International Journal of Mathematics Trends and Technology
ISSN: 2231 – 5373 / https://doi.org/10.14445/22315373/IJMTT-V68I2P512
Volume 68 Issue 2, 75-79, February 2022

Original Article

Increasing Student Learning in Mathematics with the Use of Collaborative Teaching Strategies

N. Swaminathan, S. Selvi, D. Janete Franchana, S. Annapoorani

[1]*Principal, ONGC Public School, Neravy Salai, Neravy, Karaikal, UT of Puducherry.*
[2,4]*TGT Maths, ONGC Public School, Neravy Salai, Neravy, Karaikal, UT of Puducherry.*
[3]*PGT Maths, ONGC Public School, Neravy Salai, Neravy, Karaikal, UT of Puducherry.*

Abstract *- Mathematics is called the queen of Science and it is very essential for an individual especially in the school system irrespective of the level of education that the students are in. Hence, there is an urgent need to examine and evaluate the increasing student learning and how the collaborative teaching strategies would be helpful in inculcating interest among the students. We have used three important process which are very important in learning mathematics in understanding and solving mathematical problems. They are (i) Visualize the problem (ii) Approach to be followed for the problem (iii) Review the problem and (iv)Solve the problem. We have administered a qualitative questionnaire to the students studying in class 10 of our school and the data collected were thoroughly analysed using statistical method. The finds of the student recommends that group learning, positive reinforcement and personal attention towards slow learners has helped to increase their willingness to learn mathematics in an easy and understandable way.*

Keywords - *Mathematics, Group learning, Positivity, Reinforcement, Careful reading.*

I. INTRODUCTION

The twain that lore of numbers and of letters give Are eyes,
The wise declare, to all on earth that live. – Sage Thiruvalluvar

Mathematics assumed importance even during the time of Thiruvalluvar (before 2000 AD) who stated that Letter, Number, Art and Science of living kind both are the eyes. Life without mathematics is not full. Sakuntala Devi, Indian writer and mental calculator quoted "Without mathematics, there is nothing you can do. Everything around you is mathematics. Everything around you is numbers. Mathematics is considered as the Queen of Science and it very essential for human being to run their life without any hassle. In the modern era, technology plays a vital role in education and more so mathematics is. Mathematics is not limited to school and college learning but the knowledge and usage of mathematics is enduring throughout the full life time. Importance of mathematics is instilled among the school going children from 1st standard onwards and continued till 12th standard where besides adding, subtraction, multiplication and division, students learn about trigonometry, algebra, statistics etc. It is a known factor that India has contributed much to mathematics by inventing the number Zero which enabled the mathematicians to calculate everything with wholeness. Mathematics helps children to think logically, critically and arrive at a solution to the problem in hand.

II. MATHEMATICS LEARNING IN SCHOOL

Mathematics is one of the important subjects in which student learn about, numbers, shapes, data, measurements and arrive at a solution logically. It plays a vital role in every field of learning such as Medicine, Engineering, Architecture, Finance and Economics besides natural science etc. In fact, every human being is surrounded by Mathematics in all eight directions. What every the concept, theorems, formulas which they learn in school have to be applied in day to day life situations to get solutions to the problems occurred in and out. Hence, it is very essential to learn mathematics, understand its applications and significance. As per the New Educational Policy due importance has been given to numerical ability from class 1 onwards and it goes up to 12th standard. Many of the mathematical teachers are of the opinion that whenever we teach maths to children, their expression towards understanding of the concept, formulae through their face shows their understanding is clear. But when we ask them to solve the problem on the board they find it difficult to go beyond certain steps. This clearly shows logical application of the minds of students is lacking. In our school we observed the same kind of understanding among the students.

Hence, mathematical teachers have decided to go for personal teaching for slow learners, group learning and peer learning. Outcome of the studies are discussed in this article.

III. EASY STEPS TO LEARN MATHEMATICS

There is no single approach to solve problems in the field of mathematics as there are multiple approaches can be applied to arrive at a conclusion. Even the toughest mathematical problem can be solved if we follow the step by step approach to get to know the route of getting solution to the tough math problem. There are four-step process could help the children to improve their math skills. 1. Visualize the problem 2. Approach to be followed for that problem, 3. Review the problem and 3.Solve the problem. The following four steps to help solve any mathematical problems very easily. Figure 1 depicts the process involved in approaching towards the mathematical problem at the any level of education.

Fig. 1 Illustrating the four easy steps to learn mathematics

A. Read Carfully

The mathematical problem at hand has to be read carefully in order to understand the nature of the problem, identify which type and which formula can be applied, and move forward to get the solution. It is very important to find out whether the problem is word problem, fractions, multiplications or divisions, quadratic equations and any other type.

B. Review the Problem

Once you understand the problem, review it more than twice and move forward to solve it. Drawing can be done using the form of shapes, or shapes with numbers, graph sheets etc. Once the entire process of understanding, reading and drawing is conducted, then you need the review the data on hand and analysis the data properly and come out with solution made out of it.

C. Develop a Plan

After clear understanding of the problem with concepts, which type of formula can be applied to solve it using the text books? The steps involved in solving the problem has to be written properly and in consecution and organize the steps. Easy problem can be solved quickly with the application of formula you identified and for difficult problem you need to put in more time to ensure clear understanding of the problem to get an estimated answer for that..

D. Solve the Problem

Once develop a plan to solve the problem using certain strategy and method to solve the problem you could start solving it by ensuring all the steps are followed meticulously, cross check more than once to find out any step is missed for perfect execution of your plan. Compare the arrived answer with your estimated one after finishing each and every step involved in it. This will not only help to save precious time but also will allow checking thoroughly all the steps are carefully checked. You should always have a back-up plan or a plan B to solve the problem and clearly register in your mind that which plan has worked out properly to arrive at a solution and continue to practice it until you master over it.

E. Case Study

In our school we have employed only five simple questions to the children of 10th standard in order to find out whether their understanding of mathematical problem is happening instantaneously at the first time teaching itself, personal attention, collaborative project, group learning and positive reinforcement etc. We have administered a qualitative questionnaire and responses received from the students are given below in the table 1 and depicted in the figure 1.

Table 1.

Class 10 **No. of Respondent 120**

S.No.	Question	YES	% Age
1	Do you understand mathematics instantly or at the first time explanation itself?	28	23
2	Do you understand mathematics only when personal attention given?	16	13
3	Do you understand mathematics through group learning?	24	20
4	Do you understand mathematics through peer learning?	20	17
5	Do you understand mathematics through reinforcement?	32	27
	TOTAL	120	100

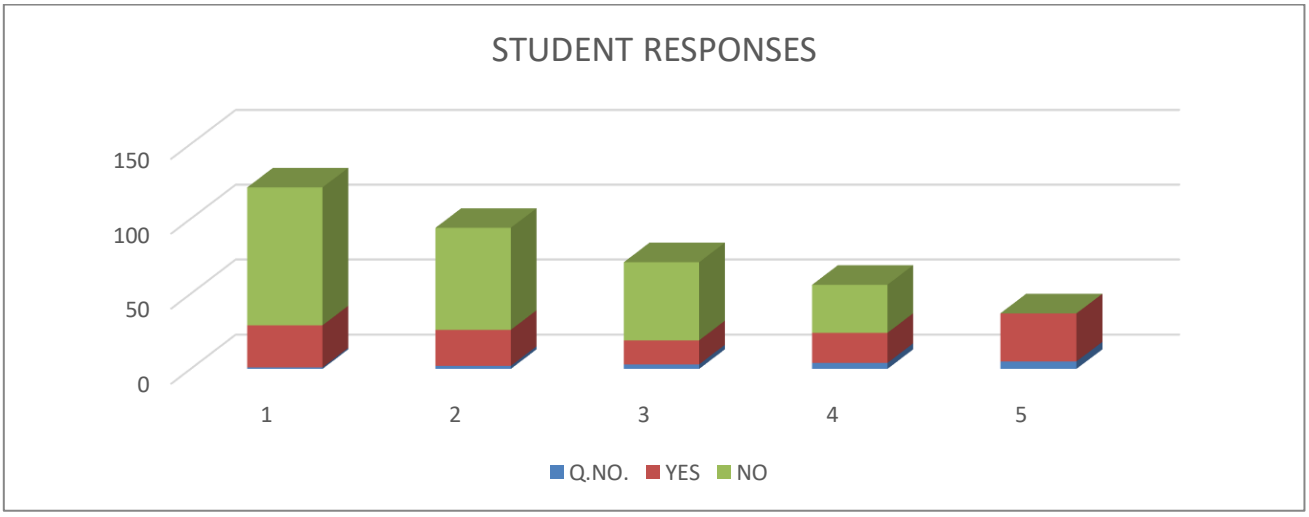

Fig. 1 Graph depicting the student's responses for the questionnaire

After analysing the data given above our mathematics teachers have decided to validate how the group learning, positive reinforcement has on the students. As far as slow learners are concerned personal attention is the only method through which imparting of maths be given.

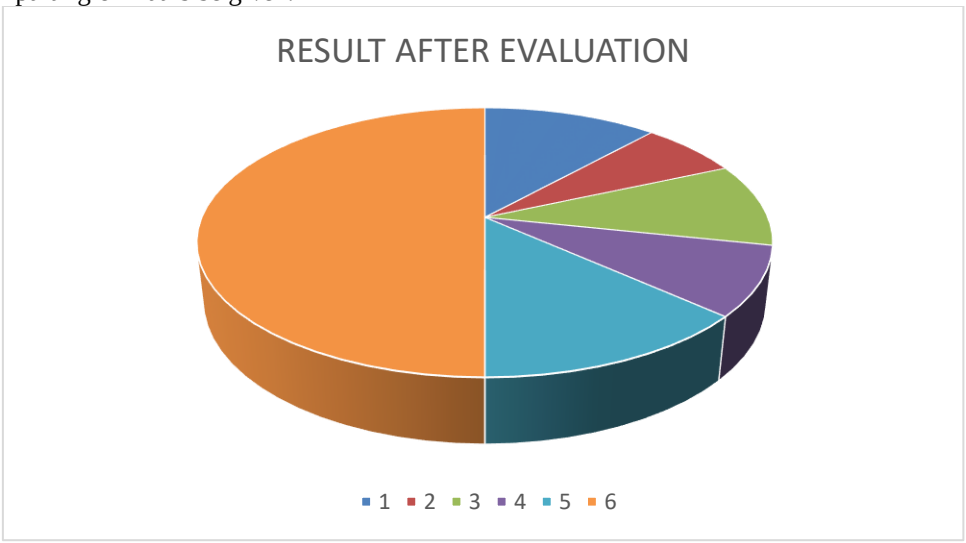

Fig. 2 Graph depicting the student's responses after evaluation of the questionnaire

F. Group Learning

According the author of The Power of Groupthink, Lee grouping students in the mathematics setting is very substantial and effective when people pull together their knowledge, they can out-perform the brightest of individuals and this study was conducted among 120 students of ONGC Public School, Karaikal. According to Theodore Panitz, the author of Using Cooperative Learning in Mathematics Classroom not only benefits students and their learning but also the teachers. Working together with those around me in a group was of great help in understanding the material and many different ways in which a problem can be cracked and solved. Grouping students motivates them and their critical thinking skills are enhanced, as well, students becoming more familiar with their peers while still enjoying mathematics. This can be corroborated in our study initially 24 students have said we can understand the mathematical concepts after group study but after giving a year of group study for those students 44 students scored good marks (meaning both group study and peer study put together) have benefited a lot.

G. Positive Reinforcement

Positive reinforcement is an extremely powerful tool for shaping the behaviour of students. By giving reward and encouragement the students can exhibit their innate talent in a better way. There have been many studies shown the benefits of giving positive reinforcements resulted increase of student learning especially mathematics. The remaining 32 (27%) of students have done better mathematics after encouragement, awards, stars given through positive encouragement.

IV. CONCLUSION

It is true that mathematician will always say that maths easier than you think but for slow learners, learners who needs some positivity promotion and reinforcements besides group study maths is difficult. We found that when students are encouraged and made them to believe in themselves has resulted in higher scoring in mathematics in our school. Hence, we would like to state that group learning, positivity and reinforcement plays an important role in increasing the interest among the students in learning mathematics for the benefit of their life.

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QUESTIONNAIRE

CLASS 10 NO. OF RESPONDENT 120

1.	Do you understand mathematics instantly or at the first time explanation itself?	YES / NO
2.	Do you understand mathematics only when personal attention given?	YES / NO
3.	Do you understand mathematics through group learning?	YES / NO
4.	Do you understand mathematics through peer learning?	YES / NO
5.	Do you understand mathematics through reinforcement?	YES / NO