EFFECTS OF SELF-REGULATED LEARNING STRATEGY ON CHEMISTRY STUDENTS' ATTITUDE IN SENIOR SECONDARY SCHOOLS IN DELTA NORTH SENATORIAL DISTRICT

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Abstract

This study's purpose was to examine the effect of self-regulated learning strategy on Chemistry students' attitude in senior secondary schools in Delta North Senatorial District. Three research questions and three hypotheses guided the study. The study's design was quasi-experimental. The study's population was 5,813 SSII Chemistry students in the 146 public senior secondary schools in Delta North Senatorial District. A sample size of 252 senior secondary two (SS II) Chemistry students purposively selected from four public mixed secondary schools in Delta North Senatorial District was used for the study. The instrument used for data collection was Chemistry Attitude Questionnaire (CAQ). The reliability of the CAQ was established with Cronbach Alpha which yielded coefficient of internal consistencies of 0.72. Data were collected by administering the Chemistry Attitude Questionnaire (CAQ) as pretest and posttest. The data obtained were analyzed using Analysis of Covariance (ANCOVA). The results showed that there was a significant difference between the mean attitude scores of students who were taught Chemistry using self-regulated learning strategy and those who were taught using the lecture method, in favour of self-regulated learning; there was no significant difference between the mean attitude scores of male and female students who were taught Chemistry using self-regulated learning strategy; and there was no significant interaction effect of teaching method and sex on students' attitude towards Chemistry. The study recommended the adoption of self-regulated learning strategy in teaching Chemistry at the Secondary School level.

Keywords: Self-Regulated learning, lecture method, attitude

Introduction

Chemistry is the study of matter in its most basic form. Chemistry is a branch of science that studies the composition and structure of matter, as well as the forces that hold structures together. Chemistry is beneficial to learners who

pursue careers in medicine, pharmacy, dentistry, food science, agriculture, engineering, science education, environmental education, and other fields. According to Giginna and Nweze (2014), the study of chemistry as a discipline is extremely important to humanity because its principles have aided modern advancements. Chemistry is vital for a growing country like Nigeria to boost the development of scientifically educated citizens in order to advance to the level of developed countries. Qualified chemists are needed to help the country achieve its goal of being one of the world's top 20 economies by 2040.

The Federal Ministry of Education (2007), while considering the functions of chemistry in national development, cited the followings as the objectives of teaching chemistry in Nigerian schools:

i) to facilitate a transition in the use of scientific concepts and techniques acquired in integrated science to Chemistry;

ii) to provide the students with basic knowledge of Chemistry concepts and principles through efficient selection of content and sequencing;

iii) to show Chemistry and its inter-relationship with other subjects;

iv) to show Chemistry and its link with industry, everyday life, benefits and hazards; and

v) to provide a course which is complete for pupils not proceeding to higher education, while it is at the same time a reasonably adequate foundation for a post-secondary Chemistry course.

The aforementioned goals are admirable. However, government, educational stakeholders, parents, and the general public are concerned about students' poor performance in Chemistry in the West African Senior Secondary Certificate Examination (WASSCE). According to the WAEC Chief Examiner's Report (2015), the 691,407 students who sat for Chemistry had a mean score of

36.0 and a standard deviation of 15.62 in the essay section (Paper 3). Chemistry had a mean score of 43.0 in 2016, with a standard deviation of 15.36 for the 667,412 students who took the examination. The average score for the 704, 494 students who took Chemistry in 2017 was 47.0, with a 16.0 standard deviation. The average score of the 728, 988 students who took Chemistry in 2018 was 29.0, with a standard deviation of 13.78, according to the report. Chemistry students' performance in the 2018 WASSCE was the worst from 2015 to 2018, with a mean score of 29.0.

According to the WAEC Chief Examiner's Report (2015), among the 691,407 students who registered for Chemistry, the mean score was 27.00 and the standard deviation was 8.83 in the practical component (Paper 2). In 2016, the 667,412 students who registered for chemistry had a mean score of 25.00, with a standard deviation of 7.81. For the 704,494 students who registered for Chemistry in 2017, the mean score was 26.00, with an 8.37 standard deviation. For the 728,988 students who registered for Chemistry in 2018, the mean score was 24.00,

with a standard deviation of 9.95. According to the WAEC Chief Examiner's report (2018), students' main weakness is a lack of basic understanding of chemistry concepts, which can be traced back to students' memorization of chemistry concepts as a result of poor teaching methods used by Chemistry teachers at the secondary school level.

The principles and procedures used by teachers to help students learn are referred to as a teaching method. These strategies are influenced by the subject matter to be taught as well as the learners' personalities. For a teaching approach to be effective and suitable, it must be related to the learners' characteristics and the sort of learning it is intended to facilitate. Teacher-centred and student-centred methods to teaching can be broadly classified. Teachers are the major authority figure in the teacher-centred approach. The primary duty of students is to passively receive material (through lectures and direct instruction) with the purpose of testing and assessment as the final result. The lecture technique is one of the most commonly used teacher-centred approaches.

The lecture method of instruction is a teacher-centred approach in which the teacher passes on knowledge in its ultimate form to the students. The students pay attention to the teacher and are rarely given the opportunity to ask questions as the course develops. According to Ajaja (2009), a lecture is an address, a discussion, a lesson, or other sorts of verbal presentation by a teacher to students. The advantages of the lecture method of teaching include covering a large volume of content, teaching a large number of students, transmitting knowledge to students, generating interest in a topic, providing students with new information, and assisting students in clarifying and understanding content. Students' passive involvement and lack of student-student connection, as well as students' interaction with the learning content, are important drawbacks of the lecture method, according to. Passivity on the part of students during the teaching and learning process does not help them understand chemistry ideas. According to the WAEC Chief Examiner's report (2018), this could be the cause of students' lack of basic comprehension of Chemistry topics. As a result, student-centred approaches to teaching that encourage active participation and interaction among students during the learning process may be a viable alternative to the teacher- centred approach to teaching (lecture method) in improving students' achievement in Chemistry concepts.

Teachers and students participate actively in the learning process in a student-centred approach. The major job of the teacher is to assist and guide students in their learning and overall grasp of information. Under the leadership of the teacher, the students take charge of their own learning. Despite the fact that there are several examples of student-centred approaches, this research only looked at self-regulated learning strategy. Self-regulated learning strategy is a student-centred approach. Students choose their own learning goals, regulate their

cognition, motivation, and behaviours, and are led and limited by their own goals and contextual characteristics surrounding them in self-regulated learning (Pintrich, 2000). It assists students in getting to know themselves, becoming intelligent and resolute in their learning strategies (Zimmerman, 2000). Students learning about themselves can be understood as a process involving metacognitive abilities, information acquisition through cognitive skills, and the ability to motivate themselves and regulate their surroundings efficiently. As a result, the cognitive, metacognitive, resource management, and motivational techniques of self-regulated learning are divided into four groups.

Students' cognitive strategies are associated with the behaviours and cognitive processes they use to complete a task or attain a goal related to an academic subject during their learning experiences (Boekaerts, 1996). The sub- strategies of rehearsal, elaboration, and organizational strategies are all covered under cognitive strategies. Predicting, planning, monitoring, and evaluating are examples of metacognitive processes that assist people govern and regulate their own cognitive processes. Controlling and managing one's time, study environment, effort, peer cooperation, and asking aid are all examples of resource management tactics. Motivational strategies spanning intrinsic values, self- efficacy, and test anxiety (Pintrich & De Groot, 1990) constitute the final dimension of self-regulated learning since it is critical that students are motivated to use these strategies.

Students' ability to understand and control their learning is referred to as self-regulation. It is the ability to monitor and manage one's own behaviour, emotions, and ideas, and to change them in response to the situation's demands (Kadivar, Manzari, & Sarami, 2012). A self-regulated learning strategy is an active, constructive process in which learners define learning goals and strive to monitor, regulate, and control their cognition, motivation, and behaviour in response to those goals and environmental factors (Tang, 2012). It is a type of learning that is guided by meta-cognition (thinking about one's own thoughts), strategic action (planning, monitoring, and assessing personal progress against standards), and motivation to learn. Self-regulated learners, in particular, are aware of their academic strengths and shortcomings, and they have a repertoire of abilities that they may use to address the day-to-day challenges of academic assignments (Ejelue, 2017). The implementation of a self-regulated learning technique is believed to enhance the attitude of students of varied sexes.

According to Eagly and Chaiken (2007), attitude is a psychological propensity that is conveyed by a positive or negative evaluation of a certain entity. The opinion and feeling you have about anything is referred to as your attitude. Attitude is typically characterized as a favourable or unfavourable attitude to an object, person, institution, or event. Academic accomplishment and a good study pattern are greatly influenced by one's attitude toward studying. Regardless of

students' sex, self-regulated learning strategy has been found to improve students' attitudes toward numerous subjects (Arsal, 2009; Oruc & Arslan, 2016; Ozdemir & Arslan, 2016; Celik, 2018).

There is a strong case to be made that sex influences students' attitude towards science subjects in general, and Chemistry in particular. Male and female students in a school system are referred to as "sex" in this study. Because most Delta State schools are coeducational, it is vital to determine whether self- regulated learning strategy will improve male and female students' towards Chemistry in different ways. This is one of the study's rationales. There are mixed results from reviewed empirical studies on the effect of self-regulated learning strategy on students' attitude. While some studies found significant effect of self- regulated learning on students' attitude (Arsal, 2009; Zumbrum, 2010), others found non-significant effect (Garmabi & Zarein, 2016; Rahman, 2011; Schroeder, 2007) As a result, the findings of this study will provide additional empirical evidence on this topic. It should be noted that sex is a moderator variable in this study. It is against this background, this study sought to examine the effect of self- regulated learning strategy on secondary school Chemistry students' attitude in Delta North Senatorial District.

Statement of the Problem

According to an analysis of Chief Examiner's reports from the West African Examination Council (WAEC) from 2015 to 2018, student performance in Chemistry is declining, with the poorest score recorded in 2018. Students' poor academic performance in WASSCE has been attributed to a lack of comprehension of basic Chemistry topics, and perhaps students' attitude which could be due to Chemistry teachers' use of teacher-centred teaching methods, particularly the lecture method. The use of the lecture method is believed to have made students in Nigerian secondary schools develop negative attitude towards Chemistry concepts as a result of their passive involvement in the teaching and learning process. The students in the lecture classroom are not given the opportunity to perform learning task, attempts to monitor, regulate and control their cognition. This calls for the adoption of students-centred teaching method such as self-regulated learning strategy that gives students opportunity to set goals for their learning and develop positive attitude towards the subject, perform learning task(s) and attempts to monitor, regulate and control their cognition. Hence, the problem of this study is: What is the effect of self-regulated learning strategy on male and female students' achievement and attitude towards Chemistry?

Purpose of the Study

The study's purpose was to investigate the effects of self-regulated learning strategy on students' attitude towards Chemistry.

Specifically, the study determined:

1. the mean attitude scores of students who were taught Chemistry using self-regulated learning strategy and those who were taught using lecture method;
2. the mean attitude scores of male and female students who were taught Chemistry using self-regulated learning strategy;
3. the interaction effect of sex and teaching method on students' attitude in Chemistry.

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

1. There is no significant difference between the mean attitude scores of students who were taught Chemistry using self-regulated learning strategy and those who were taught using lecture method.
2. There is no significant difference between the mean attitude scores of male and female students who were taught Chemistry using self-regulated learning strategy.
3. There is no significant interaction effect of sex and teaching method on students' attitude towards Chemistry.

Methodology

The quasi-experimental design was adopted for the study. The study's population was senior secondary two (SSII) students. The study's population comprised 5, 813 SSII Chemistry students in the 146 public secondary schools in the Delta North Senatorial District. Sample size of the study comprised 252 SSII Chemistry students selected from four public mixed secondary school students in Delta North Senatorial District selected using purposive sampling. The instrument used for data collection was Chemistry Attitude Questionnaire (CAQ). The CAQ was validated by three experts. The reliability of the CAQ was established using the Cronbach Alpha which yielded 0.72 reliability coefficient.

The four public schools were grouped in two treatment groups namely self-regulated learning strategy group and the lecture method group. The treatment involved exposing the students in the experimental group to some Chemistry concepts using self-regulated learning strategy and students in the control group using the lecture method for a period of six weeks. Pre- and post- tests were administered before and after treatment respectively. The scores obtained were collated and analyzed using Analysis of Covariance (ANCOVA)

Results

✔ There is no significant difference between the mean attitude scores of students who were taught Chemistry using self-regulated learning strategy and those who were taught using lecture method.

Table 1: ANCOVA Summary of Achievement Scores of Students who were taught Chemistry using Self-Regulated Learning Strategy and Lecture Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected	337.265[a]	2	168.632		
		2.241	.109		

Table 1 shows that there is a significant difference between the mean attitude scores of students who were taught Chemistry using self-regulated learning strategy and those taught using lecture method, $F_{(1, 249)} = 4.430$, $P(0.036) < 0.05$. Thus, null hypothesis one is rejected. Therefore, there is a significant difference between the mean attitude scores of students who were taught Chemistry using self-regulated learning strategy and those who were taught using lecture method, in favour of students who were taught using self-regulated learning strategy.

✔ There is no significant difference between the mean attitude scores of male and female students who were taught Chemistry using self-regulated learning strategy.

Table 2: ANCOVA Summary of Attitude Scores of Male and Female Students who were taught Chemistry using Self-Regulated Learning Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected	7.072[a]	2	3.536		
		.046	.955		

Error	19068.356	126	76.580
Total	817432.000	129	
Corrected Total	19075.429	128	

Table 2 indicates a non-significant difference between the mean attitude scores of male and female students who were taught Chemistry using self- regulated learning strategy, $F(1, 126) = 0.041$, $P(0.840) > 0.05$. Thus, null hypothesis two is retained. Therefore, there is no significant difference between the mean attitude scores of male and female students taught Chemistry using self- regulated learning strategy.

✔ There is no significant interaction effect of sex and teaching method on students' attitude towards Chemistry.

Table 3: ANCOVA Summary of Interaction Effect of sex and Teaching Method on Students' Attitude in Chemistry

Source	Type III Sum of Squares	df	Mean Square F	Sig.
Corrected		359.384ᵃ	4	89.846
		1.186	.318	

Table 3 shows that there is no significant interaction effect of sex and teaching method, as measured by the students' mean attitude scores in Chemistry, $F(1, 247) = 0.066$, $P(0.797) > 0.05$. Therefore, null hypothesis three is retained. Thus, there is no significant interaction effect of sex and teaching method on students' attitude towards Chemistry. This implies that teaching methods do not combine with sex to influence students' attitude towards Chemistry.

Discussion
The results of this study are discussed under the following sub-headings.

Self-Regulated Learning Strategy and Attitude Towards Chemistry
The study revealed that there is a significant difference between the mean attitude scores of students who were taught Chemistry using self-regulated

learning strategy and those who were taught using lecture method, in favour of students who were taught using self-regulated learning strategy. This finding concurs with that of Arsal (2009) who reported that self-regulated learning significantly improved the attitude scores of students in Mathematics. This finding further gives credence to that of Ozdemir and Arslan (2016) who observed that self-regulated Jigsaw IV significantly enhanced students' attitude towards English Language, compared to the lecture method. However, this finding contradicts that of Oruc and Arslan (2016) who reported that there was no significant difference between the mean attitude scores of students' taught using self-regulated learning strategy and lecture method.

Self-Regulated Learning Strategy, Sex and Attitude towards Chemistry

Another finding of the study revealed a non-significant difference between the mean achievement scores of male and female students taught Chemistry using self-regulated learning strategy. This finding is consistent with that of Rahman (2011); Garmabi and Zarein (2016) who reported a non-significant difference in the attitude scores of male and female students exposed to self-regulated learning strategy. However, this finding contradicts the views of Kanmani and Annaraja (2009) who reported a significant difference between the effects of self-regulated learning strategy on the attitude of male and female students, in favour of female. **Interaction Effect of Sex and Teaching Method on Attitude Towards Chemistry**

The study finally revealed that there is no significant effect of interaction between sex and teaching method on students' attitude towards Chemistry. This finding is in agreement with that of Oruc and Arslan (2016), who found a non- significant effect of interaction between sex and teaching method on students' attitude towards reading comprehension. This finding also gives credence to that of Ozdemir and Arslan (2016) who observed that there was no significant effect of interaction between sex and teaching method on students' attitude towards English

Conclusions

Self-regulated learning strategy lifts students' attitude towards chemistry than the lecture method. Self-regulated learning strategy did not differentiate between sexes with respect to students' students' attitude towards chemistry. Self- regulated learning did not unite with sex to manipulate students' attitude towards chemistry.

Recommendations

On the basis of the findings of this study, the study recommended:

1. The adoption of self-regulated learning strategy by chemistry teachers during classroom instruction at the secondary school level to ensure students active involvement.
2. Chemistry teachers should attend workshops to get acquainted with innovative instructional strategies.
3. Chemistry teachers should strive to ensure that students are active during instruction.
4. Government should provide adequate infrastructural facilities and instructional materials to ensure effective implementation of innovative instructional strategies during instruction at the secondary school level.

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