

EFFECT OF RECIPROCAL CONSTRUCTIVIST INSTRUCTIONAL APPROACH ON STUDENTS' ATTITUDE AND ACHIEVEMENT IN BASIC SCIENCE IN KADUNA EDUCATION ZONE, KADUNA STATE

By

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Abstract

Science and Technology are considered to be the two key elements for Socio-economic development of all nations. This paper highlights the effect of reciprocal constructivist instructional approach on students' achievement in Basic Science. The study employed quasi-experimental design. Ninety-two (92) Basic Science students participated in the study through simple random sampling technique. Basic Science Achievement Test was used as instrument for data collection. Findings from the study revealed that there is no significant difference between the mean achievement scores of experimental and control groups pre-tested, Basic Science students exposed to reciprocal constructivist instructional approach performed significantly better than those taught using lecture method. It was also discovered that students taught Basic Science using lecture method were not actively engaged in the teaching and learning of Basic Science. It is recommended among others that Basic Science teachers should plan and implement their lessons using activity-based teaching strategies in order to create conducive atmosphere for effective teaching and learning of Basic Science to enhance students' achievement.

Key – Reciprocal Instructional Strategy, Basic Science Achievement.

Introduction

Science and technology are considered to be the two key elements for socio-economic development of all nations (Bala, 2010). For a country that aspires to address the problems of under-development; science and technology have to be at the fore front of every educational programme.

Basic science is one of the core subjects listed in the National Policy on Education (FRN, 2013) for Junior Secondary Schools in Nigeria. It is a basic subject that lays the foundation for the take off of the sciences (Biology, Chemistry and Physics) in the senior secondary classes. It is a subject meant to provide a solid foundation for senior secondary science subjects like Biology, Chemistry and Physics (Gadzama, 2012).

Basic science in the junior secondary school is a course of study which is designed and presented in such a way that students gain the concept of the fundamental unity of science, communality of approach to problem solving of scientific nature and help students' to gain understanding of the roles and function of science in everyday life and the world in which they live.

Basic science is a fundamental science which cut across subject boundaries that offers learners' experiences that help them to develop an operational understanding of the structure of science that could enrich their lives and make them responsible citizens in the society. Basic science occupies a central position in science education by exposing the learners or students to some basic science process skills. In furtherance to this, Okebukola (2007) stated that when one acquires the science process skills, such individual become specially equipped with tools required for scientific investigations. The science process skills are also required to facilitate the pursuit of profession or higher education which would make the individual self-reliant and independent economically (FME, 2004).

Ado (2012) and Ojimba (2013) opined that science education has experienced worldwide transformation in its outlook. In early 1960s and 1970s, Nigeria faced significant revolutions in its approach to teaching science. Eze (2012) asserted that for learning to be meaningful and effective in the classrooms, the teacher should be able to select the appropriate teaching strategies that will stimulate the interest of the learners and get them actively engaged in the process of learning. This brought a change in the trend of educational practice. These trends are daily occurrences that reflect positive change which is a move from transmission view of education to that of knowledge construction especially in the face of current world realities such as technological development. The National Policy on Education (2014) emphasizes paradigm shift in educational practices from teacher to learner centeredness, so as to enhance conceptual learning in science. As a result of the shift, conventional practices of teaching are now more in vogue.

Researchers have found that conventional practices such as lecture method and expository approach have scarcely proved the capability of giving the desired learning outcomes among students (Umoren & Aniashi, 2007; Atomatofa, 2013). These seem not to help students acquire science process skills that will enable them understand scientific concepts thereby limiting their ability to self-reliant lives in the society after graduation from secondary school. The search for alternative but viable option could have led to the exploration of instructional strategies that are based on constructivism. Constructivism, according to Orji and Ekpo (2013) is a learning theory on knowledge that argues that humans generate knowledge and meaning from interaction between their experiences and their ideas. Thus, in reciprocal constructivist instructional approach, learners interpret and process the incoming information

through their senses to create knowledge. In reciprocal constructivist instructional approach, views are held that scientific knowledge are personally constructed and reconstructed by the learners on their prior knowledge or experiences. One of the constructivist approaches considered in this study is the reciprocal teaching.

Reciprocal teaching is an instructional activity that takes the form of a dialogue between teachers and students regarding segments of text for the purpose of constructing the meaning of text. A reciprocal approach provides students to facilitate a group effort between teacher and students as well as among students in the task of bringing meaning to the text (Pelincsar, 1986). According to Sharman (1991) and Slavin (1991), reciprocal teaching is also an intervention in which students provide instruction or academic assistance to other students. This process transforms learning from a private to social activity by making learners to be responsible for their learning and that of others. In this process, students function reciprocally as both tutors and tutees. This role is beneficial because it enables students to gain from both preparation and instruction in which tutors are engaged and from the instructions that tutees received (Griffin and Griffin, 1997).

Reciprocal teaching focuses on four (4) thinking strategies namely:

- i. Predicting
- ii. Clarifying
- iii. Questioning
- iv. Summarizing

Adedoyin (2010) as well as Danmole, Femi & Adoye (2004) further submitted that instructional approaches that involve the active participation of students could be more effective. Moreover, science is an abstract knowledge which cannot be easily understood using traditional teaching methods. The National Commission for Colleges Education (NCCE, 2002) stated that teachers ought to explore several methods of teaching for effective teaching and learning to be achieved in basic science. This is because basic science occupies a special position in secondary school curriculum and represents the foundation stone for subsequent instruction in the science and related courses in life. In basic science teaching and learning process, the achievement of students depends on the qualities of teachers, availability of resources, the use of appropriate methods of instruction and appropriate choice of techniques of teaching.

Research Questions

- i. What are the students' attitude and achievement scores in basic science before exposure to reciprocal constructivist instructional approach and lecture method in Kaduna Education Zone?
- ii. What is the effect of reciprocal constructivist instructional approach on students mean attitude scores taught basic science and those taught using lecture method in Kaduna Education Zone?

Null Hypotheses

The following hypotheses were formulated to guide the study and tested at 0.05 level of significant.

Ho₁: There is no significant difference between the pre-test mean achievement scores of experimental and control groups of basic science students in Kaduna Education Zone.

Ho₂: There is no significant difference between the mean attitude scores of students taught basic science using reciprocal constructivist instructional approach and those taught using lecture method in Kaduna Education Zone.

Methodology

Quasi-experimental research design was adopted for the study, specifically the pre-test, post-test, non-equivalent group. The population for the study consists of ninety-two (92) basic science students randomly selected in two different classes in Government Secondary School Kawo Kaduna, which were divided into experimental and control groups. The instrument for data collection was Basic Science Achievement Test (BSAT) developed by the researchers to test the students' knowledge of the selected basic science concepts. The instrument was validated by the two Senior lecturers from Department of Science and Environmental Education, Faculty of Education, University of Abuja.

Experimental procedure

Before the commencement of the study, subjects were pre-tested. They were divided into experimental and control groups. The experimental group was taught basic science concepts using reciprocal constructivist instructional approach for six weeks while the control group was taught same basic science concepts using lecture method.

Method of Data Analysis

Data collected were analyzed using mean, standard deviation and t-test statistical tool.

Hypothesis One; There is no significant difference between the pre-test mean achievement scores of experimental and control groups of basic science students in Kaduna Education Zone.

Table 4.3.1: Independent t-test statistics on difference between the pre-test mean achievement scores of experimental and control groups of basic science students in Kaduna Education Zone

Variable	Study Groups	N	Mean	STD	Mean diff	Df	T computed	T critical	P value
Pretest Achievement Scores	Experiment	45	28.244	6.928	2.095	90	1.378	1.96	0.172
	Control	47	30.340	7.622					

p value > 0.05, t computed < 1.96 at df 90

Results of the Independent t-test statistics above showed that there is no significant difference between the pre-test mean achievement scores of experimental and control groups of basic science students in Kaduna Education Zone. Reasons being that the p value of 0.172 is higher than the 0.05 alpha level of significance and the t computed value of 1.378 is lower than the 1.96 t critical value at df 90. Their computed Pretest Mean achievement scores are 28.244 and 30.340 by experimental and control groups of basic science students in Kaduna Education Zone, respectively. This shows that the pretest scores of both groups are relatively the same. Therefore the null hypothesis which states that there is no significant difference between the pre-test mean achievements scores of experimental and control groups of basic science students in Kaduna Education Zone is hereby accepted and retained.

Hypothesis Two: There is no significant difference between the mean attitude scores of students taught basic science using reciprocal constructivist instructional approach and those taught using lecture method in Kaduna Education Zone.

Table 4.3.2: Mann Whitney test difference between the mean attitude scores of students taught basic science using reciprocal constructivist instructional approach and those taught using lecture method in Kaduna Education Zone.

Ranks					Mann	Z	P value
	Groups	N	Mean Rank	Sum of Ranks	Whitney U		
Mean Attitude	Experiment	45	31.31	1409.00	374.00	5.3	0.000
	Control	47	61.04	2869.00	0	47	
	Total	92					

p value < 0.05, Mann Whitney > Z score

Outcome of the Mann Whitney Non Parametric test above revealed that significant difference exists between the mean attitude scores of students taught basic science using reciprocal constructivist instructional approach and those taught using lecture method in Kaduna Education Zone. This is because the p value of 0.000 is lower than the 0.05 level of significance and the Mann Whitney value of 374.000 is greater than the 5.347 Z value. Their computed Mean Attitude scores are 31.31 and 61.04 by students taught basic science using reciprocal constructivist instructional approach and those taught using lecture method respectively. This shows that students taught basic science using reciprocal constructivist instructional approach have significantly higher mean attitude than those taught using lecture method. Therefore the null hypothesis which states that there is no significant difference between the mean attitude scores of students taught basic science using reciprocal constructivist instructional approach and those taught using lecture method in Kaduna Education Zone, is hereby rejected.

Discussion of result

The result in table 1 provide answer to research question one. It reveals that there is significant difference in the academic achievements of students in the experimental and control groups. This shows that reciprocal constructivist instructional approach enhances students' academic achievement. The result obtained is in line with the findings of Adedoyin (2010), Damole, Femi & Adoye (2004), whose findings reveal that instructional approaches that involve active participation of students would be effective.

Conclusion

It can be concluded that the use of reciprocal constructivist instructional approach enhances students' achievement in basic science than lecture method of teaching, because it boosts the academic achievement of students in Kaduna Education Zone Kaduna State. Also, gender factor does not affect the academic achievement of students taught basic science using reciprocal constructivist instructional approach because there was no significant difference in the achievement of male and female students taught basic science using reciprocal constructivist instructional approach in Kaduna Education Zone Kaduna State.

Recommendations

Based on the findings from this study, the researchers recommended that:

1. Reciprocal constructivist instructional approach should be incorporated into the teaching of basic science at the secondary school level since it promotes students achievement in basic science.
2. Teachers should plan their basic science lessons with equal learning opportunities for both male and female students in Kaduna Education Zone Kaduna State.

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