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CAUSES OF INEFFECTIVE LEARNING OF CHEMISTRY IN PRIVATE SECONDARY SCHOOLS IN ENUGU STATE

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Abstract

This study evaluated the causes of ineffective learning of chemistry in private secondary school, Enugu State Metropolis. Descriptive survey research design was adopted for the study. Two research questions and two null hypotheses were formulated in line with objectives of the study.The population for this study consisted of all the 23 private secondary schools in Enugu Metropolis, Enugu State. The simple random sampling technique was used to select 10 private secondary schools with a population of 283 students. Chemistry achievement test and chemistry Teachers' test (CAT&CTT) were used to collect data from a sample of 90 SS2 students who were offering chemistry and 10 chemistry teachers respectively. The instruments were validated by experts in education measurement and evaluation, chemistry and educational management and policy.One sample t-test was used to test the two formulated hypotheses with the aid of SPSS Version 20.0. It was found that student's attitudes and teaching strategies contributed to ineffective learning of chemistry. Conclusively, causes of ineffective learning of chemistry relied basically on both the students and the chemistry teachers in private secondary schools. The researchers therefore recommended among others that chemistry teachers should be able to exhibit caring and sincere attitudes in order to create an environment in which students will not feel threatened and to overcome chemistry anxiety.

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Introduction

Chemistry Education as an activity has been in existence "in one form or another as long as there has been chemistry" (Taber, 2015). As an established research field, however, it is relatively a young one – its origins go back only to the 1970s (Georgios, 2016). Research in chemistry education has continued to seek better approaches for teaching practical chemistry in order to bring about meaningful learning and to identify factors responsible for persistent problems of low interest and understanding among students (Okeke, 2019). Chemistry which is expected to be an interesting practical science subject is posing a great treat to many students nowadays. Some have already developed phobia because of their consistent poor achievement on assessment or repeated failure in external examinations (Mogboh & Okeke, 2019).

Evidence has shown that most concepts in chemistry are indeed difficult to learn by most students (Johnstone & Otis, 2006). It was lamented that most chemistry educators have lost excitement in carrying out their pedagogical roles, and also considers almost the entire concepts in the senior secondary school Chemistry syllabus as areas commonly found difficult to teach by graduate teachers (Norman, 2008). Olayiwola (2001) documented that there is no ideal situation that is devoid of one difficulty or the other and that difficulty is an inherent variable in any purposeful activity. The secondary school knowledge of chemistry is often characterized by lack of coherence. Instead of having a well-structured and integrated domain-specific knowledge structure, students consider the different concepts as isolated elements of knowledge. Most students do not possess a well-founded basic framework in which newly acquired concepts can be integrated (Fatokun & Fatokun, 2013). This lack of integration is suspected to be the basis of students' difficulties concerning concept formation and application of acquired knowledge in exercises and practical work (Brandt,

Elen, Hellemans, Heerman, Couwenberg, Volckaert & Morisse, 2001).

A number of studies have been conducted on different topics in chemistry and in other areas such as biology, physics, or in general, science. Many high school and university students experience difficulties with fundamental ideas in chemistry **(**Carson & Watson, 2002). Despite the importance of chemistry, most students still consider chemistry a difficult subject. The students' perception about chemistry in the beginning affects their academic achievements. Ajagun (2000) reported that the performance of students in senior secondary sciences in Nigeria has remained consistently poor. The prior studies however, saw causes of ineffective learning chemistry from the area of National Curriculum in terms of students' learning in chemistry and what actually happens in the classroom; the level of anxiety towards the learning of chemistry; gender and strategy on students' chemistry and on students' learning style. The issue of ineffective learning in chemistry can be attributed to both students' attitude and teaching environment. A student's attitude toward learning has to do with the way he or she processes information in order to learn it and then apply it.It is against the backdrop that this study therefore, evaluates the causes of ineffective learning of chemistry in Enugu State Private Secondary Schools from two angles (student attitude and teaching strategy).

Chemistry is one of the most important branches of Science; it enables learners to understand what happens around them. It is because chemistry topics are generally related to or based on the structure of matter, chemistry proves a difficult subject for many students (Kolade, 2014). Chemistry curricula commonly incorporate many abstract concepts, which are central to further learning in both chemistry and other Sciences (Taber, 2002). These abstract concepts are important because further chemistry/Science concepts or theories cannot be easily understood if these underpinning concepts are not sufficiently grasped by the student (Coll &Treagust, 2001; Nicoll, 2001). The abstract nature of chemistry along with other content learning difficulties (e.g. the mathematical nature of much

chemistry) means that chemistry classes require a high-level skill set (Taber, 2002). Chemistry is often regarded as a difficult subject, an observation that sometimes repels learners from continuing with studies in chemistry. With the establishment of new syllabuses in Chemistry for secondary schools in different countries in the last decayed (Kolade, 2014) one of the essential features of Chemistry remains the constant interplay between the macroscopic and microscopic levels of thought, and this aspect of chemistry learning represents a significant challenge to novices. Consequently, many students from secondary schools to universities in many countries struggle to learn chemistry and many do not succeed (Reid, 2008). Research has shown that many students do not correctly understand fundamental chemistry concepts (Kamisah &Nur, 2013). Many of the scientifically incorrect ideas held by the students go unchanged from secondary schools to university and sometimes beyond (Sozbiler &Pynarbapy, 2010). By not fully and appropriately understanding fundamental concepts, many students have trouble understanding fundamental concepts that build upon these fundamental concepts (Thomas, 1997). Chemistry had been regarded as a difficult subject for students by many researchers, teachers and science educators because of the abstract nature of many chemical concepts, teaching styles applied in class, lack of teaching aids and the difficulty of the language of chemistry (Carter & Brickhouse, 1989) All these cause students, from primary level to the university, to develop poor understanding and misunderstandings. Misunderstanding of concepts in chemistry has attracted attention over the last three decades (Temechegn, 2001).

The preceding arguments suggest that a lesson presentation that is consistent with active learning is characterized by activities in which students fully engage their higher order thinking mental capacities like concepts, procedures, predicting and justifying with each other (Sirhan, 2007). Furthermore, chemistry has done a lot in the following life activities; cooking, cleaning, medicine and environmental issues. This implies that any science student who wants to become a medical doctor, nurse, pharmacist, geologist, et cetera must

have the knowledge of chemistry. Okoye (2017) noted that the knowledge of chemistry is used either directly or indirectly in almost all spheres of human activities such as in the processing of cassava, production of shoe polish, hair relaxer and others. It was affirmed that most students learn essentially in the same environment and learning can be highly effective if the learning situation is consistent with how students learn (Norman, 2008). Since everyone learns differently, understanding learning styles can help a teacher perform better by matching the teaching pattern with students' learning styles for appropriate understanding of the lesson content (Kolb & Kolb, 2005).

An examination of studies on students' learning of basic physical and chemical concepts clearly demonstrates that most of the basic concepts were poorly learned (Taber, 2002; Sozbiller & Bennett, 2007). Learning difficulties are important for both teaching and learning. Both science educators and cognitive researchers agree that efforts to understand and improve science education should be focused on fundamentally important knowledge domains (Risch, 2010). Hence, it has been concluded that it is worthwhile to conduct a research study about chemistry undergraduates' learning difficulties.

Giving responsibility and leadership in scientific activities, keeping the students informed of their progress in chemistry, providing opportunity for students demonstration, arranging for students cooperative enterprise in science, organizing field trips, science clubs and science fairs, creating a sense of healthy competition among the students are some strategies that may be adopted to alleviate chemistry learning problems (Hofstein, 2004). The learners should be actively involved in the learning experience. The teacher does not take center stage in the classroom but should be a facilitator and listener (Temechegn & Sileshi, 2005).

Research Method

Descriptive survey research design was adopted for the study, for studies that use questionnaires to explore the opinions of a given population or its representative sample on existing phenomena. In survey research the focus is on people,

their beliefs, opinions, attitudes and behavior. Based on this, the design is appropriate for the study. The population for this study consisted of all the 23 private secondary schools in Enugu Metropolis in Enugu State. The simple random sampling technique was used to select 10 private secondary schools with a population of 283 SS2 students. Chemistry achievement test and chemistry Teachers' test (CAT&CTT) were used to collect data from samples of 90 SS2 students who were offering chemistry and 10 chemistry teachers respectively.The instrument for data collection was a structured questionnaire titled "Questionnaire on Top Private Secondary Schools (TPSS). Information for the instrument was gotten from literature reviewed. It is divided into two parts A and B. Part A contained demographic information of the respondents, such as gender. Part B contained two clusters of B1 and B2, of top ten schools. Cluster B1 was to find out whether students' attitudes are responsible for the ineffective learning of chemistry in private secondary schools. Cluster B2 sought to check whether teaching strategies contributed to ineffective learning of chemistry in private secondary schools and were structured on a 5 point rating scale. The research assistants helped in the distribution and retrieval of the instrument.The researchers administered the instrument with the help of the internet and research assistants from the schools. However, one sample t-test was used to test the two formulated hypotheses with the aid of SPSS Version 20.0.

Presentation and Analysis of Data

Research Question 1: Are students' attitudes responsible for the ineffective learning of chemistry in private secondary schools?

Teachers and students are required to respond to this question. The responses obtained are presented in table 1.

Table 1: Mean responses of teachers and students on whether students' attitudes are responsible for their ineffective learning of chemistry in private school in Enugu Metropolis.

S/N	Questions	SA	A	Un	D	SD
1	Not summarizing material while reading to be read before examination.	31	40	8	15	6
2	Not paying adequate attention during chemistry practical	35	45	0	20	0
3	Student not participation in learning/teaching situation regularly	33	34	6	21	6
4	Non attending to class and take down note regularly	30	38	4	23	5
5	Non discussing previous lesson with other students	40	34	3	21	2
6	Non reviewing past lesson before the end of the day	35	43	7	15	0
7	Students not acquiring appropriate study materials	28	40	9	18	5
8	Not observing demonstration step by step	35	37	5	16	7
9	Not making meaningful correction on assignments	35	34	8	21	2

Source: Field Survey, 2020

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Question 2: How do teachers' teaching strategies contribute to ineffective learning of chemistry in private secondary schools?

Table 2: Mean responses of teachers and students on whether teaching strategies contribute to ineffective learning of chemistry in private secondary schools in Enugu metropolis.

S/N	Questions	SA	A	Un	D	SD
1	Individualizing instruction by paying special attention to each student's learning	30	44	5	17	4
2	Not demonstrating with real or improvised equipment	35	45	0	20	0
3	Lack of dedication and commitment on the part of chemistry teachers such as preparation of lesson note	33	40	0	27	0
4	Allocation of insufficient period for teaching chemistry.	33	39	3	20	5
5	Poor practical assignment by chemistry teachers.	38	36	3	23	0
6	Shortage of chemistry teachers and Lack of special incentives	31	43	7	15	4
7	Inadequate provision of equipment and facilities for teaching chemistry	31	42	10	17	0
8	There are too many unmanageable classes for teaching chemistry.	40	37	5	15	3
9	Lack of qualified chemistry teachers with comprehensive knowledge of chemistry subjects.	28	43	8	15	6

Source: Field Survey, 2020

Test of Hypotheses

Hypothesis 1

Ho_1: Students' attitudes are not significantly responsible for the ineffective learning of chemistry in private secondary schools. This hypothesis was tested using data in table 1

Table 3: One-Sample Test

CVBG	Test Value = 0					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Not summarizing material	3.005	4	.040	20.00000	1.5205	38.4795
Not paying adequate attention	2.202	4	.092	20.00000	-5.2183	45.2183
Student not participating regularly	3.249	4	.031	20.00000	2.9074	37.0926
Non attending to class	2.959	4	.042	20.00000	1.2307	38.7693
Non discussing previous lesson	2.571	4	.062	20.00000	-1.5957	41.5957
Non reviewing past lesson	2.436	4	.072	20.00000	-2.7939	42.7939
Non acquiring appropriate study materials	3.135	4	.035	20.00000	2.2872	37.7128
Not observing demonstration	2.942	4	.042	20.00000	1.1283	38.8717
Not making correction	2.998	4	.040	20.00000	1.4788	38.5212

The results from table 3 show that six responses of the nine were significant while three were not significant (responses 2, 5 and 6) which are 0.092, 0.062 and 0.072 which is higher than 0.05 level of significance. The general observation was that students' attitudes are responsible for the ineffective learning of chemistry because some of the students are not participating regularly, not paying attention in class, non-acquiring appropriate materials, not making corrections given by the teachers. Based on this, this study

therefore concludes that student's attitudes are responsible for the ineffective learning of chemistry in private secondary schools.

Hypothesis 2

Ho_2: Teaching strategies does not significantly contribute to ineffective learning of chemistry in private secondary schools in Enugu State Metropolis.

This hypothesis was tested with the data in table 2

Table 4: One-Sample Test

Questions	Test Value = 0					
	T	df	Sig. (2-tailed	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
No special attention to student's learning	2.619	4	.059	20.00000	-1.1994	41.1994
Not demonstrating with real equipment	2.202	4	.092	20.00000	-5.2183	45.2183
Lack of dedication and commitment	2.375	4	.076	20.00000	-3.3783	43.3783
Insufficient period for teaching	2.768	4	.050	20.00000	-.0597	40.0597
Poor practical assignment	2.502	4	.067	20.00000	-2.1942	42.1942
Shortage of chemistry teachers	2.697	4	.054	20.00000	-.5907	40.5907
Inadequate provision of equipment	2.680	4	.055	20.00000	-.7213	40.7213
Large classes unmanageable for teaching	2.552	4	.063	20.00000	-1.7557	41.7557
Lack of qualified	2.890	4	.045	20.00000	.7843	39.2157

chemistry teachers						

The results from table 4 show that only two responses out of the nine were significant while seven were not significant (responses 1,2,3,5,6,7,and 8) which are 0.059, 0.092, 0.076, 0.067, 0.054, 0.055 and 0.063 which is higher than 0.05 level of significance. The general observation was that teaching strategies contributed to ineffective learning of chemistry because of no special attention to student's learning, lack of dedication and commitment by some chemistry teachers, inadequate provision of equipment, lack of qualified chemistry teachers and Poor practical assignment. Based on this, this study therefore concludes that teaching strategies contributed to ineffective learning of chemistry in private secondary schools.

Conclusion

This study evaluated the causes of ineffective learning of chemistry in private secondary schools in Enugu State Metropolis and found that students' attitudes were responsible for the ineffective learning of chemistry as most of the chemistry students were not participating regularly, not paying attention in class, non-acquiring appropriate materials among other things. On the part of teachers, it was observed that some chemistry teachers placed no special attention to student's learning, lacked dedication and commitment, there was inadequate provision of chemistry equipment for practicals as well as lack of qualified chemistry teachers, and so on. This is in conformity with Kindu and Mekonnen (2016); MelakuMasresha, Harrison and Temechegn (2014); Georgios (2015) and MelakuMasresha, Harrison and Temechegn (2013). On this note, causes of ineffective learning of chemistry relied basically on both the students and the teacher/school authority in private secondary schools. This means that, curbing the ineffective learning is a joint responsibility between the teachers and students towards achieving academic excellence in chemistry.

Recommendations

The researchers thereby recommended the followings;

1. Caring and sincere attitude should be displayed by the chemistry teachers in order to create an environment in which students will not feel threatened as well, overcome chemistry anxiety.
2. School laboratories should be equipped with appropriate chemicals, equipment and extra time should be given so that students cope up academically.
3. Students should be fully engaged in chemistry lessons and open up to any negativity during teaching and learning in chemistry.
4. Chemistry teachers should be paying serious attention to practical and laboratory activities.

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