



MULTI-SENSORY TEACHING STRATEGIES IN ENHANCING PROBLEM SOLVING ABILITIES OF HIGHER SECONDARY STUDENTS IN MATHEMATICS

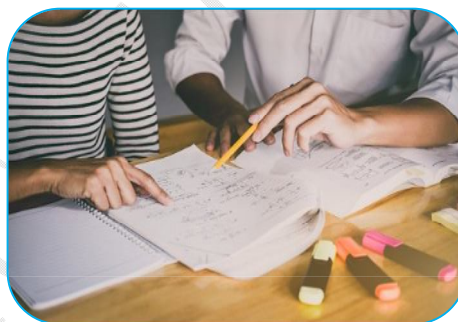
N. Rajkumar¹ and Dr. K. Nachimuthu²

¹ Ph.D scholar, Department of Education, Periyar University, Periyar Palkalai Nagar, Salem.

² Professor and Head, Department of Education, Periyar University, Periyar Palkalai Nagar, Salem.

ABSTRACT:

The main objectives of the study is to find out whether the package use to enhancing problem solving ability in mathematics among higher secondary students is effective. The investigator adopted the Quasi-Experiment method has gathered information to measure a multi-sensory teaching strategies in enhancing problem solving abilities of higher secondary students in mathematics. The investigator used simple random sampling technique for selecting the sample from the population. The sample consists of 58 secondary students studying in secondary level in Salem District, Tamil Nadu. The researcher has constructed and standardized the following research tool (problem solving ability questionnaire) to collect data from the sample. The statistical used descriptive analysis, differential analysis. The major findings of the study reveals that there was a significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through multi-sensory teaching strategies for control group and experimental group. The findings of the study concluded that multi-sensory teaching strategies definitely enhance problem solving ability in mathematics among higher secondary students.



KEYWORDS: multi-sensory teaching strategies, problem solving abilities, Mathematics, higher secondary students.

INTRODUCTION

Mathematics is a form of reasoning. Thinking mathematically consists of thinking in a logical manner, formulating and testing conjectures, making sense of things, and forming and justifying judgments, inferences, and conclusions. We demonstrate mathematical behaviour when we recognize and describe patterns, construct

physical and conceptual models of phenomena, create symbol systems to help us represent, manipulate, and reflect on ideas, and invent procedures to solve problems (Battista, 1999). Mathematical problem-solving competence is defined as the capacity to the ability to solve real-world problems and to transfer problem-solving strategies through metacognition and technology

and also ability to solve problems by applying cognitive skills such as reasoning and logical thinking (Rajkumar and Hema, 2019). Through this approach, teachers can present information in multiple ways and engage all students in the learning process. Because multi-sensory teaching allows teachers to present information to students using a number of different means of sensory input, this method

adheres to the universal design of learning (UDL) (Metcalf, Evans, Flynn, and Williams, 2009) by providing a flexible learning environment that accommodates students' differences with regard to the ways in which they learn (Rajkumar and Nachimuthu, 2017; 2018).

NEED AND SIGNIFICANCE OF THE STUDY

Mathematics is regarded as the mother of all sciences. Mathematics is the only subject to encourage and develops logical thinking and problem solving ability in the world. If our students are to function effectively in this digital era of rapid technological advancement and globalisation, they must be mathematically literate. Therefore, in teaching mathematics it is necessary to combine the picture method and the definition method in order to improve the existing knowledge and to enlarge it with the new facts, which is one of the points of the cognitive theory of multimedia learning (Mayer, 2001, 2005).

Hence, the researcher felt a need of finding out the effect of multisensory strategy in learning Mathematical Concepts. Multisensory Strategies was selected to make learning active, interesting, creativity, understanding knowledge and concrete and above all activity centred. Mathematical knowledge is very essential for training rational, trustworthy and useful citizens in a democratic society. It is necessary that each student should learn mathematics.

REVIEW OF RELATED STUDIES

Nurdiana Siregar (2017) The objective of this study were to determine the increasing of students' problem solving ability and self confidence after the implementation of problem based learning and to see the interaction between gender and learning to increase problem solving ability and students' self confidence. The method kuantitatif with the design of this research was quasi-experimental with factorial design is 2×2 . There were 73 students as the sample of this study containing 36 students in grade VIII-5 and 37 students in grade VIII-6. The instruments of this student were test of problem solving and self confidence scale. The data were analyzed by applying two way analysis of variance (ANOVA). The result showed that the increasing of students' problem solving ability taught by using problem based learning was higher than that taught by using conventional learning there was no interaction between gender and learning with increasing of students' problem solving ability.

Robert L. Durham., Jenny R. Rains., and Catherine A. Kelly., (2008) In recent years, partially because of federal legislation, there have been increases in demand for accountability in all educational venues. Performance in elementary mathematics is no exception. In this paper we review the relevant parts of the learning theories of Piaget, Bruner, and Vygotsky and address the difficulties teachers may face when introducing mathematical concepts. The review of theories, along with a review of previously published empirical studies, supports the use of multi-sensory teaching techniques in the elementary, specifically kindergarten through third grade, classrooms. Since students (both regular and special needs) develop and learn at different rates, it is unlikely that all will be developmentally prepared to assimilate new mathematical concepts at the same time. Multi-sensory techniques allow many students, by assimilation, to grasp elusive concepts and keep up with their peers.

STATEMENT OF THE PROBLEM

Educational technology is the application of the teachers and headmasters of mathematics and to make the educational process more effective and creativity of increase for their problem solving ability. Today teachers will need to prepare with planning and preparation of an electronic instructional material and use of devices and materials that involve sight, sound both for tomorrow's classrooms to use multisensory approach to a text, audio, visual and Kinesthetic learning of mathematical education. The proposed study entitled as '**Multi-sensory Teaching Strategies in Enhancing Problem Solving Abilities of Higher Secondary Students in Mathematics**'.

OBJECTIVES OF THE STUDY

- To find out the significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies between control group.
- To find out the significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies between experimental group.
- To find out the significant differences in the post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies between control and experimental group.
- To find whether the package use to enhancing problem solving ability in mathematics among higher secondary students is effective.

HYPOTHESES OF THE STUDY

- There may be significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies between control group.
- There may be significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies between experimental group.
- There may be significant differences in the post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies between control and experimental group.
- The package used to enhancing problem solving ability in mathematics among higher secondary students may be effective.

METHODOLOGY OF THE STUDY

The advantage of Quasi-Experiment method is that it becomes possible to study on the problem thoroughly and deeply in all aspects. Therefore the investigator adopted the Quasi-Experiment method has gathered information to measure a multi-sensory teaching strategies in enhancing problem solving abilities of higher secondary students in mathematics. The investigator used simple random sampling technique for selecting the sample from the population. The sample consists of 58 secondary students studying in secondary level in Salem District, Tamil Nadu. The researcher has constructed and standardized the following research tool (problem solving ability questionnaire) to collect data from the sample. The data was tabulated then the data was analyzed statistically using descriptive analysis, differential analysis.

TESTING OF HYPOTHESES:

Hypothesis: 1

There may be significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies for control group.

Table No: 1

Significance of Difference of control group pre and post-test of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies

Control	N	Mean	Std. Deviation	r value	t value	P value
Pre Test	24	6.79	1.587	0.852	69.056	0.01
Post Test	24	23.38	2.183			

S – Significant at 5% level

Inference:

Form the table 2, it is showed that the mean and standard Deviation values of Pre-test scores in the control group are 23.51 and 2.216 and Post-test scores in the control group are 27.13 and 1.981. The obtained p value 0.01 is lesser than the table value at 0.05 level of significance. So, the hypothesis is rejected. Hence, there is significant difference in the pre and post test scores of control group.

Hypothesis: 2

There may be significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies for experimental group.

Table No: 2
Significance of Difference of experimental group Pre and post-test of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies

Experiment	N	Mean	Std. Deviation	r value	t value	P value
Pre Test	24	6.79	1.560	0.859	95.917	0.01
Post Test	24	26.79	1.978			

S – Significant at 5% level

Inference:

Form the table 2, it is showed that the mean and standard Deviation values of Post-test scores in the experimental group are 6.79 and 1.560 and Post-test scores in the experimental group are 26.79 and 1.978. The obtained p value 0.01 is lesser than the table value at 0.05 level of significance. So, the hypothesis is rejected. Hence, there is significant difference in the pre and post test scores of experimental group.

Hypothesis: 3

There may be significant differences in the post test scores of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies for control and experimental group.

Table No: 3
Significance of Difference of control group and experimental group post-test of problem solving ability in mathematics among higher secondary students through administration of multi-sensory teaching strategies

Post Test	N	Mean	Std. Deviation	r value	t value	P value
Control	53	23.38	2.183	0.230	6.472	0.01
Experiment	53	26.79	1.978			

S – Significant at 5% level

Inference:

Form the table 2, it is showed that the mean and standard Deviation values of Post-test scores in the control group are 23.51 and 2.216 and experimental group are 26.79 and 1.978. The obtained p value 0.01 is lesser than the table value at 0.05 level of significance. So, the hypothesis is rejected. Hence, there is significant difference between control group and experimental group of post-test.

CONCLUSION

The major findings of the study reveals that there was a significant differences in the pre and post test scores of problem solving ability in mathematics among higher secondary students through multi-sensory teaching strategies for control group and experimental group. The findings of the study concluded that multi-sensory teaching strategies definitely enhance problem solving ability in mathematics among higher secondary students. Finally, a nationwide research could take place in the future in order to study the correspondence of a larger sample of students in various disciplines with the use of ICT in mainstream higher secondary education. In this research, it was examined with the participant observation a teenage student enrolled in the mainstream higher secondary education so as to verify whether the use of multi-sensory approach using ICT helped him correspond to the objectives of the school curriculum of Mathematics and to socialize.

REFERENCES

- Battista, M (1999). "The Mathematical Miseducation of America's Youth" Phi Delta Kappan, 80 (6).
- Martin, N., Gaffan, E. A., & Williams, T. (1998). Behavioural effects of long-term multi-sensory stimulation. *British Journal of Clinical psychology*, 31, 69-82.
- Mayer, R. (2001). *Multimedia Learning*, New York: Cambridge University Press, United States of America.
- Mayer, R. (2005). *The Cambridge handbook of Multimedia Learning*, New York: Cambridge University Press, United States of America.
- Nurdiana Siregar (2017) Problem Solving Ability Of Students Mathematics In Problem Based Learning. *Journal of Educational Science and Technology*, 3 (3), 185- 189.
- Rajkumar, N. & Nachimuthu, K. (2018). Effect of Multi-Sensory Strategies and Its Implication on Mathematics Learning Ability. *Online International Interdisciplinary Research Journal*, 8(1), 66-71.
- Rajkumar, N., & Nachimuthu, K. (2017). Analysis on Problem Solving ability of Undergraduate Students. *International Journal of Academics Research and Development*, 3(2), 286-288.
- Rajkumar, R., & Hema, G. (2019). Factors affecting mathematical problem solving competence of undergraduate students in facing competitive examinations. *IMPACT: International Journal of Research in Humanities, Arts and Literature (IMPCT: IJRHL)*, 7(2), 319-328.
- Robert L. Durham., Jenny R. Rains., and Catherine A. Kelly., (2008) The Evolution of the Importance of Multi-Sensory Teaching Techniques in Elementary Mathematics: Theory and Practice. *Journal of Theory and Practice in Education*, 4(2), 239-252.



N. Rajkumar

Ph.D scholar, Department of Education, Periyar University, Periyar Palkalai Nagar, Salem.



Dr. K. Nachimuthu

Professor and Head, Department of Education, Periyar University, Periyar Palkalai Nagar, Salem.