574.
5. Gabel D. Understanding Chemistry. The Particulate Nature of Matter. Journal of Chemistry Education. 1999; 76:548-554.
6. Gafoor KA, Shilina V. Perceived Difficult of Chemistry units in Std IX for Students in Kerala stream calls for further innovation. UGC sponsored national seminars, 2013.
7. Herron JD. The Chemistry Classroom. Formulas for Successful Teaching. Washington, DC: American Chemical Society, 1996.
8. Jack GU, Danjuma E, Abdul-Kadir MA. Assessment of Conceptual Difficulties in Chemistry Syllabus of the Nigerian Science Curriculum as Perceived by High School College Students. American Journal of Educational Research. 2017; 5(7):710-716.
9. Johnstone AH. Why is science difficult to learn? Things are seldom what they seem. Journal of Computer Assisted Learning. 1991; 7(2):75-83.
10. Johnstone AH. Teaching of chemistry – Logical or psychological? Chemical Education: Research and Practice in Europe. 2000; 1(1):9-15.
11. Kozma RB, Russell J. Multimedia and Understanding: Expert and Novice Responses to Different Representations of Chemical Phenomena. Journal of Research in Science Teaching. 1997; 34(9):949-968.
12. Nakhleh MB. Why some students don't learn chemistry. Journal of Chemical Education. 1992; 69(3):191-196.
13. Niaz M, Maza A. Nature of Science in General Chemistry Textbook. Dordrecht, the Netherlands: Springer, 2011.
14. Niaz M. How important are the Laws of Definite and Multiple Proportions in Chemistry and Teaching Chemistry? – A History and Philosophy of Science Perspective. Science & Education. 2001; 10(3):243-266.
15. Njoku ZC, Nzewi UM. Difficulties experienced in the learning of electrochemistry Concept by students of different cognitive styles. The STEM fest Journal, Department of Science education, University of NSUKA, 2010, 1-11.
16. Osborne J, Collins J. Pupils views of the role and value of the Science Curriculum. A Focus- group Study. International Journal of Science Education. 2001; 23(5):441-467.
17. Sabiru DY. Effects of using Gagne's learning hierarchy on chemistry students' academic achievement and anxiety level in balancing chemical equations in secondary schools in Katsina Metropolis, Nigeria. Journal of Applied Chemistry (IOSR- JAC). 2013; 5(4):10-15.
18. Sliwka HR. Reform of chemical language as a model for spelling reform, Journal of the Simplified Spelling Society. 2003; 32:24-28. Retrieved February 14, 2020, from http://www.spellingsociety.org/journals/j32/chemical.php
19. Tkachyk LM. Perceptions of International Teacher Turnover in East Asia Regional Council of Schools, 2017. Retrieve from http://scholarworks.waldenu.edu/dissertations on 30th October 2020
20. Uchegbu RI, Oguoma CC, Elenwoke UE, Ogbuagu OE. Perception of Difficult Topics in Chemistry Curriculum

by Senior Secondary School (II) Students in Imo State. AASCIT Journal of Education. 2016; 2(3):18-23.
21. Uchegbu RI, Ahuchaogu AA, Amanze KO. Tertiary Institution Students' Perception of Difficult Topics in Organic Chemistry Curriculum in Imo State. AASCIT Journal of Education. 2017; 3(2):9-15.