

Effects of Case-Based Learning Instructional Strategy on Achievement and Attitude of Senior Secondary School Students toward Chemistry in Niger State, Nigeria

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Abstract

This study determined the Effect of Case-Based Learning Instructional Strategy on Achievement and Attitude toward Chemistry among Senior Secondary School Students in Niger State, Nigeria. The study adopted a pre-test post-test non-randomized and non-equivalent control group quasi-experimental design. Four (4) research questions were raised and four (4) null hypotheses were tested at 0.05 level of significance. The population of the study comprises all Senior Secondary School Two (SS2) Chemistry students in Minna Metropolis of Niger state. Simple random sampling technique was used to select six schools from Minna Metropolis. A total of (82) students participated in the study using intact classes. Two research instruments were used for data collection: Chemistry Achievement Test (CAT) and Attitude to Chemistry Questionnaire (ACQ). The face and content validity of the two instruments CAT and ACQ were determined by two experts in the Department of Science Education Federal University of Technology Minna, Niger State Nigeria. A reliability coefficient of 0.83 was obtained using Kuder-Richardson (KR-20) method and 0.71 using Cronbach alpha respectively. The data collected were analyzed using mean, standard deviation and t-test. Findings from the study showed that there was significant difference in achievement scores of students taught Chemistry using CBL instructional strategy and those taught using conventional lecture method. There was also significant difference in the achievement of male and female students taught Chemistry using CBL instructional strategy in favour of the males. There was significant difference in the attitude of students exposed to CBL towards Chemistry and those in the control group. Based on these findings it was recommended that CBL instructional strategy should be employed by all the secondary school Chemistry teachers

Keywords: Case-based learning instructional strategy, Achievement, Attitude

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I. Introduction

Chemistry is the study of the nature and properties of all forms of matter as well as the substance that make up our environment and the various changes which these substances undergo in different conditions. Chemistry is also one of the basic sciences which are essentially the pre-requisites for technological breakthrough of any nation. Hence, the need for effective Chemistry education in Nigeria appears very crucial and therefore, demands considerable attention. It is against this backdrop that the Nigerian government have made Chemistry a compulsory subject at the senior secondary school level for science students (Imomotimi & Vikoo, 2013; Abanikanda, 2016).

However as important as Chemistry is to the development of the nation and efforts by Nigerian government to improve on the students' performance this have not yielded the desired results as shown in the student's results in Senior Secondary School Certificate Examination (SSCE) over the years. This have been attributed to a number of factors such as lack of chemistry laboratory, lack of qualified teachers, the abstract nature of the subject, inadequate trained teachers, poor methods of teaching, poor attitude, gender among others (Wanbugu, Changeiwo & Ndriru 2013, Chado, Gimba, Babagana & Yahaya, 2016). Also studies have shown that method adopted by Chemistry teachers is one major factor that is responsible for students' poor achievement in secondary schools in Nigeria.

Although efforts have been made by scholars to address this problem by adopting some instructional strategies but these have not yield the desired results. Therefore, there is the need to adopt a strategy that brings to classroom real life scenarios through storytelling, students setting, the actors and their goals, a sequence of

events, results, and explanations linking results to goals and the means of achieving them (Miles 2015, McLeans, Hornm, Tyroch,2012) One of such strategy is the case based instructional strategy.

Scholars have defined case based learning in different ways depending on the context in which it is use. Schneider and Paraskevi, (2005) defined case-based learning as a story telling style that is based on facts, containing complex problems that are written to stimulate learning process in the classroom). Emerg (2005) also defined case-based learning as an approach in art/science of teaching/learning that references questions that are based upon “real life” problems that may be related to a practical case. The strategy is usually composed of two main parts: (a) the case situation for the study or a story or narration of an event and (b) the questions related to the case situation. This guide and direct students to facilitate their understanding, rather than simply asking for the names, dates, or labels in analyzing the data and suggesting solutions. This however enabled the students to solve the presented problem using their background knowledge. Researchers have also observed that CBL enable students to analyze data and highlight important aspects of a concept and disseminating the presentation of task material. The use of cased based learning has also been found to help bridge the gap between student daily lives and the industries they see around them. (Adesoji & Idika, 2015, Emerg 2015).

Studies conducted on the effect of case-based learning (CBL), using cases in the form of short stories in teaching have been found to encourages critical thinking, understanding and arouse students’ interest thus enhances students’ achievement in chemistry (Adesoji & Idika,2015; Yadav et al., 2007; Hereid, 2004)

Attitude have also been found to affects students’ achievement in chemistry when instructional strategies like case based learning which allows students to think and share their ideas and opinions with their pairs which usually makes the class very interesting. Thus some researchers observed that the use of case based learning affect students’ achievement in chemistry (Adesoji & Idika, 2015; Yalcinkaya et al, 2012). However, Kilavuz (2005) findings in a similar study revealed no significant difference in the achievement and attitude of students toward chemistry.

Student gender have also been found to affect achievement in chemistry although there have been conflicting report by scholars. While some observed that gender affect students’ achievement in favour of the male. (Chado, Gimba, Babagan &Yahaya,2016). However, some researchers observed no gender difference in student’s achievement Hassan, Gimba, & Chado, (2016). Therefore, there is the need to find the effect of gender in this study

Statement of the Problem

The poor achievement of student in chemistry and the areas of weakness; such as writing chemical formulae and correctly balancing chemical equations, expression of chemical terms and nomenclatures, understanding the atomic nature of matter among others. The poor achievements of students have been attributed to a number of factors such as poor method of instruction poor attitude to chemistry, poor retention, and gender among others. Although several attempt have been made by scholars to ameliorate some of these problem especially in respect to poor method of instruction but have not yielded the desired result. Therefore, there is need to adopt a strategy that relate concept to everyday life through story telling which scholars have been found to enhance students’ achievement. Therefore, this study determined the effects of case-based learning on the achievement and attitude towards chemistry among secondary school students in Niger state, Nigeria

Objectives

The aim of this study is to determine the effect of case based learning instructional strategy on the achievement and attitude towards chemistry of senior secondary school students in Niger State and the following objectives will be achieved

- 1. To determine the effect of case-based learning instructional strategy on the students’ achievement in chemistry*
- 2. To examine the gender effect of case-based learning instructional strategy in chemistry*
- 3. To determine the effect of case-based learning instructional strategy on students’ attitude towards chemistry*
- 4. To determine the gender effect on the attitudes of students towards chemistry*

Research Questions

The following research questions were answered

- 1. What is the effect of case-based learning instructional strategy on secondary school students’ achievement in chemistry?*
- 2. What is the gender effect of secondary school students’ achievement in chemistry?*
- 3. What is the effect of case-based learning instructional strategy on secondary school students’ attitude towards chemistry?*

4. What is the gender effect of case-based learning instructional strategy on the attitude of secondary school students towards chemistry?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance

HO₁: There is no significant difference in the achievement of secondary school students taught chemistry using CBL and those taught using conventional lecture method.

HO₂: There is no significant difference in the achievement of male and female secondary school students taught chemistry using case-based learning instructional strategy.

HO₃: There is no significant difference on the attitude of secondary school students taught towards chemistry using case base learning and those taught using conventional lecture method.

HO₄: There is no significant difference on the attitude of male and female secondary school students towards chemistry using case-based learning instructional strategy.

II. Methodology

The research design adopted for this study is quasi experimental, using pre-test, post-test, non-equivalent, non- randomized, control group design. Simple random sampling technique was used to select Six (6) schools. The sample size for the study consisted of eight two (82) SSII chemistry students. However intact classes were used for the study. The selected schools were assigned into experimental and control groups using simple random sampling technique. However, the experimental group was taught using case based learning strategy while the control group was taught using the conventional lecture method. The instruments used for data collection were: Chemistry Attitude Questionnaire (CAQ) and Chemistry Achievement Test (CAT). The CAT is made up of two parts: section A-personal data and section B consisting of twenty (20) multiple choice questions with five options A-E. While CAQ is made up of two parts: section A-Personal data and section B is a five point Likert scale Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) Strongly Disagree (SD) that solicit for student’s response on attitude toward chemistry. The face and content validity of the two instruments were determined by experts in the Department of Science Education Federal University of Technology, Minna Niger state, Nigeria and experts in Department of Test and Measurement in National Examination Council, Nigeria (NECO). The reliability of the instruments CAT was determined using test-retest and a reliability coefficient of 0.85 was established using Pearson Product Moment Correlation Coefficient formula (PPMC) which indicates that the instrument is reliability. The data collected was analyzed using Mean, Standard Deviation, t-test with the aid of Statistical Package for Social Sciences (SPSS) version 21.0.

III. Results

Hypothesis One (HO₁): There is no significant difference in the achievement of students taught chemistry using CBL and those taught using conventional lecture method.

Table 1: t-test Analysis of post-test scores of students taught chemistry using CBL and those taught using conventional lecture method.

Group	N	Mean	SD	df	t	P value	Decision
Experimental	42	59.55	11.94	80	4.158	0.00	Sig
Control	40	44.90	19.28				

Significant at p<0.05

Table 1 reveals the t-test analysis of post-test scores of students taught chemistry using CBL and those taught using conventional lecture method. There was a significant difference in the achievement of students taught chemistry using CBL and those taught using conventional lecture method, t(80) = 4.158, p <0.05, Thus the null hypothesis was rejected. This implies that CBL has a great effect on achievement of students taught chemistry concept.

Hypothesis Two (HO₂)

There is no significant difference in the achievement of male and female student taught chemistry concept using CBL.

Table 2: test analysis of post-test scores of male and female student taught chemistry concept using CBL.

<i>Gender</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>df</i>	<i>T</i>	<i>p-value</i>	<i>Decision</i>
<i>Male</i>	24	60.29	7.63	40	0.462	0.647	NS*
<i>Female</i>	18	58.56	16.22				

Not Significant at $p \geq 0.05$

Table 2 shows the t-test analysis of post-test scores of male and female student taught chemistry concept using CBL with $t(40) = 0.462$ $p > 0.05$. Hence, null hypothesis two was retained. This indicates that there was no significant difference in the achievement of male and female student taught chemistry concept using CBL.

Hypothesis Three (HO₃) *There is no significant difference in the attitudes of senior secondary school student towards chemistry using CBL and those taught using conventional lecture method.*

Table 4: One Sample t-test Analysis of the difference in the attitudes of senior secondary school student towards chemistry.

<i>Group</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>P value</i>	<i>Decision</i>
<i>Experimental</i>	42	56.19	11.28	80	4.582	0.001	Sig
<i>Control</i>	40	39.73	20.22				

Significant at $p \leq 0.05$

Table 3 presents t-test analysis of the difference in the attitudes of senior secondary school students towards chemistry, using CBL and those taught using conventional lecture method. There was a significant difference in the attitudes of senior secondary school student towards chemistry $t(80) = 4.582$, $p < 0.05$. Therefore, null hypothesis three was rejected This implies that the attitudes of senior secondary school students towards chemistry affects their academic achievement.

Hypothesis Four (HO₄)

There is no significant difference in the attitudes of male and female student towards chemistry using CBL.

Table 5.:t-test Analysis of the difference in gender on the attitudes of student towards chemistry

<i>Gender</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>df</i>	<i>T</i>	<i>p-value</i>	<i>Decision</i>
<i>Male</i>	24	57.25	8.12	40	0.699	0.489	NS*
<i>Female</i>	18	54.78	14.63				

Not Significant at $p \geq 0.05$

Table 4 shows the t-test Analysis of the difference in gender on the attitudes of student towards chemistry. There is no significant difference in gender on the attitudes of student towards chemistry $t(40) = 0.699$, $p > 0.05$. Hence, the null hypothesis was retained which mean that gender has no effect on the attitude of senior secondary school student towards chemistry.

IV. Discussions of Findings

The result of this study in HO₁ indicated that there was a significantly differences in the achievement of students taught chemistry using CBL instructional strategy and taught using conventional lecture method. This however may be attributed to the fact that students in the experimental group were taught the chemistry concept using story telling where the concept were related to ever day life thereby making it real and interesting. This agrees with the findings of Adesoji and Idika (2015), McLean, Horn and Tyroch. (2012 who found that student taught using CBL comprehend abstract concept better, thus enhances their achievement in chemistry.

Also findings from HO₂ also revealed that the male students achieved higher than their female counterpart exposed to CBL instructional strategy this result is in line with the findings of Adesoji and Idika (2015) who observed that there is usually no gender difference in student achievement of secondary school students in chemistry

The result of these findings in HO₃ indicates that there was significant difference in the attitude of senior secondary school student towards chemistry. The reason for this is not far fetch as it is natural that when the concept taught is related to what is familiar and what the students see or do in everyday life they become interested especially when it tell in form of a story and can affect the students attitude toward the subject. This is however in agreement with the findings of Adesoji and Idika,(2015); Yalcinkaya et al,(2012).

Lastly H₀₄ revealed that gender has no effect on the attitude of senior secondary school students toward chemistry which mean that gender is not a factor use to determine the effect of attitude of senior secondary school students' attitude toward chemistry The result of the study is in line with the findings of Gimba, Nsofor, Yaki, (2006), Hassan and Ogunyemi (2008). The findings is in contrast to Fabunmi (2004) in a study that discovered that gender has a no significant effect on students attitude

V. Conclusions

The study tries to determine the effects of case base learning on the achievement and attitude to chemistry among secondary school students in Niger state from the study revealed that the strategy enhances students' achievement and also attitude toward chemistry as against those taught using the conventional lecture method.

VI. Recommendations

1. Chemistry teacher should employ modern, practical teaching strategies such as the case-based learning that allow students to construct their own knowledge and actively participate in the learning process.
2. Policy makers and curriculum planners should review and upgrade the chemistry curriculum to accommodate the inclusions of more learner-centered teaching strategies.
- 3 Both federal and state government should make provision of instructional learning materials and laboratory facilities to schools to ease teaching and learning
4. Science teachers should also be morally and financially motivated and encouraged to attend science workshops and seminar to update their knowledge in the area of science and technology

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