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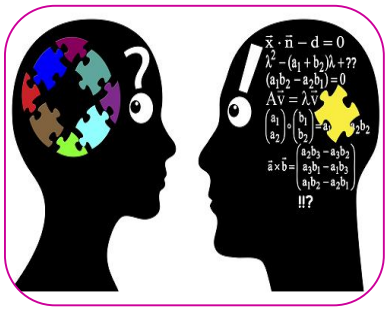
EFFECT OF METACOGNITIVE STRATEGIES ON LEARNING IN MATHEMATICS



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ABSTRACT:

The most distinctive feature of modern society is its science based technology which has been making a professional impact on teaching learning process. So there is need to be realized to explore new strategies to improve the learning of mathematics. So the present study aims to find out the effect of metacognitive strategies on learning in mathematics. The research was carried out on a sample of 120 IX standard students of district Sangrur in Punjab. The data was analysised with the of t-test and analysis of variance. The results revealed that there is a significant positive effect of metacognitive strategies on learning of mathematics.

KEY WORDS: *Metacognition, Metacognitive Strategies and Learning in Mathematics.*

INTRODUCTION

The term Metacognition has been used to describe our knowledge how we perceive, remember, thinks and that is what we know. Metacognition refers to higher order of thinking that involves an active control over the thinking processes involved in learning. Activities such as planning, how to approach a given learning task, monitoring comprehension and evaluating progress towards the completion of a task are metacognitive in nature. Metacognition effects acquisition, comprehension, retention and application of what is learned, in addition to affecting learning efficiency, critical thinking and problem solving. It is also believed that metacognition awareness enables to control or self regulation over thinking and learning processes. People whose metacognitive strategies are well developed are better problem solvers, decision makers and critical thinkers and more likely to be able to regulate their emotions even in difficult situations, handle complexity and cope up with conflicts. It is important for even the most advanced learners to "flex their cognitive muscles" by consciously applying appropriate metacognitive strategies to new knowledge and in new situations.

J.H. Flavell first used the word "Metacognition" in 1976. He described, "Metacognition refers to one's knowledge concerning one's own cognitive processes and products or anything related to them, and refers, among other things, to the active monitoring and consequent regulation and orchestration of these processes, usually in the service of some concrete goal or objectives" e.g. the learning relevant properties of information or data.

More specifically Taylor (1999)**:** defined Metacognition as "an appreciation of what one already knows, together with a correct apprehension of the learning task and what knowledge and skills it requires, combined with the ability to make correct inferences about how to apply one's strategic knowledge to a particular situation and to do so efficiently and reliably."

"A metacognitive strategy is a systematic cognitive technique to assist students in recognizing, planning, implementing and monitoring solutions to problems" (Smith Steven W, 1992). The basic metacognitive strategies are:-

- Connecting new information to former knowledge
- Selecting thinking strategies deliberately.
- Planning, monitoring and evaluating thinking processes. (Dirkes, 1985)

Mathematics in the real sense is a science of space and quantity and helps us in solving the problems of life needing numeration and calculations. It provides opportunity for the intellectual gymnastic of the man's inherent powers. It is in this sense that Courrent and Robbins defined mathematics as follows:

"Mathematics as an expression of the human mind reflects the active will, the contemplative reason and the desire for aesthetic perfection, its basic elements are logic and intuition, analysis and construction, generality and individuality."

Bacon has rightly said, "Mathematics is the gate and key of all sciences

As the already discussed above that mathematics involves high cognition powers of man and metacognition is defined as "cognition about cognition" and "knowing about knowing" or "thinking about thinking". It is appreciation of what one already knows, together with a correct comprehension of the learning task.

So metacognitive strategies are important for learning mathematics at least for two reasons.

- Awareness of one's own thought, which is important for developing an understanding of ideas, concepts and problems.
- Awareness and control of thinking which have a significant impact on problem solving ability.

Now a day, majority of the children enrolled into school but are forced to drop out because they are unable to cope up with the demands of school and find studies "uninteresting" or "difficult". The way of teaching is designed by their text books and teachers alienates them, not allowing them to use their rich experiences as well as their metacognitive strategies and they are soon made to believe that they have no brains, according to the national curriculum framework 2005, vision for school mathematics is :-Children learn to enjoy mathematics rather than fear it.Children see mathematics as something to talk about, to communicate, to discuss among themselves to work together on.

Socio–cultural dimensions of mathematics knowledge have greatly influenced research in the field of mathematics education in the past few decades resulting in the rise of different areas of research that include use of same metacognitive strategies in everyday mathematics (Shobha, 2002).

STATEMENT OF THE PROBLEM

EFFECT OF METACOGNITIVE STRATEGIES ON LEARNING IN MATHEMATICS.

OBJECTIVES OF THE STUDY

The present study will be undertaken with the following objectives in view:

- To study the metacognition level of secondary school students.
- To find out the effect of metacognitive strategies on learning in mathematics.

HYPOTHESES OF THE STUDY

There will be exist no significant effect of metacognitive strategies on learning in mathematics of secondary school students.

METHODOLOGY

In the purposed study IX class students from one school of Sangrur District, selected for the study. For the selection of the sample, the purposive sampling technique was used. In all 120 students of class IX was selected for study. Two groups were matched on the basis of concept understanding in mathematics and metacoginition level. Then the students were randomly assigned into the groups: viz; experimental group and control group. Criterion Achievement pre testpost test prepared for experiment and to know the effect of metacognitive strategies on learning in mathematics.

DESIGN OF THE STUDY

The purposed study is experimental in nature. The Quasi- Experimental Design Non Randomised Control Group Pre-test-Post-test design was employed because this design provide as much control as possible. There were two groups: experimental group and control group. Experimental group will be exposed to Metacognitive and Control group will be exposed to Traditional Method. Student a were matched the basis of metacognitive level and scores of pre test.

SAMPLE OF THE STUDY

In order to collect data, a sample of 120 students belonging to IX grade of Sangrur district were involved from one of the school of district Sangrur in Punjab.The sample was divided into two groups , the students were randomly assigned to experimental group and control group.Each group consists of 30 male students and 30 female students.

TOOLS EMPLOYED

- Metacognitive Inventory prepared by PunitaGovil (2003).
- Self made Six Modules of mathematics for experiment (two modules of Algebra, two modules of geometry and two modules of areas and volumes of solid shapes).
- Criterion achievement pre test and post test in Mathematics developed by the investigator to measure the learning of Secondary School Students in Mathematics before and after treatment.

STATISTICAL ANALYSIS

- The following statistical techniques were used to analysis the data.
- Descriptive statistical mean, median, mode and standard deviation will be employed to study the nature of distribution of the sample.
- Inferential statistics i.e. t-test, ANOVA, product moment co-relational technique were employed to test the hypothesis.

RESULTS AND DISCUSSION

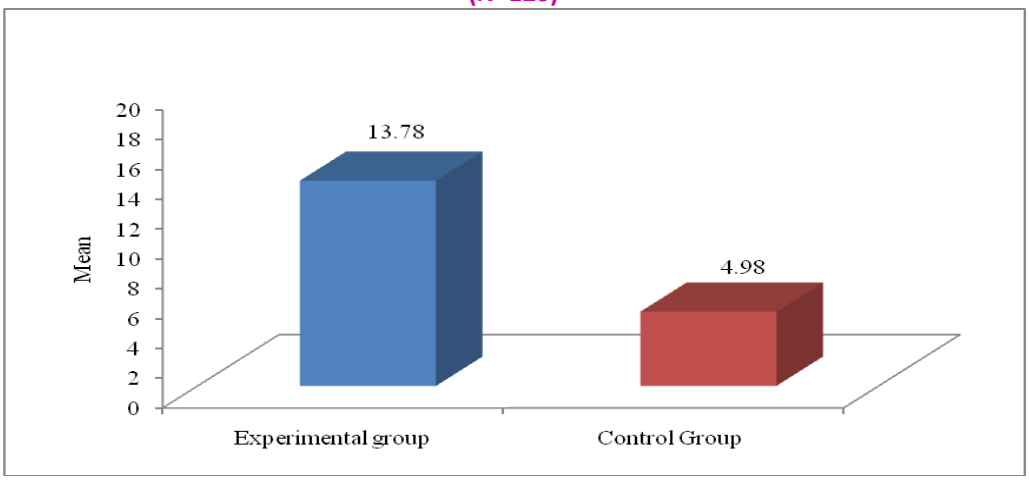
For testing the significance of difference in learning in mathematics of the groups treated with metacognitive strategies and treated without metacognitive strategies t-test was employed on gain scores (=Post-test scores – Pre-test scores) of the groups.

Table 1 :- Significance of difference in Mean Gain Scores of learning in mathematics of the secondary school students provided with Metacognitive strategies and secondary school students not provided with Metacognitive strategies (N=120)

Groups	Variable	N	Mean	S.D.	SE_M	t-ratio	Sig/Not sig.
Experimental group	Learning in Mathematics	60	13.78	7.27	0.94	7.20	Sig. at .01 level
Control Group		60	4.98	6.07	0.78		

Table 1 reveals a significant difference was found between the group of secondary school students treated with and treated without metacognitive strategies in learning in mathematics, therefore **Ho** stating 'There will be no significant difference in the learning in mathematics of secondary school students belonging to experimental and control group after use of metacognitive strategies' stands rejected.

Fig. Mean Gain Scores of Learning in mathematics of the secondary school students provided with Metacognitive strategies and secondary school students not provided with Metacognitive Strategies (N=120)



DISCUSSION OF RESULTS

As the mean gain score of the group of secondary school students treated with metacognitive strategies was found to be significantly higher than that of the group treated without metacognitive strategies, it was also concluded that the learning in mathematics of the secondary school students treated with metacognitive strategies is enhanced significantly than the group of secondary school students treated without metacognitive strategies. Thus the metacognitive strategies contribute significantly in learning in mathematics of secondary school students. The findings were supported by many studies Jayapraba (2013), Priya (2012), Sekar and Annaaraja (2013), Gupta (2017), SeemaGopinath (2014).

The investigator could not find any study showing negative effect of metacognitive strategies on leaning in mathematics and other academic achievement. As, such a result is neither expected or desired.

CONCLUSION

After the analysis of data it is found that metacognitive strategies effects the achievement and learning in mathematics of secondary school students significantly. So by using metacognitive strategies and techniques we can improve the learning of secondary school students in mathematics. Teaching learning process in mathematics can be more innovative and effective by the use of metacognitive strategies.

EDUCATIONAL IMPLICATIONS OF THE STUDY

- Workshops and seminars can be arranged by the government from time to time to motivate the teachers for using innovative techniques based on metacognitive strategies in mathematics.
- Curriculum of mathematics should be based on metacognitive strategies.
- Students should be motivated to use their metacognition in solving the problems of mathematics.
- Metacognitive strategies must be used in teaching and learning of academic subjects other subjects also.
- Metacognitive skills and experiences should be utilised to solve problems faced by our learners in their daily life also.

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