EFFECTS OF TWO MODELS OF INSTRUCTIONAL STRATEGIES ON STUDENTS' LEARNING OUTCOMES IN MATHEMATICS

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Abstract

The article investigated the effect of co-operative and competitive instructional strategies on students' learning outcomes in Mathematics. The subjects for the study were one hundred and ninety junior secondary school three (JSSIII) students randomly selected through judgmental and stratified random sampling from the secondary schools in Ido-osi Local Government Areas of Ekiti State. Instrument for data collection was Mathematics Achievement Test (MAT) the instrument was used for both pre-test and post-test. The experimental treatment lasted for four weeks and the data collected were analyzed using one - way analysis of variance and scheffe post-hoc pairwise comparisons analysis test. The findings showed that the students' learning outcomes in Mathematics were most enhanced by the cooperative learning strategy and rather minimally by the conventional learning strategy.

Introduction

Mathematics is an important core subject in the secondary schools curriculum. The subject is indispensable to national goals and objectives that is made compulsory for every students in both primary and secondary schools. This great emphasis is places upon the learning of mathematics because of its utility to the individuals as well to the nation at large.

The development of effective instructional strategies for mathematics stems from the quest for optimizing students' learning outcomes in mathematics. The annual students' wastage arising from mass failure of the Nigerian students in mathematics in both internal and external examination has attracted public outcry over the years. Effective strategies for teaching and learning mathematics have therefore, become pertinent in Nigeria where debates on the process of education hinge mainly on the quality of education at all levels, and where quality is measured in terms of students' learning outcomes. Students' learning outcomes in turn are seen as a function of quality of instructional strategies to which students are exposed.

According to Connelly (1993) and Farrell (1993), if what pupils learn is the basic output of schooling, the more students learn in a given time the more effective is the instructional strategy to which they are exposed. Substantial research findings in Nigeria and other parts of the world had shown that many variables that impinge on students' learning outcomes are outside the teachers' control, and so not directly as a result of teaching (Touray, 1982; Keith, 1986; Alonge, 1986; Idowu, 1991;Akiniua, 1995; Oladunni, 1995).

In Nigeria today, learners' test scores are regarded as an important operational measure of teacher or instructional strategies effectiveness. This is in agreement with the opinion of Bajah (1995), that effective instructional strategy is determined directly or indirectly by the academic achievement of the learners. Given this view point, the traditional instructional strategy needs to be revolutionized more so that it had been found least effective in enhancing learner's cognitive achievement (Okebukola and Ogunniyi, 1984; Slavin, 1991; Anakwe, 1997; Alebiosu, 1998; Esomonu and Onunkwo, 2003). Enhancing students' achievement through effective instructional strategy is still a challenge to teacher and researchers.

In view of the foregoing, (his study investigated the instructional strategy that would best enhance the students' cognitive achievement in Mathematics

Statement of Problem

There have been so much hue and cry from parents, organizations, communities, government functionaries, educators and researchers about the poor achievement of students' in mathematics. Several factors have been identified by mathematics researchers and educators as responsible for the current deteriorating students' achievement in mathematics.

One of the factors according to Oladunni (J995) has to do with the instructional strategies. Based on this view, the problem of this study was to investigate the effect of co-operative, competitive and conventional instructional strategies on students' learning outcomes in mathematics. In addressing this problem, this research question was raised.

To what extent do co-operative, competitive or conventional instructional strategies influence

students' learning outcomes in mathematics?

Research Hypothesis

There is no significant difference in the mean achievement scores of students taught mathematics using co-operative, competitive and conventional instructional strategies.

Method

Population and Sample

The population of this study comprised all the JSSIII students in all the government owned secondary schools in Ido-osi Local Government Area of Ekiti Slate, Nigeria. The students were 1157 in 2004/2005 academic years when this research was conducted. The JSSIII students were used because they were considered to be most matured in terms of responding to the instructional strategies under investigation when compared with both JSSI and JSSII.

The sample consisted of 190 JSSIII students. This was drawn through judgmental and stratified random sampling techniques taking into consideration variables such as school type on the basis of a boys' school, a girls' school and a mixed school and school location.

Instrumentation

The instrument used for the study was developed by the researcher and tagged Mathematics Achievement Test (MAT). The MAT was a 25 - Items multiple - choice objective test. To ensure validity, two experienced mathematics teachers and one specialist in educational test and measurement vetted the item in terms of clarity of words, appropriateness to the class level, readability and plausibility of the distractors. The reliability index of the item using Cronbach alpha technique was 0.89.

Experimental Procedure

The experimental design used for this study was non-randomized control group, pretest-posttest design. The three groups of students involved in this study include co-operative instructional strategy group (CPIS), competitive instructional strategy group (CMIS) and conventional instructional strategy group (CMS). Co-operative instructional strategy as used in this study is where students work in sub-groups and members of each sub-group work together as a team. Each student's achievement is based on the group performance. ^Competitive instructional strategy as used in this study is where students work in sub- groups and members of each sub-group compete with each other and seek to outperform one another. Conventional instructional strategy as referred to in this study is a normal traditional classroom setting used in normal mathematics class, in Ekiti State of Nigeria.

CPIS and CMTS were the experimental groups while the CN1S served as the control group. In each of the three schools, the three instructional strategies were randomly assigned to the three intact JSSIII classes.

The regular mathematics teachers of these schools were the experimenters. They were trained on how to utilize the instructional strategies using lesson plans prepared by the researcher. Before the treatment commenced, pre-test was administered to the subjects using the MAT, and six lessons of one hour each were taught for four weeks.

Before the teacher started the treatment in each of co-operative instructional strategy group, the students were divided into mixed abilities. There were five students in each sub- group. Members of each subgroup were instructed to share ideas together, work towards mutual goals, render assistance to one another and provide answers to questions by consensus. Each student's achievement in the lessons was evaluated based on the performance of his/her sub- group and not on his /her individual contributions.

Students in the competitive instructional strategy group were divided into mixed abilities. There were six students in each sub-group and members of each sub- group were sensitized for competition before the treatment commenced. They were told not to seek assistance from their team mates but seek to outperform other, as the best student in each sub-group will be rewarded.

In the conventional instructional strategy group, the students were not given any special treatments. The teachers taught students the six lessons with the normal instructional strategy utilized by most of the

secondary school teachers, in Ekiti State.
The researcher occasionally supervised the lessons in each of the instructional groups to ensure that the teachers effectively implemented all the instructions.
At the end of the treatment a post-test was administered to all the students using MAT. Pretest .-posttest sensitization was controlled by renumbering the items used for the pre-test and producing same on coloured papers for use in the post-test. Data were analyzed using mean, one-way analysis of variance (ANOVA) and Scheffe post-hoc analysis test.

Results

Table 1: Students' Achievement Scores on Pre and Post Treatment Test

Instructional strategies	N	Pre-Test		Post-Test		Mean Gain Score
		X	SD	X	SD	
Co-operative	65	28.85	9.62	56.26	10/72	27.41
Competitive	72	25.75	10.37	37.32	9.92	11.57
Conventional	53	26.60	11.30	31.98	'11.76	5.38

Table 1 show that the students mean gain score was highest in co-operative instructional strategy group while the conventional instructional strategy group was least.

Table2: ANOVA of Students' MAT Scores Before the Treatment.

Source of variation	Sum of squares	Degree of freedom	Mean squares	F	Result
Between groups	725.97	2	362.985		
Within groups	112818.89	187	603.310	0.60	**
Total	113544.86	189			

** Not significant: P< 0.05

From table 2, F, calculated is less than the critical value of F at P<0.05, (df 2,187). This result implies that there was no significant difference in the mean scores of the three groups (i.e. CPIS, CMIS and CNIS) before treatment.

Table 3: ANQVA of Students' MAT Scores **Due to the Effect of Instructional Strategy.**

Source of variation	Sum of squares	Degree of freedom	Mean squares	F	Result
Between groups	10130.54	2	5065.27		
Within groups	258610.35	187	1382.94	3.66	*
Total	268740.89	189			

* Significant: *P*< 0.05

From table 3, F- calculated is greater than the critical value of F at P<0.05 (df 2, 187). The null hypothesis was therefore rejected. Thus, there is a significant difference in the means achievement score of JSSIII students taught Mathematics with co-operative, competitive and conventional instructional strategies.

In order to detect the significant comparisons among the three instructional strategies, Scheffe test for data snooping was carried out.

Table 4: Scheffe Post Hoc Pairwise Comparisons of the Students' Mean Achievement Post Test Scores.

.	Mean scores	Instructional strategies

Instructional strategies		Conventional	Co-operative	Competitive
Co-operative	56.26	*6.15		
Competitive	37.32		*5.19	
Conventional	31.98			**1,38

* Significant; $P < 0.05$, df- (2,187) ** Not significant: $P < 0.05$, df = (2,187)

From table 4, it could be concluded that:

i. Students taught with co-operative strategy achieved significantly higher than their counterparts taught with competitive and conventional strategies ii. Students taught with competitive strategy were not statistically different from those taught with conventional strategy.

Discussion

Results of this study showed that students' learning outcomes in Mathematics were enhanced most by the co-operative strategy. This finding is similar to the works of Barell (1995), Esan (1999) and Esomonu and Onunkwo (2003). An explanation to this superiority of the co-operative strategy over the other could be referenced to the peer support and mutual interactions which existed among members of the sub-groups within this strategy during the instructions. This must have benefited the low ability students

The competitive instructional strategy enhanced the students[1] learning outcomes in Mathematics fairly than the conventional strategy. The reason for this is due to the rewards which must have motivated the students higher than their counterparts in the conventional instructional strategy.

Conventional instructional strategy found inferior to both co-operative and competitive strategies could be as a result of its teacher-centeredness. Since the students contributed minimally to the instruction, it is obvious that performance may have been hampered.

Recommendations and Conclusion

The results of the study revealed that co-operative instructional strategy and competitive instructional strategy can be used for teaching and learning processes but co-operative instructional strategy is the most effective because it promotes academic goals and is highly effective at enhancing cognitive achievement among students. It is therefore recommended that the co-operative instructional strategy should be regularly utilized in the teaching and learning of Mathematics in secondary schools. The competitive strategy may also be used occasionally but the conventional strategy which predominated in the secondary schools in Ekiti State, Nigeria, should be drastically de-emphasized.

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