

IMPACT OF A CONSTRUCTIVIST PEDAGOGY (STS) ON ATTITUDE OF SENIOR SECONDARY SCHOOL BIOLOGY STUDENTS IN FUNTUA EDUCATION ZONE, KATSINA STATE, NIGERIA

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Abstract

This study is titled “Impact of a Constructivist Pedagogy (STS) on attitude of Senior Secondary School Biology Students in Funtua Education Zone Katsina State Nigeria”. Senior Secondary School students (SS II) formed the population of the study. Two schools were randomly selected and assigned to as experimental and control. Two intact classes totaling 723 SS II biology students' were randomly selected, where 413 are assigned to the experimental group with another intact class of 310 assigned to the control group. Students Attitude Questionnaire (SAQ) was the instrument used in the study for data collection after validation, with estimated reliability coefficient of 0.80 using PPMCC. Research question was answered using Kruskal-Wallis's statistics. The findings revealed that there was significant difference in students attitude change towards biology after exposure to STS strategy compared to their counterpart in the control group whom were exposed to conventional teaching method. Hence, recommendations were made for stakeholders in the teaching and learning profession to bring into use STS instructional strategy for the promotion of students attitude towards science in general and biology in particular.

Keywords: Constructivist Pedagogy, Attitude, Biology Students.

Introduction

One of the goals of teaching science is to produce students who experience the richness and excitement of knowledge about the natural world which occur from natural curiosity. The word Biology is of Greek origin, coined from 'bios', meaning 'life' and 'logos' meaning study. Hence, Biology is the study of life. It can also be defined as the study of plants and animals (Michael, 2019). Ali (2021) defined Biology as the study of living things that concerns itself with the study of structure, behavior, distribution, the origin of plants and animals and their relationships with the environments. Biology is conceptualized as a unique life subject, which deals with animates and in-animates objects; including their structure, function, growth, origin, evolution and distribution. Biology as a science subject, has many branches notably zoology; study of animals and botany, the study of plants. Biology has other branches such as ecology, microbiology, evolution, genetics and many others. Biology serves as a core-requisite or a core subject to many science disciplines such as human medicine, food technology, and agriculture, pharmacy, and veterinary medicine and health education. It is reflected as a requirement for admission into science based courses at universities, colleges of education, polytechnics and other tertiary institutions.

Science and technology have been recognized worldwide as the key to national development and have contributed tremendously to the development and comfort of the modern world

(Abdullahi, 2015). Thus the teaching and learning of science should be accorded high priority. This is supported by Mahmud (2015) who argued that the development of any society depends on its scientific and technological achievements. Science and technology. Science and technology have become critical factors of economic and social development as it is through their application that the natural resources of a country could be transformed into good and services for good quality life of that country's citizens. Thus the economic development of a nation is dependent, to a large extent, on the advancement of its science and application (technology). At secondary school level, science education faces a lot of problems. Research reports in Nigeria indicate that students achieve poorly in secondary school science subjects (Nwagbo, 2010). Science is seen as a complex human activity which culminate in the production of a body of universal statements which serve to explain the observable behavior of the universe or part of its and which in themselves have predictive characteristics and that of the importance of science to the technological development of a nation cannot be overlooked. According to Mohammed (2018), the best and most effective places of teaching science and technology to the students of any Nation are the primary and secondary schools. This means primary and secondary school science teachers in Nigeria have an important role to play in laying solid foundation for successful takeoff of science and technology, which could be through different approaches to the teaching and learning of science. One of the goals of the National Policy on Education (FME 2013) is to ensure that students are able to strive effectively in modern age of science and technology. Therefore, science subjects are made to be among the core subjects that are being taught in Nigeria secondary schools. Therefore, studies on different strategies of teaching science to secondary school students to enable them Meet the goals of the National Policy on Education is necessary. According to Nwagbo (2017), one of the goal of teaching science is to produce student who experience the richness and excitement of knowledge about the natural world which occur from natural curiosity. Despite the important position of Biology among other science and science related disciplines, Students' attitude and performance has consistently been below expectation (Orlu, 2013). WEAC, 2015-2020 have shown that as number of concepts in biology which include genetics, evolution and ecology contain topics that seems difficult for biology students to understand.

As a requirement for SSCE students are required to offer at least one science subject. It has been observed that most students opt for Biology in their SSCE registration requirement because they consider Biology simpler than physics and chemistry (Akubuilu, 2014). Attitude toward Biology is considered in this study and it denotes interest in studying science. It is the student's disposition toward "like" or "dislike", while attitude in science means scientific approach assumed by an individual for solving problems, assessing ideas and mankind decision (Para. 2019). Attitude has been defined by Obochi (2018) as the predisposition to reach positively or negatively toward object, idea, institution or people. Thus if student show the positive attitude toward a concept, it is relatively easily to lead them toward desirable objective. Such psychologist have viewed attitude as having there components; Cognitive, Affective and

Behavioural. The cognitive component is a set of belief about attributes of the attitudes' object and its assessment is performed using paper and pencil test. The effect component includes feeling about the object and its assessment is performed by using psychological indices while the behavioural component pertains to the way in which people act toward the objective and the assessment is performed with directly observed behaviours. Attitude may affect an individual's behavior in the presence of attitude object in predictable ways.

Attitude according to John (2014) is the tendency to react favourably or unfavourably towards designed object or event. Literally scientific attitude is respect of ethics of science. Aderogba, (2012) define scientific attitude as the ability to react consistently, rationally, and objectively in certain way to a novel or problematic, situation. Or the ability to do things in a way that rely on proven principle. Or thought and feeling free 'superstition unverified assumption and many times from popular opinion that has no empirical bases. Therefore attitude determine the behavior or how one feel about something or somebody. It also implies the manner, reposition, and feeling, position with regard to a person or thing. If positive attitude would be cultivated towards a learning activity, it will likely lead to achievement in that teaching and learning activity,

A study on elementary school pupils, positive correlation between students' attitude and students' achievement was found that student's belief and attitude were found to have the potential to either facilitate or inhibit learning. This study intends to investigate the attitude of student towards STS pedagogy. Attitude is viewed as a set of affective reactions towards an object, it is derived from the concepts and beliefs that the individual has, concerning the object and predisposition the individual has in a certain manner towards the object (Ibrahim, 2019). Attitude is built up largely as a product of unique experience and each individual will interpret evidence, anticipated events and make decision in the light of attitude possessed. Attitude which is an expression of likeness plays significant role in the learning subjects (Situ, 2008). Students' attitude towards science subject is influenced by the instructional strategies employed in the process of teaching

Many factors could contribute to students' attitude towards study science. Ibrahim (2019) concluded that a member of factors have been identified as related to the students attitude to science, such factors are teaching strategies, teachers attitude, influence of parents, gender, age, student career, societal view of science, and student interest, On social implication of science and scientists, Katcha (2007) worked on the influence of comparative impact of instructional strategies on students' attitude towards science subjects. The result obtained was that attitudes become more positive after instruction. Ibrahim (2018) also concluded, that groups that scores significantly high in science performance test also score significantly high in attitude test after instruction. Betakin (2015) reported that several factors can work to influence students' attitude and behaviour toward quantitative aspect of the practical Chemistry. Instructional strategy is one of such factors, and the result obtained indicated that these factors actually influence the

attitude of the subject towards volumetric analysis, that students exposed to programmed instruction, recorded high and more favourable attitude toward mathematics.

Attitude toward Biology is the dependent variable to be considered in this study and it denotes interest in studying science. It is the student's disposition towards "like" or "dislike", while attitude in science means scientific approach assumed by an individual for solving problems, assessing ideas and making decision (Yara, 2019). However, recent research has reported that student's performance also depends on academic enablers such as attitude and behavior that allow the students to participate in and ultimately benefit from academic interaction in the classroom (Liza, 2020). Students attitude about the value of learning science may be considered as both an input and outcome variable because their attitude towards the subject can be related to academic performance in ways that reinforce higher performance (Bunkure, 2012).

Several research reports indicated that students attitude were poor in secondary school science subjects (OlaREWaju, 2016) These research express the view that teachers shy away from activity-oriented teaching methods which is known to be effective, and rely on teaching methods that are easy but most often inadequate and inappropriate. Based on such findings, several attempts have been made to investigate the effectiveness of teaching methods on achievement in Biology. Results from these investigations indicated that innovative teaching methods such as Outdoor laboratory approach, guided discovery, co-operative learning and inquiry methods were effective than the lecture method in enhancing students cognitive performance in biology. Since attitude is concept which arises from the attempt to account for the observed regularities in the behavior of individual, the quality is judged from the observed evaluative response one hands to make. An individual can show positive or negative attitude towards particular object, subject or idea (Situ, 2018). Akinbola (2017) reported that students attitude towards science has significant and direct effect on students' performance in the subjects. Children who are academically successful hold positive attitude in schools as well as adjusted emotionally and socially.

Recent reported studies show that students' performance also depends on academic enablers such as attitude and behaviour that allow the student to participate in and ultimately benefit from academic interaction in the classroom (Situ, 2018). Students attitude about the value of learning science may be considered as both an input and outcome variable because their attitude towards the subject can be related to academic performance in ways that reinforce higher performance. Bunkure (2012). Attitude towards science forms an aspect of this study so as to establish the differences (if any) in the attitude of students before and after exposure to STS instructional strategy. Gadzama (2012) have conducted research into the area of attitude, such studies revealed that, students attitude to science is affected by some instructional methods. There is need to conduct a study to investigate the effects of STS on students' attitude towards genetics (variation) as a concept. Therefore, STS Constructivist teaching strategy is compared with conventional method as a control to see whether it can improve SS II biology students' attitude.

Statement of the Problem

The consistent poor performance and negative attitude towards science attest to the fact that science teaching procedure among many other factors hasn't been properly done. Hence, the concepts taught are not properly understood because improper science teaching has led to poor performance in science subjects. Therefore, science teaching needs appropriate method of instruction that will best achieve the aim of science teaching, thus improving the performance and enhancing positive attitude towards science subjects. This is supported by Ibraheem (2014) who explained that the teacher and his method of teaching may have been the major course of student poor academic performance in Biology as many teachers still prefer using the "chalk and talk" method of teaching known as lecture method. Also in support of this Lakpini (2006) expressed the view that teachers shy away from activity-based teaching methods and rely on the teaching methods that are easy but most often inadequate and inappropriate for science teaching. This makes students to achieve poorly in secondary school subjects especially biology which may eventually affect the student's overall academic performance. Result from studies indicated that innovative teaching method such as STS approach, guided discovery; cooperative learning and inquiry methods were more effective than the lecture method in promoting positive attitude toward learning science.

Researchers have attributed the failure of students to a number of factors. One of the isolated factors is teacher's consistent use of teaching methods which does not lead to attitude stimulation towards meaningful learning of science concepts and their applications to solve problems. Despite the adoption of new approaches to teaching like child centered, problem-based or project-based method, inquiry method of teaching and others, the approach to teaching has predominantly remained unchanged as teachers persistently use traditional method to teach science (Abdullahi, 2015). Failure rate in science at SSCE continued to be a source of worry to curriculum planners, educationist, parents and the entire society. Usman (2000) and Danladi (2013) noted that as a result of the constant use of lecture method in teaching, the performance of students and their attitude towards science remains poor.

The view of Okebukola (2007) was that, despite the efforts of science educators and teachers towards devising better methods of teaching, academic achievement and attitude of students in secondary school Biology concepts is still relatively poor. Therefore there is still room for studies aimed at finding efficient teaching methods that can improve the attitude of secondary school students, especially in biology. STS approach has the feature of relating learning to an application in the real world thereby making learning relevant and more interesting as the students could establish relationship between concepts taught and their use in personal and societal life. The present study seeks to establish how STS instructional Strategy can be used by teachers in understanding the concepts they teach which might likely lead to improved students' achievement and positive attitude. In this study, therefore, the researcher intends to find out the effects of STS instructional strategy on students' attitude change to biology.

Objective of the Study

The objective of this study is to:

1. Investigate attitude change of SS2 biology students towards biology after exposure to STS instructional strategy.

Research Question

This study intends to answer the following research question:

1. What is the change in attitude of SS2 biology students after exposure to STS instructional strategy?

Hypothesis

1. There is no significant difference in attitude change between SS2 Biology students taught using STS instructional strategy and those taught using lecture method.

Methodology

At the beginning of the study, a Biology Achievement pre-test based on some selected topics ' (variation and variability) was administered to both experimental and control groups to find out equivalence between the two groups. Then the experimental group (EG) received treatment i.e. the STS instructional strategy of teaching using SSCSA approach while the control group was taught the same selected Biology topics (variation and variability) using the traditional lecture teaching method. Treatment application took four (04) weeks. Finally at the end of the treatment both the experimental and control groups were administered the Students Attitude Questionnaire (SAQ).

The population of this study comprises all the year two Senior Secondary School Biology Students totaling 8,863 students in Funtua Education Zone. Funtua Education Zone comprises Funtua Local Government, some part of Bakori, Danja, Sabuwa, and Dandume Local Governments, all in Katsina State. The zone has 41 Katsina State Government owned Senior Secondary Schools. Three schools are boys only while two other schools are girls only and the rest are co-educational. The students offer Biology as one of their basic science subjects. They were already exposed to introductory Biology concepts for one session in SS I. Thus, they have experience in the use of Biology text materials such as Modern Biology, Certificate Biology and STAN Biology. The students are academically expected to be --It>7 average in ability. The average age of the students is 18 years.

The sample for this study comprised of 723 Senior Secondary School II Biology students drawn from two co-educational schools in Funtua Education Zone, in Katsina State. The two co-educational secondary schools were selected from the total of 41 secondary schools. The schools for the purpose of this research were chosen by randomization through balloting by drawing folded papers in a box and they are Government Day Secondary School Kurami Funtua which served as experimental and Government Day Secondary School, Dandune which served as control. Both the two schools selected were co-educational.

The instruments used for this study was a questionnaire (SAQ) to measure students' attitude change toward biology. The instrument is briefly described as follows; The Student Attitude

Questionnaire (SAQ) is an adopted Likert scale type developed by the researcher. It is to measure the student attitudes change towards biology (variation and variability). The questionnaire comprises twenty items and it is made up of two sections, section A contains the personal data of the subject while section B is made up of items base on Likert five point scales of strongly agreed (SA), Agreed (A), undecided/neutral (U/N), disagreed (D) and strongly disagreed (SD) respectively. The points in the questionnaire were scored as follows: SA = 5, A= 4, N=3, D=2 and SD = 1. The questionnaire was administered to the students personally and directly by the researcher and collected on the spot. Analysis of the questionnaire result was by split half method of odd against even number method, Kuder Richardson correlation coefficient statistics was used for analysis and the reliability coefficient was found to be $r = 0.79$. Reliability is the degree to which a test on repeated measure yields the same result when administered to subjects of similar characteristics Bichi, (2002). The Students Attitude Questionnaire (SAQ) was constructed by the researcher. The questionnaire comprises of 20 items. Split half method was used, using odd and even number method. Kuder Richardson correlation coefficient statistics was used for analysis. The reliability coefficient was found to be $r = 0.79$.

The experimental group is exposed to the STS teaching strategy using SSCSA approach while the control group was taught using the traditional lecture method both for the same period, 80 minutes (two periods) per week for 4 weeks. Lesson plan for both experimental group (STS) and control group (lecture) group for the topic taught is designed for the purpose of teaching the two groups,

Results

Research Question: What is the Attitude Change of Biology Students toward Biology between those taught using STS and those taught using Conventional Method? This research question was answered using mean, sum of means and rank difference descriptive statistics, thus

Table 1: Summary of Mean Ranking Difference in Attitude Change toward Biology

Attitude Level	Group	N	Mean	Sum Mean	Mean Differences	Mean Rank Differences
Before	STS	131	64.88	190.00	60.32	
After	STS	131	125.20			
Before	(Conventional)	165	43.29	124.21	37.63	44.18
After	(Conventional)	165	81.2			
	Total	596				

The result in above table shows that difference existed in attitude change in Biology between students taught variation concepts using STS strategy and those taught using conventional method. The means Rank attitude level were 64.88, 125.20, 43.29 and 81.02 by students before (experimental) after (experimental), before (control) and after (control) groups respectively. This indicates that among the experimental group their attitude levels had changed from 64.88 to 125.20, while among those in control group, their attitude had changed from 43.29 to 81.02. The Mean Rank Difference were 60.32 and 37.63 respectively, Mean Rank Difference for after (experimental) and after (control) was 44.18 in favour of the experimental (STS) group. This showed that the experimental had Mean Scores more than control group. To test whether the mean rank difference is significant or not. Kruskal-Wallis analysis is used as follows:

H0₁ There is no significant difference in attitude change between SS2 biology students of different abilities taught using the STS instructional strategy and those taught using the traditional method. To test this hypothesis, the Students Attitude questionnaire (SAQ) scores was subjected to Kruskal-wallis statistic and the results are shown thus:

Table 2: Summary of Kruskal Wallis Analysis on Difference in Attitude Change of students, towards Biology.

	Group	N	Means	Er Rank	Ch Mrd Square	P-Value	Remark
Experimental	Before	131	64.88	3	68.10		
(STS)	After	131	125.20		60.32	0.01	Sig
Control	Before	165	43.29		37.73		
(Conventional)	After	165	81.02		44.18		
	Total	592					

Significant at $P \leq 0.05$

The result above showed that significant difference existed in attitude change towards Biology between students taught variation/variability concepts using STS method. This is because the calculated significant values of 0.01 is less than the 0.05 a value of significance. This implies that a significant positive attitude change to Biology has taken place among the students in favour of the experimental group. Therefore, the null hypothesis, which states that there is no significant difference in attitude change towards Biology between students taught variation concepts using STS instruction and those taught using conventional method, is therefore rejected.

The attitude questionnaire was sub-divided into three scales, namely interest, career awareness and social implication. The SAQ was analyzed under these three categories. All the subsets except social implication were significantly different between the groups. The highest

difference was recorded in career awareness followed by interest and the least was social implication. There was on the whole a significant difference in the attitude towards biology between the students of experimental and control groups in favour of the experimental groups. The null hypothesis was thus rejected. This implies that the STS instructional strategy tends to improve students' attitude towards biology compared to the traditional instructional method. This is supported by further analyzing the pre-attitude and posts-attitude scores of the experimental group.

Discussion of Findings

Table 1 shows that there was a significant difference between the experimental and control groups in their attitude towards biology indicating that STS instructional strategy had a direct influence on the attitude of the students. The more favorable attitude shown by the students of the experimental group could be attributed to some of the following reasons. First, the students were exposed to scientific experience that could help them in developing scientific attitude and skills. The brain-storming questioning sessions must have provided the students with good training on developing mental activities that could help them cope adequately with daily problems, both at school and society. This could have made the learning materials to appear very exciting and interesting leading to a positive attitude towards learning. Yager (1990) reported that the STS groups were found to have a better or more positive attitude towards science. Pederson (1990) also supported Yager's conclusions which were all in line with findings of Hunt and Leuton, (1993), and Solomon (1993) Okorafo (2012) and Mohammed (2018) which is also in line with the findings from this study.

Conclusion

Based on the findings that emanates from the study, it can be concluded that students show positive attitude toward biology when taught using STS instructional strategy than when taught using conventional lecture method.

Recommendations

Based on the findings from this study, the following recommendations were made:

1. Science curriculum developers, educators and teachers should try to popularize and incorporate STS instructional strategy into teaching so as to produce science training curricular at all levels, because of its potentiality in enhancing student attitude towards science in general and biology in particular.
2. Science educators and curriculum developers should also see to the production of textbooks and teachers' guide based on the STS model of teaching and learning.

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