Effect of Instructional Learning Strategies on Achievement in Mathematics of Standard VIII Students

Communication & Journalism Research
4 (1&2) p 127 - 136

ISSN 2348 – 5663

Dr. A Hameed
Professor, Department of Education, University of Calicut, Kerala, India
Dilshath K
HSST, Mathematics, Kunhalimarakkar Higher Secondary School, Kottakkal, Malappuram, Kerala, India

Abstract

The present study investigates the effect of Instructional Learning Strategies on Achievement and Retention in Mathematics of standard VIII students. For this purpose, Jigsaw II Model of Cooperative Learning and Existing Activity Oriented Method of Teaching were utilized and compared. Jigsaw II method is intended to maximize the learning of children in Mathematics. The present study has been conducted employing the Quasi Experimental Design. The Design used in the present study was the Pre-test Post test Non-equivalent Groups Design. The Study made use of two types of lesson transcripts, Achievement Test in Mathematics and other standardized tools. Statistical techniques used were Mean Difference Analysis and One-way Factorial ANCOVA. The study reveals that Achievement in Mathematics of Standard VIII students are depended on the Jigsaw II Model of Cooperative Learning Strategy than the Existing Activity Oriented Method of Teaching.

Keywords

Instructional learning strategies, academic achievements, cooperative learning strategy, Indian education system

Introduction

Indian educational system has been constantly subjected to reforms. Instructional strategies have been developed and practiced to boost-up student achievement in

Correspondence: Email: hameedrcuedn@gmail.com

different academic subjects especially in Mathematics. Previously, efforts have been mainly vested in the areas of curriculum, school policies and textbooks. But more recently, attempts arebeing concentrated to make classroom practices more flexible and attractive to pupils. At the same time, a growing interest has also been sensing to make the students to feel the process of learning as a meaningful and happy affair. In connection with these efforts some reflections of success have been reported from some kind of innovative practices in the classrooms; but these attempts are very rare.

Mathematics is a systematized, organized and exact branch of science. The scope of Mathematics is very wide, as it covers all the activities of human beings. Using the existing methods, children are not getting successful results in Mathematics. But using cooperative learning (Jigsaw-II Method) every child will be having better understanding and maximum output (Artzt & Newman, 1997). Cooperative learning is a social process and that cooperative learning activities are essential if students are wanted to be able to construct their own knowledge. In Cooperative Learning, students work together to achieve in joint learning groups. Any assignment in any curriculum for any age students can be done cooperatively. It promotes student's psychological health and social competencies (Slavin, 1980). Here comes the relevance of innovative Cooperative Learning strategies developed by several researchers (Johnson & Johnson, 1975; Sharan & Sharan, 1976; Aronson, 1978).

The investigator reviewed different Cooperative Learning Procedure like Learning Together (Johnson & Johnson, 1975); Group Investigation (Sharan & Sharan, 1976); Numbered Heads Together (Olsen & Kagan, 1992); Think Pair Share (Andrini, 1994); Complex Instruction (Cohen, 1998); Student Team Learning (Slavin, 1980); Student Teams Achievement Divisions-STAD (Slavin, 1983); Teams Games Tournaments (TGT) (Devries, Slavin, Fennessey, Edward, & Lombardo, 1980) ; Jigsaw Learning-1 (Aronson, Blancy, Stemphan, Sike & Snapp, 1978); Jigsaw-II (Slavin, 1980 b). Among these methods, the investigator selected the 'Jigsaw-II Model' of Co-operative Learning Strategy for treatment.

In Jigsaw II, instead of each student having a unique section, all students read a common narrative, such as a book chapter or a short story. However, each student is given a topic on which to become a expert. The students who have the same topic meet in expert groups and return to their teams. Then students take individual quizzes, which are formed in to team scores and the highest scoring team and individuals are recognized in a class newsletter (Slavin, 1990). Jigsaw method of learning transfers the class room as a game board, learning as a game, an intellectual game in which all members of the team have something to be done, and something to be contributed. The individual's inevitable contribution through the group or team processing ultimately leads to the expertise gained by each member regarding the learning materials. This expertise as a personal asset, they share with other members in the team. Jigsaw learning is a learner – based strategy in which the students learn the content or language skills by mutual interaction within the

group and between the groups. Jigsaw is more different and advanced than conventional group activities (Slavin, 1990).

Jigsaw II method (Slavin, 1980) is intended to maximize the learning of children in Mathematics. It helps in reducing the stress on child while solving the problem and this method will help children to learn thing directly connected with life. Better result of group working is utilized in this method, because group is not an occasional one but a permanent system. Though teachers have applied so many new methods of instruction, Achievement in Mathematics is still reducing and in such a situation Jigsaw II Method will be of sure help in academic achievement in Mathematics.

Academic achievement is one of the prime concerns of learning, whether it is individual learning, whole class learning or cooperative learning like Jigsaw. A plenty of studies revealed that there is a positive relationship between Jigsaw learning (or such collaborative learning strategies) and academic achievement. Fraser and Walberg (1984) give evidence from studies that cooperative Learning was more successful than other competitive or individualistic learning. In the study of Sharan (1980), it has been consistently demonstrated that student's cooperation facilitates academic achievement. Intensive studies conducted by Slavin (1980), Glass, Cohen, Smith and Filby (1982), Olsen and Kagan (1992) reported that there is a positive relationship between cooperative learning strategy and pupils academic achievement. Review of related literature revealed that cooperative learning also promotes self-esteem, inter-ethnic relations, collaborative work, intergroup relations etc. (Jackson, 1990). Cooperative or collaborative learning would be a solution strategy because it has been found that cooperative learning contributes not only to academic achievement but also helps to develop social skills and democratic values that are beneficial to society as well as to each individual (Angry, 1990; Felder, 1995: Xing, 1996).

Variables of the study

The independent variable selected for the study was Instructional Learning Strategies (Cooperative Learning Strategy – Jigsaw II Method and Existing Method of Teaching) and the Dependent Variable, Achievement in Mathematics of Standard VIII students. Pre Experimental Status in the subject matter measured by a Pretest and Verbal Intelligence were the control variables selected for the study.

Objectives

The major purpose of the present study was to investigate the effect of Instructional Learning Strategies (Cooperative Learning Strategy and Existing Method of Teaching) on Achievement in Mathematics of Standard VIII students. The following were the objectives of the present study.

1. To study whether there exist any significant difference in the Mean Pre-test scores of Experimental and Control Groups for the Total sample, Boys and Girls.

2. To study whether there exist any significant difference in the Mean Achievement scores of Experimental and Control Groups for the Total sample, Boys and Girls.

3. To study whether there exist any significant difference in the Mean Gain Scores of Experimental and Control Groups for the Total sample, Boys and Girls.

4. To study the effectiveness of Jigsaw II method of Cooperative Learning Strategy over Existing Method of Teaching in terms of Achievement in Mathematics of Standard VIII students.

Hypotheses

The present study was designed to test the following hypotheses.

1. There is no significant difference in the Mean Pre-test scores of the Experimental and Control groups for the Total Sample, Boys and Girls.

2. There is no significant difference in the Mean Achievement scores of the Experimental and Control groups for the Total Sample, Boys and Girls.

3. There is no significant difference in the Mean Gain Scores of the Experimental and Control groups for the Total Sample, Boys and Girls.

4. Pupils taught through Jigsaw II Method of Cooperative Learning Strategy will not differ significantly in term of Achievement in Mathematics than pupils taught through Existing Method of Teaching.

Method

The present study has been conducted employing the Quasi Experimental Design. The Design used in the present study was the Pre-test Posttest Non-equivalent Groups Design. One class division from one school was treated as the Experimental group and one class division from another school was treated as the Control group. The Experimental Group was taught through the Cooperative Learning Strategy (Jigsaw II Method) and the control group was taught through the Existing Method of Teaching.

Participants

The participants of the study consisted of two intact class groups of 35 students each in the Experimental and control groups (Total 70 students). The Experimental Group consisted of 26 boys and 9 girls and the control group consisted of 35 subjects including 18 boys and 17 girls. The Experimental and Control groups were selected

at random by giving equal representation to efficiency level and Socio Economic status of students.

Instruments

For the present experiment, the following tools of proven psychometric properties were used for treatment in the Experimental and Control Groups.

Lesson transcript for cooperative learning strategy – jigsaw II model

The investigator prepared Lesson Transcripts for Cooperative Learning Strategy following the four different phases proposed by Slavin (1980), for his Jigsaw II model and used for treatment in the Experimental group. The phases were:

Phase I - Formation of Base Groups

Phase II - Formation of Expert Groups

Phase III - Peer-tutoring and

Phase IV - Reconvene the class, exchange of ideas and rewarding the best group.

Lesson transcript for existing method of teaching

Lesson transcript for existing method of teaching for the control group was prepared in Malayalam language, on the basis of the Activity Based Curriculum in Kerala. Each lesson was prepared as per the format. While the method of teaching in Experimental group varied from unit to unit, depending upon the nature of the subject, the teaching method followed in the control group was the existing one.

Verbal group test of intelligence (VGTI)

For the present study, the confounding variable, Verbal intelligence was measured using Verbal Group Test of Intelligence (VGTI) developed by Kumar, Hameed and Parasanna (1997). The test consists of five subtests namely; Test I- Verbal Analogy, Test II- Verbal Classification, Test III -Numerical Reasoning, Test IV- Verbal Reasoning and Test V- Comprehension.

Achievement test in mathematics

This test of Achievement in Mathematics was developed and standardized by the investigators and used as pretest and post test on the topic selected for treatment. The validity and reliability of the test obtained were 0.86 and 0.81 respectively.

Statistical techniques used for analysis

In the present study, Mean difference analysis was employed to analyse whether the experimental and control group differ in pre test, post test and gain scores without controlling the effects of the covariates. Mean difference analysis was also employed to equate the experimental and control groups with regard to pre-experimental status (Pretest Score and Verbal Intelligence). It is again employed as technique for post –hoc comparison, after the ANCOVA procedure. To control the effect of covariates i.e., Pre Experimental Status in the subject matter and Verbal Intelligence singly and combination and thereby to confirm the effectiveness of Cooperative Learning Strategy (Jigsaw II) over the Existing Method of Teaching, Analysis of Covariance (ANCOVA) was utilized.

Execution of the experiment

Before starting the experiment both Experimental and control Groups were given the same Pre-test to measure the initial status of the subjects. After that the Experimental Group was taught through Jigsaw lessons for 15 periods (of a duration of 90 minutes) and the control Group was through the Existing Method of Teaching for the same topics for 30 periods (of a duration of 45 minutes). The topic selected was Algebra. During the Experiment, the investigator administered Verbal Group Test of Intelligence and responses were collected. The same Achievement Test in Mathematics was given to both the Control Group and the Experimental Group, after the completion of the treatments as post Test. The scores on these tests were used for determining the effectiveness of Jigsaw II Method over Existing Method of Teaching.

Major findings of the study

For analysis, nine Mean Difference Analysis and three ANCOVA respectively were done to compare and to find out the effectiveness of Cooperative Learning Strategy (Jigzaw II) over Existing Method of Teaching in Mathematics for Total sample, Boys and Girls.

Results of mean difference analysis

Mean Difference Analysis was employed in the study to investigate the difference between the Experimental and Control groups (Total Sample, Boys and Girls) with respect to Pre-test, Achievement scores and Gain Scores in Mathematics, without controlling the select Covariates. Results of Mean Difference Analysis are briefly presented in Table 1.

Table 1: Summary of the t-values for pre-test, achievement and gain scores for experimental and control groups

Variables	t – value		
	Total Sample	Boys	Girls
Pre-test	1.927	1.938	0.093
Achievement	4.351**	3.885**	4.141**
Gain score	4.745**	4.289**	4.497**

** - Significance at 0.01 level,

From Table 1, the t-value obtained for Pretest for Total sample, Boys and Girls were not found significant. The t-value obtained for Achievement for Total sample, Boys and Girls are found significant at 0.01 level. Also the t-values obtained for Gain Score for Total Sample, Boys and Girls are found significant at 0.01 level of significance. From the summarised result, it can be said that Achievement in Mathematics and Mean Gain Scores differentiate the Experimental and Control Groups for the Total Sample, Boys and Girls. In all these comparisons the superiority of the Experimental Group over the Control Group in evident.

Results of the covariance analysis

Effectiveness of Instructional Learning Strategies particularly Jigzaw II Method of Cooperative Learning Strategy over the Existing Method of Teaching Mathematics for standard VIII students is studied employing the One-way ANCOVA with two Covariates singly and in combination. The Covariates controlled were Pre-experimental Status and Verbal Intelligence. Results of the one-way Analysis of Covariance are presented in Table 2.

Table 2: Summary of F-values of ANCOVA for achievement

Source of Variation	Dependent Variable	F-value – Covariates		
		Pre-Experimental Status	Verbal Intelligence	Pre Experimental Status and Verbal Intelligence
Instructional Learning Strategies	Achievement in Mathematics	27.34**	7.45**	4.19*

* - Significant at 0.05 level; ** - Significant at 0.01 level

All the three ANCOVA conducted to study the effectiveness of Cooperative Learning Strategy over Existing Method of Teaching a topic in Mathematics of

Standard VIII Students yielded significant F-values, using Pre-Experimental Status and Verbal Intelligence as covariates separately and in combination. Effectiveness of the Cooperative Learning Strategy is very clear even after the effect of Pre Experimental Status and Verbal Intelligence singly and in combination were successively removed.

The result of ANCOVA showed that standard VIII students taught through Cooperative Learning Strategy is significantly differ in Achievement in Mathematics than the pupils taught through the Existing Method of Teaching. As higher mean Achievement Scores were associated with the Experimental Group to which Cooperative Learning Strategy was implemented, Cooperative Learning Strategy is found advantageous over Existing Method of Teaching in case of Achievement in Mathematics.

Conclusion

The present study has helped to find out the effectiveness of Cooperative Learning Strategy over Existing Method of Teaching Mathematics. One of the important findings of the study is that the Cooperative Learning Strategy is more and more advantageous over the Existing Method of Teaching in enhancing student's Academic Achievement particularly in Mathematics. The implication of the findings is that the Cooperative Learning Strategy may be implemented as a teaching method throughout Kerala at least on an experimental basis. The result also shows that, irrespective of Sex, Cooperative Learning Strategy has significant advantage over the Existing Method of Teaching Mathematics of Standard VIII students. On the basis of finding it can be said that Cooperative Learning Strategy may equally be applicable in mixed sex schools and single sex schools. It is also implied that students of different ability levels can be brought to optimum level, if Cooperative Learning Strategy is utilized in an effective way.

Application of Cooperative Learning Strategies in the educational field is comparatively easy since it is time saving and practicable in the ordinary classrooms. No additional requirements other than usual classroom requirements are necessary. The teacher in the Cooperative Learning Strategy is a friend to the students, rather than an autocrat. The relationships between the teachers and the students, and also among students become more flexible. So it is implied that Cooperative Learning Methods are preferable to promote social values.

References

Andrini, E. (1994). Models that Promote Cooperative Learning. *Classroom Compass*, 1, 7-12.

Angry, R. (1990). *Enhancing Ethnic Relations through Teaching Multicultural Education in the secondary schools*. Florida. Retrieved from the ERIC Document Reproduction Services. (ED 329459)

Aronson, E., Blancy, N., Stemphan, C., Sike, J., & Snapp, M. (1978). *The Jigsaw class room*. California: Sage Baverly Hills.

Artzt, A. F., & Newman, C.M. (1997). How to use Cooperative Learning in the Mathematics class second edition National council of teachers of Mathematics. *Guide to Classroom teacher*. U.S: Verginia.

Cohen, E. (1998). *Complex Instruction: New Horizons for Learning.* Seattle, WA: USA.

Devries, D.L., Slavin, R. E., Fennessey, G. M., Edward, K. J., & Lombardo, M. M. (1980). *Teams Games Tournaments: The Team Learning approach*. Englewood Cliffs, N.J: Educational Technology Publications.

Felder, R.M. (1995). A longitudinal study of engineering students performance and retention: IV instructional methods and students responses to them. *Journal of Engineering Education*, 84, 361-367.

Fraser, B. J., & Walberg, H. J. (1984). Cooperative learning environments. Review of Slavin's "Cooperative Learning" and Johnson et al.'s "Circle of Learning Cooperation in the Classroom." *Contemporary Educational Review*, *3*, 253-260.

Glass, G. V., Cohen, L. S., Smith, M. L., & Filby, N. W. (1982). *School Class Size: Research and Policy*. Baverly Hills, Cali: Sage publications.

Jackson, S. A. (1990). *Accelerating academic achievement for black students: Transforming the teaching learning environment and behaviours to accommodate the preferred learning style of African American children.* Paper presented at the conference of the National Alliance of Black School Educators, Dalls, TX.

Johnson, D. W., & Johnson, R. T. (1975). *Learning Together and Alone Eaglewood Cliffss.* N.J: Prentice – Hall inc.

Kumar, S. P. K., Hameed, A., & Prasanna, A. (1997). *Verbal Group Test of Intelligence.* Calicut: Department of Education, University of Calicut.

Olsen, R.W. B., & Kagan, S. (1992). About Cooperative Learning. In C. Kessler (Ed.), *Cooperative Language Learning: A Teacher's Resource Book*. Eaglewood Cliffs, NJ: Prentice – Hall.

Sharan, S., & Sharan, Y. (1976). *Small Group Teaching*. Englewood Cliffs, NJ: Educational Technology Publications.

Sharan, S. (1980). Cooperative learning in small groups: Recent methods and effects on achievement, attitudes and ethnic relations. *Review of Educational Research*, *50*, 241-271.

Slavin, R. E. (1980). Cooperative Learning. *Review of Educational Research*, *50*, 315-42.

Slavin, R. E. (1980a). *Using student team learning*. Baltimore: Maryland, John Hopkins University, Center for Social Organisation of School.

Slavin, R. E. (1983). *Cooperative Learning*. New York: Longman.

Slavin, R. E. (1990). Achievement effects of ability grouping in secondary schools. *Review of Educational Research*, *60*, 471-500.

Xing, F. (1996). *The Effects of Computer Assisted Co operative Learning in Mathematics in Integrated Classroom for Students with and without Disabilities.* New Jersy. Retrieved from the ERIC Document Reproduction Service. (ED 412-696).