

## Understanding Jigsaw Cooperative Learning: Influence on Scholastic Achievement and Learning Experiences of Students in Mathematics Education

Venkateshwar Rao D<sup>1\*</sup>

### ABSTRACT

Mathematics is a compulsory subject at school level. The performance of students in mathematics is not satisfactory at secondary school level. Some of the factors that are attributed to the unsatisfactory performance include: anxiety and fear towards the subject by students, ineffective instructional methods, class room climate and learning environment which are not supportive for students' participation.

The purpose of the study was to investigate the effect of cooperative learning strategy in mathematics on students' performance from positive psychology perspective. In addition to performance this study also sought to find out students perception towards cooperative learning strategy. The sample of the study consisted of 60 students divided in to two groups of 30. In the experimental group cooperative learning strategy was employed while in the controlled group traditional instructional method was used. Scholastic achievement test and Questionnaire on cooperative learning was used to collect the data. Data was analysed by using statistical techniques including "t" test. The study supports the effectiveness of cooperative learning strategy in mathematics education.

**Keywords:** *Performance in mathematics, instructional methods, cooperative learning strategy.*

The knowledge of mathematics is indispensable for the existence of any individual and society. It should be visualised as a vehicle to train a student in thinking, reasoning, analyzing and articulating logically (National Policy on Education, 1986). But unfortunately mathematics is still a subject that is considered difficult and boring to many students. According National Curriculum Framework (NCF), 2005 a majority of children have a sense of fear and failure regarding mathematics. Review of the researches, surveys and reports of government and private organisations revealed that the performance of students in mathematics is not satisfactory

<sup>1</sup> ICSSR Post-Doctoral Fellow, Dept. of Psychology, Osmania University, Hyderabad

\*Responding Author

## **Understanding Jigsaw Cooperative Learning: Influence on Scholastic Achievement and Learning Experiences of Students in Mathematics Education**

(Venkateshwar Rao D., 2012). Trends in International Maths and Science study (TIMSS) scores revealed that Indian students' performance in mathematics is below international averages (Chengappa R & Maheshwari S., 2006). According to State Curriculum Framework, Andhra Pradesh (2011) about 35% of students is unable to perform fundamental operations in mathematics.

The underachievement and unsatisfactory performance of students is primarily attributed to ineffective teaching methods in mathematics classroom. National Educational Commission (1964-66) emphasized the need for improving teaching learning methods (Ediger, M. & Bhasker Rao, D. 2000). According to NCF (2005) much of our learning is still individual based (although not individualized!). The teacher is seen as transmitting knowledge which is usually confused with information to children and organizing experiences in order to help children to learn. But interaction with teachers, with peers as well as those who are older and younger can open up many more rich learning possibilities. Learning in the company of others is a process of interacting with each other and also through the learning task at hand.

According to Ediger, M (1998) to optimize instruction we should help students to work effectively with others in collaborative situations. Students need to learn to assist each other in the school and classroom setting; because human beings are dependent upon each other for survival. Cooperative learning helps to understand that goals in life can be achieved in cooperating with each other, rather than through dog eat dog approach. According to Public Report on Basic Education (PROBE) Survey (1999) children who are taught in a supportive environment enjoy the schooling experiences. But in the traditional instructional methods child's participation in the lesson is altogether missing. Most children view learning in schools as boring even unpleasant and bitter experiences (Learning without Burden, 1993). Students learn mathematics best if they consider it as something pleasurable (Liebeck, P. 1990). Students should be given the opportunities to interact and to share with friends through cooperative learning. Thus the cognitive and affective development of students in mathematics can be improved. The vision of NCF (2005) is children should learn to enjoy mathematics rather than fear it. They should see mathematics as something to talk about, to communicate through and to discuss among them to work together on. Positive Psychology foundation for schooling involves the importance of diversity of student backgrounds and opinions in the classroom. It encourages students to become sensitive to the ideas of people other than those from their own ethnic or age cohort (Synder, CR & Lopez, S.J., 2007). The positive psychology premise is to foster an environment which values the views and opinions of all students in the classroom. Many studies have shown that cooperative learning in mathematics increases achievement (Slavin, 1980), conceptual understanding, communication, positive peer relations, positive attitude and self-esteem (Leikin & Zaslavsky, 1999). It involves an element of positive interdependence, because students cannot learn all the content without their group members (Sharan, 1980).

## Understanding Jigsaw Cooperative Learning: Influence on Scholastic Achievement and Learning Experiences of Students in Mathematics Education

### *Jigsaw cooperative learning strategy in mathematics classroom*

Cooperative learning can be defined as a classroom technique in which students work on learning activities in small groups and receive rewards or recognition based on their group performance (Slavin, 1980). There are various cooperative learning methods; 'Jigsaw' is one among them.

Jigsaw classroom was designed by University of California – Santa Cruz professor emeritus Elliot Aronson. In this approach students and teachers use group based goals and the students from different backgrounds are placed in work units where they must share information in order for the group – and therefore each member – to succeed (Snyder, C.R. & Lopez, S.J., 2007).

In jigsaw cooperative learning strategy students from different backgrounds are placed in groups where they share information. According to Aronson (2000) jigsaw is a cooperative learning strategy that enables each student to specialize in one aspect of learning unit. Students work in a group of 5-6 to their own learning and learning of others. Each student has part of the information that is important to the success of the group as a whole and thus there is strong motivation to include each student's input. It teaches cooperation rather than competition (Snyder C.R. & Lopez, S.J., 2007). Studies have shown that students learn the content along with respect for their fellow students.

In Jigsaw method, students are placed in small groups and the task is divided into pieces and assigned to group members based on ability level (Slavin, 1980). Individuals from all groups with same task meet and discuss to become experts on the content. After they return to original groups and teach the content to other members (Sharan, 1980). All the students are expected to know all the pieces of content and are assessed individually (Slavin, 1980).

## **METHOD**

### *Objectives*

The objectives of the present study are:

1. To assess whether there is statistically significant difference in scholastic achievement in mathematics between students taught using jigsaw cooperative learning strategy and students taught using traditional methods
2. To assess the learning experiences and perceptions of students towards jigsaw cooperative learning strategy in mathematics

### *Hypotheses*

- There is no significant difference in scholastic achievement between students taught by using jigsaw cooperative learning strategy and traditional methods in mathematics

# Understanding Jigsaw Cooperative Learning: Influence on Scholastic Achievement and Learning Experiences of Students in Mathematics Education

## *Research design*

This is a primary research covering sixth grade students from Semi urban schools.

## *Sample*

A sample of 60 students of which 30 boys and 30 girls were selected from 2 schools of Ranga Reddy district of Telangana state. Community wise BC's are 27% and SC's are 30%. The ST and OC are 27% and 16% respectively.

Two stage sampling technique was followed to select the sample. In the first stage randomly 2 schools were selected. In the second stage 30 students of sixth grade were selected randomly from each school.

## *Research tools*

Research tools included a personal data sheet, student's interview questionnaire and scholastic achievement test in mathematics. Personal data sheet was used to collect information like gender, community. Students' interview questionnaires were used to gather information on learning experiences and perceptions of students towards jigsaw cooperative learning strategy. Scholastic achievement test was used to measure scholastic achievement before and after intervention.

## *Procedure*

Research was conducted after taking permission from the school authorities and obtaining consent from the students. After fixing the tentative time schedule for the study, data were collected from the students. The sample was divided in to 2 matched groups of 30. In order to control the differences of dependent variables a pre test was given before intervention. After an intervention of 4 weeks a post test was administered to both groups. The instrument was validated and had reliability coefficient of 0.83. The pre test and post test was analysed using t test. Content analysis was used for open ended questions on jigsaw cooperative learning

## *Data Analysis*

Data were analysed by using statistical techniques mean, standard deviation and 't' test

## **RESULTS AND DISCUSSION**

*Table-1, Analysis of differences in Scholastic Achievement Test in Mathematics (Before Intervention)*

Group	N	Mean	SD	t value
Experimental	30	14.20	3.35	0.882
Control	30	15.76	3.93	

As shown in the above Table 1 the experimental group had a mean score of 14.20 with Standard Deviation of 3.35. Students in the control group had a mean score of 15.76 with a standard deviation of 3.93. The 't' value was 0.882. The difference was not statistically significant

**Understanding Jigsaw Cooperative Learning: Influence on Scholastic Achievement and Learning Experiences of Students in Mathematics Education**

indicating that the groups are homogenous and suitable for the study. Hence it was possible to assess the difference between groups on the test scores after the intervention.

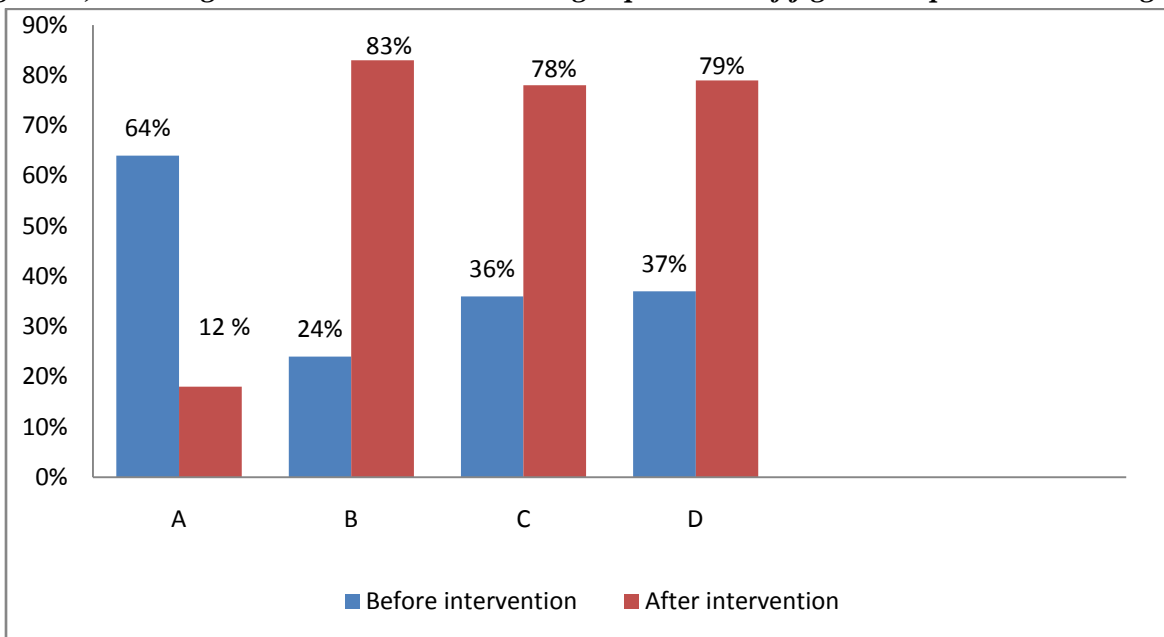
*Table – 2, Analysis of differences in Scholastic Achievement Test in Mathematics (After Intervention).*

Group	N	Mean	SD	t value
Experimental	30	15.76	2.68	4.54*
Control	30	12.30	3.21	

**\*Significant at 0.01 level of significance**

As shown in Table 2, there was statistically significant difference in the mean of mathematics achievement of students across experimental group and control group. Therefore, it can be concluded that mathematics achievement of students through Jigsaw cooperative learning strategy was better than mathematics achievement of students undergoing traditional instruction.

*Figure 1, Showing details on students learning experiences of jigsaw cooperative learning*



- A: Anxiety and fear towards mathematics
- B: Enjoying mathematics
- C: Feeling towards mathematics (interesting / boring)
- D: Feeling of happiness

From the above Figure 1 it can be observed that 64% of students have anxiety and fear towards mathematics before intervention. The corresponding percentage after intervention was 12%. 24% of the students (before intervention) reported that they enjoy mathematical problem solving and 36% of students reported that they have interest in mathematical problem solving before

## Understanding Jigsaw Cooperative Learning: Influence on Scholastic Achievement and Learning Experiences of Students in Mathematics Education

intervention. The corresponding percentages after intervention were 83% and 78% respectively. 37% of the students before intervention expressed that they feel happy while solving mathematical problems. The percentage after intervention was 79%. From the above Figure 1 it can be clearly observed that the intervention had positive impact on the students learning experiences of mathematical problem solving (like decrease in anxiety and fear of maths, increase in happiness and enjoyment etc.)

*Table 3, Reasons for preference to jigsaw cooperative learning strategy*

Response	Frequency-percentage
Better understanding	23
Peer group discussion	21
Improvement in marks	19
Active involvement	18
Joy of learning	15
Can ask doubts without fear	4

From the above Table 3, it is evident that 23% of the students' reported that they prefer jigsaw cooperative learning strategy because of better understanding. 21% reported that it is because of peer group discussion. 19% reported that it improves marks. 18% reported that it is because of active involvement. 15% reported that it is because of joy of learning and 4% expressed that they can ask doubts without fear.

### **CONCLUSION:**

Mathematics educators need to recognize the importance of jigsaw cooperative learning strategy in the classroom. In Jigsaw cooperative learning strategy students tend to enjoy mathematics and this enjoyment motivates them to learn mathematics effectively. In short the present study suggested that learning experiences and scholastic achievement of sixth grade students in mathematics influenced positively by the intervention incorporating jigsaw cooperative learning strategy. The intervention helped the students to improve interest in mathematics, to overcome anxiety and fear and to score higher in scholastic achievement test.

### **IMPLICATIONS**

The findings of the present study have clear implications for mathematical educators. There is a need to place greater emphasis on jigsaw cooperative learning strategy in mathematics learning.

### **LIMITATIONS**

The findings of the present study are limited to a small sample (60) comprised of semi urban students of sixth grade. In order to be able to make more meaningful generalisations about the

## Understanding Jigsaw Cooperative Learning: Influence on Scholastic Achievement and Learning Experiences of Students in Mathematics Education

intervention, further studies should focus on more heterogeneous samples (urban, semi urban and rural) of larger size.

### ***Acknowledgements:***

This work is a part of the study (Post Doctoral Fellowship) funded by Indian Council of Social Science Research (ICSSR), New Delhi.

### **REFERENCES**

- Aronson, E (2000). Nobody left to hate developing the emphatic school room. *The Humanist*, 60, 17-21.
- Chengappa, R., & Masheshwari, S. (2006). what is wrong with our teaching, *India Today*, 27(11), 2006.
- Ediger, M. & Bhasker Rao, D. (2000). *Teaching mathematics successfully*, New Delhi. Discovery Publishing House.
- Ediger, M. (1998). Change and the school administrator, *Education*, 118(4), 44-45.
- Learning without Burden (1993). Ministry of Human Resource Development, Dept. of Education, Government of India, New Delhi.
- Leikin, R & Zaslavsky, O. (1999). Cooperative learning in mathematics, *The mathematics teacher*, 92(3), 240-246.
- Liebeck, P. (1984). *How children learn mathematics* London: Penguin Books.
- National Policy on Education (1986) Ministry of Human Resource Development, Dept. of Education, Government of India, New Delhi
- Public report on Basic Education in India (PROBE) (1999). Oxford University Press, New Delhi.
- Sharan, S. (1980). Cooperative learning in small groups: Recent methods and effects on achievement, attitudes and ethnic relations: *Review of Educational Research*, 50(2), 241-271.
- Slavin, R.E (1980). Cooperative Learning. *Review of Educational Research*, 50 (2), 315-342.
- Slavin, R.E (1991). *Student team learning: A practical guide to cooperative learning*, Washington, Dc: National Educational Association.
- Snyder, C-R & Lopez, S.J., (2007) *Positive Psychology*, New Delhi, Sage Publications.
- State Curriculum Framework, Andhra Pradesh (2011). State Council of Educational Research and Training, Hyderabad.
- Venkateshwar Rao, D. (2012). Towards performance of quality mathematics, Ph.D thesis, unpublished, Osmania University.