

EFFECTS OF RECIPROCAL INSTRUCTIONAL STRATEGY ON JUNIOR SECONDARY SCHOOL STUDENTS' PERFORMANCE IN BASIC SCIENCE IN EKITI STATE, NIGERIA.

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Abstract

This paper examined the effects of reciprocal instructional strategy on junior secondary school students' performance in Basic Science in Ekiti State. The study adopted a quasi-experimental pre-test, post-test, control group design. Four null hypotheses were generated and tested at 0.05 level of significance. The sample consisted of 120 Junior Secondary School II Basic Science Students selected through multistage random sampling technique. The instrument that was used for the study was Basic Science Achievement Test (BSAT). It is a self-designed instrument that consisted of information on bio-data of the respondents and 40 multiple-choice items. The data were analyzed using inferential statistics of t-test. The study found out that there was a significant difference between the posttest means scores of students exposed to reciprocal instructional strategies and conventional strategies. It was also revealed in the study that there was no significant difference between the posttest means scores of male and female students exposed to reciprocal instructional strategies and conventional strategies. Based on this finding, it was recommended among other things that the state government should organize a seminar among the teachers in secondary schools on the effective use of reciprocal instructional strategies in their various classes to enhance performance.

Keywords: Reciprocal instructional strategy, Performance, Basic Science.

Introduction

Nigeria today is undergoing major transformations which are multidimensional, affecting the technological, economic, social, cultural and political development of human communities. Education in the generic and global context is a strategic instrument for technological and economic transformation. The focus of education system all over the world is the development of the human capital required to meet present and future challenges of globalization and knowledge economy (Dike, 2014). The enviable position of science education system of most countries of the world, including Nigeria is perhaps justifiable. The reason is that science can exert a dominant influence of life of individual as well as on the developmental effort of a nation (Adu & Adeyanju, 2013). The Universal recognition of the above submission is responsible for the prime position that has accorded Science and in particular Basic Science which serves as a pivot upon which other sciences rotate. The importance of Basic Science cannot be over stressed. All students must learn and pass it at the Junior Secondary School level before they can advance to the senior level.

Despite the importance of Basic Science to mankind and the efforts of researchers to improve on its teaching and learning, the performance of students in the subject is still not encouraging. The rate and degree of failure could not be specifically determined but may be as a result of factors like teacher's qualification, school environment, teaching strategies among others. Connelly, (2010) said that in order to get students know each other better and share their learning experiences, they can be put together in several other classes and it is helpful for students both in social and academic way. It is on this basis that some strategies are considered, especially those that have to do with collaborative learning. Reciprocal instruction method, one of the group working methods is thought to be effective in the crowded classrooms, will be concern of this study.

According to Palincsar, David, and Brown (1989), reciprocal teaching is an instructional procedure designed to enhance students' comprehension of concept. The procedure is best characterized as a dialogue between teacher and students. The term 'reciprocal' describes the nature of interactions since one person acts in response to another. The dialogue is structured by the use of four strategies: questioning, summarizing, clarifying, and predicting. The teacher and students take turns assuming the role of the leader. The reciprocal teaching approach is one of the instructional methods which cover the necessary strategies: predicting, generating questions, clarifying, and summarizing. It helps students improve their understanding of scientific concept and thus enhancing performance. The aim of reciprocal teaching is to use discussion to improve students' comprehension, develop self-regulatory and monitoring skills, and achieve overall improvement in motivation (Mohammed and Abbas, 2012).

Reciprocal teaching is an instructional approach that can be best characterized by three main features: (a) the scaffolding and explicit instruction which a teacher uses and which include guided practice and modeling of comprehension-fostering strategies, (b) the four main strategies of predicting, generating questions, clarifying, and summarizing, and (c) social

interaction which provides opportunities for learners to improve their cognitive, metacognitive and affective strategies and offers them chances to share ideas, increase confidence, and learn from their more capable friends. These three features help improve the students' ability to resolve difficulties, reach a higher level of thinking, build metacognition, and increase motivation (Mohammed and Abbas, 2012).

In applying the Reciprocal strategy in teaching, the researcher presented the lesson in accordance with this strategy, where a schedule distributed to students by the four sub-strategies for reciprocal teaching strategy: prediction, questioning, summarizing, and clarification. In the first phase of the lesson the researcher leads the dialogue, applying the strategies to one of the concepts of the subject. Students are divided into cooperative groups (each group of five individuals), in accordance with sub-strategies involved. A leader is determined for each group (the role of the teacher in the dialogue management) taking into account exchanging roles with other members of the group. Interactive dialogue within the group begins with the leader / teacher runs the dialogue, and each individual within each group presents its mission to the rest of the members of the group, and answers their questions about what he has done. Reciprocal teaching as one of the possible techniques in collaborative learning can assist in improving the understanding, critical thinking skills, problem solving skills, communication skills of learners, increase the involvement of learners, both individually and socially, in exploring and critically solving problems (Doolittle, 2006).

Shunneman (2013) has raised the issue of equity in learning and social behavior in heterogeneous groups and the opportunity to learn from others, which suggested that all students must participate and learn regardless of race, gender, preferences, or level of learning achievement. Meanwhile, concerns about academic achievement with respect to males and females have generated a considerable interest in the field of educational testing over the years. Differences in academic achievement of the two genders are likely to contribute disparities in the allocation of cognitive roles in the world of work.

Numerous studies on sex differences in cognitive performance can be found. Colom and Lynn (2004) asserted that males have larger average brain sizes than females and therefore, would be expected to have higher average IQs. Mackintosh (1998) on the other hand, claims that there is no sex difference in general intelligence. In view of these, we should therefore continue to seek strategies which would improve students' mastery of the subject as well as their performance in the subject. Therefore, this study intends to investigate the effects of reciprocal instructional strategies on Junior Secondary School Students' performance in Basic Science.

Statement of the Problem

The poor performance of some junior secondary school students in basic science has been widely reported. However, one cannot shun the fact that, in schools some students are

affected by deprivation of needs, lack of access to educational materials, and some schools been deprived from well-equipped laboratories, libraries, experienced teachers, inappropriate teaching methodologies among others. These situations seem to be hindering effective teaching and learning processes especially the issue of inappropriate instructional strategies which do not allow the students to be actively involved in the lectures (Ali, 2013). The students just listen to lecturers without concentration or distracted by some factors that may result in reduced assimilation and low achievement. It is against these mentioned observations that this research was carried out to investigate the effects of reciprocal instructional strategy on junior secondary school students' performance in Basic Science in Ekiti State.

Purpose of the Study

The purpose of this study was to examine the effect of using reciprocal instructional strategies on junior secondary school students' performance in Basic Science in Ekiti State. The study also intends to examine possible effect of gender on the students' performance in Basic Science. The outcome of this effort will be used to suggest steps that can enhance and improve science performance.

Research Hypotheses

The following null hypotheses was generated and tested;

1. There is no significant difference between the pretest mean scores of subjects exposed to the reciprocal instructional strategy and conventional strategy.
2. There is no significant difference between the posttest mean scores of students exposed to reciprocal instructional strategy and conventional strategy.
3. There is no significant difference between the posttest mean scores of male students exposed to the reciprocal instructional strategy and conventional strategy.
4. There is no significant difference between the posttest mean scores of female students exposed to the reciprocal instructional strategy and conventional strategy.

Research Design

The study was a quasi-experimental pre-test, post-test, control group design. The pre-test was to establish the knowledge base line of the students that were used for the study while the post-test will measure the level of academic performance of the students after treatment. The design of the study is represented as follows:

Experimental Group = $O_1 \quad X_1 \quad O_2$
Control Group = $O_3 \quad X_2 \quad O_4$

Where O_1, O_3 , represent pre-test. X_1 = reciprocal instructional strategy, X_2 = Conventional method. Also, O_2, O_4 , represent post-test.

Population

The target population for this study was made up of all the public Junior Secondary School II Basic Science students in Ekiti State.

Sample and Sampling Techniques

The sample for this study comprised 120 junior secondary school II Basic Science students selected from the three senatorial districts in Ekiti state using the multistage sampling technique. The first stage involved the selection of three local government areas across the three senatorial districts through random sampling technique. The second stage also involved selection of one school from each local government area through random sampling technique, while the next stage involved the selection of sixty (60) students from each of the sampled schools using stratified random sampling technique to ensure gender equality. Intact classes were used in each of the sampled schools.

Research Instrument

The instrument that was used for this study is Basic Science Achievement Test (BSAT). It is a self-designed instrument. Section A of the BSAT consisted of information on bio-data of the respondents while Section B consisted of 40 multiple-choice items that covers all the content of the chosen topics used as achievement test.

Results

H1: There is no significant difference between the pretest mean scores of students exposed to reciprocal instructional strategy and conventional strategy.

In testing this hypothesis, the mean total scores and standard error obtained from the pretest mean scores of students exposed to reciprocal instructional strategy and conventional strategy were subjected to t-test analysis at 0.05 level of significance.

Table 1: The t-test showing the pretest mean scores of students exposed to reciprocal instructional strategy and conventional strategy.

Group	N	Mean	SD	df	t-cal	t-table	Result
Reciprocal strategy	60	34.57	2.35				
Conventional method	60	20.57	1.58	118	28.31	1.96	Significant at $p < 0.05$

Table 1 shows that the mean score of students exposed to reciprocal instruction is 34.57 with standard deviation of 2.35, while the mean score of students exposed to conventional method is 20.57 with standard deviation of 1.58. The t-calculated is 28.31 while the t-table is 1.96. Thus the t-calculated is greater than the t-table value; therefore, the null hypothesis is rejected.

H2: There is no significant difference between the posttest mean scores of students exposed to reciprocal instructional strategy and conventional strategy

In testing this hypothesis, the mean total scores and standard errors obtained from posttest mean scores of students exposed to reciprocal instructional strategy and conventional strategy were subjected to t-test analysis at 0.05 level of significance.

Table 2: the t-test showing the posttest mean scores of students exposed to reciprocal instructional strategy and conventional strategy.

Group	N	Mean	SD	df	t-cal	t-tab	Result
Reciprocal strategy	60	11.46	3.71				
Conventional method	60	7.66	2.85	118	14.21	1.96	Significant at $p < 0.05$

Table 2 shows that the mean score of students exposed to reciprocal instructional strategy is 11.46 with standard deviation of 3.71, while the mean score of students exposed to conventional method is 7.66 with standard deviation of 2.85. The t-calculated is 14.21 while the table value is 1.96. Thus, the t-calculated is greater than t-table value, and therefore, the null-hypothesis is rejected. This implies that there is a significant difference between posttest means scores of students exposed to reciprocal instructional strategy and conventional strategy

H3: There is no significant difference between the posttest mean scores of male students exposed to reciprocal instructional strategy and conventional strategy.

In testing this hypothesis, the mean total score and standard error obtained from the posttest mean scores of male students exposed to reciprocal instructional strategy and conventional strategy were subjected to t-test analysis at 0.05 level of significance.

Table 3: The t-test showing the posttest mean scores of male students exposed to reciprocal instructional strategy and conventional strategy.

Group	N	Mean	SD	df	t-cal	t-table	Result
Reciprocal strategy	30	2.64	1.49				
Conventional method	30	2.48	1.33	58	0.87	1.96	Not Significant at $p < 0.05$

Table 3 shows that the mean score of male students exposed to reciprocal instructional strategy is 2.64 with standard deviation of 1.49, while the mean score of male students exposed to conventional method is 2.48 with standard deviation of 1.33. The t-calculated is 0.87 while the t-table is 1.96. Thus the t-calculated is less than the t-table value; therefore, the null hypothesis is not rejected. This implies that there is no significant

difference between the posttest means scores of male students exposed to reciprocal instructional strategy and conventional strategy

H4: There is no significant difference between the posttest mean scores of female students exposed to reciprocal instructional strategy and conventional strategy.

In testing this hypothesis, the mean total score and standard error obtained from the posttest mean scores of female students exposed to reciprocal instruction and conventional strategy were subjected to t-test analysis at 0.05 level of significance

Table 4: The t-test showing the posttest mean scores female students exposed to reciprocal instructional strategy and conventional strategy

Group	N	Mean	SD	df	t-cal	t-table	result
Reciprocal Strategy	30	29.74	2.80				Not Significant at p<0.05
Conventional method	30	27.54	2.84	58	1.47	1.96	

Table 4 shows that the mean score of female students exposed to reciprocal instructional strategy is 29.74 with standard deviation of 2.80, while the mean score of female students exposed to conventional method is 27.54 with standard deviation of 2.84. The t-calculated is 1.47 while the t-table is 1.96. Thus, the t-calculated is less than the t-table value; therefore, the null hypothesis is not rejected. This implies that there is no significant difference between the posttest means scores of female students exposed to reciprocal instruction and conventional strategies.

Discussion

The finding of the study revealed in hypothesis 1 that there is significant difference between the pretest mean scores of students exposed to reciprocal instructional strategy and conventional strategy . This can be traced to the fact and findings of Doolittle, (2006) who shared the view that collaborative learning can assist in improving the understanding, critical thinking skills, problem solving skills, communication skills of learners, increase the involvement of learners, both individually and socially, in exploring and critically solving problems. The study also revealed in hypothesis 2 that there is a significant difference between the posttest means scores of students exposed to reciprocal instruction and conventional strategy. This is in accordance to the submission of Mohammed and Abbas (2012), who asserted that reciprocal instruction increases and improve students' comprehension, develop self-regulatory and monitoring skills, and achieve overall improvement in motivation, hence affects the attitudes and performance of students positively. It was therefore found from the study that students exposed to reciprocal instruction performed better than those exposed to conventional method. The study also revealed in hypothesis 3 and 4 that there is no significant difference between the posttest

mean scores of male and female students exposed to reciprocal instruction and conventional strategies. This was in accordance to the study of Mackintosh (1998) who shared the view that there is no sex difference in general intelligence. This is an indication that gender has no significant contribution because male and female students exposed to the same treatment have nearly same scores in the test.

Conclusion

Based on the findings of this study, it was found that reciprocal instructional strategy was more effective in teaching Basic Science than the conventional method. The reciprocal instructional strategy allows students to construct their own meanings and scaffold what they are learning with their peers, therefore has the potency of producing higher students' performance. It was also discovered that sex does not play any significant role in students' performance. Male and female students exposed to same treatment did not differ significantly in their performance.

Recommendations

Based on the findings, the researcher considers the following recommendations necessary:

1. Basic Science teachers should adopt reciprocal instructional strategy in classrooms to enable students participate actively and interact to arouse their interest and improve performance.
2. Government should provide enabling environment for teachers and making the school conducive for participatory studentship.
3. The curriculum planners should introduce some collaborative packages into the methodologies of teaching sciences to update teachers' knowledge on the application of the reciprocal instructional strategy.

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