Research Article

Metacognition for Learners' Accomplishment

Dr. Annie Kavitha l

Assistant Professor in Mathematics

Meston College of Education, Chennai

ABSTRACT

The foremost objective of the study is to fathom the role of Metacognition for enhancing Mathematics Achievement. The sample consisted of 977 students who are studying XI standard in Villupuram District, Tamil Nadu The system of the study is descriptive in approach, synchronic in nature. It is a cross sectional study, survey type in application, applied systematic random sampling technique to collect the data. Tools used were Metacognitive Inventory constructed and standardized by the investigator and Mathematics Achievement measured by the Mathematics mark obtained by the sample in the State Board Public Examination. The findings revealed that the Metacognition plays a chief role for enhancing Mathematics Achievement of the students.

Keywords: Metacognition, learning achievement, self-regulated learning, cognitive strategies, academic performance

INTRODUCTION

Mathematics is one of the subjects needed to learn at schooling in order to fulfill skillful students. It is important for them to pursue higher education, reaching their dreams, using it into daily life, and facing multi challenges of life both simple and complex one. Students have to learn in order to become a better thinker. Lawson (1974) stressed that schooling system is not meant to teach facts and concepts of knowledge domain only, but it's more important to help students in gaining thinking skills. A classroom is a miniature society wherein there are various categories of students. These students differ from one another in a variety of ways, some of which are utmost importance as far as teaching and learning which decide his achievement. Mathematical learning should be designed to grow cognitive skill and to improve ability and develop students' inner potencies. Renner and Philips (Trifone, 1987) believed that

students should be given opportunities to develop their thinking ability as a basis for developing intellectuality.

SCOPE OF THE STUDY

Mathematics plays a key role in shaping how individuals deal with various spheres of private, social and civil life. The need for mathematics in everyday life and in the workplace has never been greater and will continue to increase (NCTM, 2000). The new workforce should have problem solving skills, such as absorbing new ideas, adopting to change, coping with ambiguity, and perceiving patterns. For a country to be a leader in the high-tech global economy, it needs to invest in the education of well-trained mathematicians (National Commission on Excellence in Education, 1983).

New applications and theories have given emphasis to instructional methods that play an important role in developing the learning of mathematics. Documents such as those produced by the National Council of Teachers of Mathematics (NCTM, 1989, 1991 & 1995) and the National Research Council (NRC, 1989) suggest that the traditional mathematics instruction has been challenged by the changing expectations of the skills and knowledge of workers, and therefore, mathematics instruction should shift from concentrating on the products to the learning processes that comprise learning strategies, planning, monitoring, evaluation and reasoning. In other words effective mathematics instruction gives special attention to teach students how to learn and how to reason and evaluate their learning and solution processes.

It is therefore, important for the parents and the teachers to understand the nature of the students' mind and its functioning in different styles of learning and thinking. Research has demonstrated that students are capable of mastering new skills if they are taught through instructional methods that complement their hemispheric preference. Because of metacognition, as students become more skilled, they gain confidence and become more independent as learners. Independence leads to ownership as students realize they can pursue their own intellectual needs and discover a world of information at their fingertips. Metacognition has been linked to a wide variety of positive academic outcomes for students, such as better grades and performance on tests of intelligence. Designing metacognitive activities that focus on both cognitive and social development is a theoretical and practical

challenge. The balanced approach to metacognition concerns itself with many aspects of student development, ranging from academic competence to knowledge about the 'self' as learner.

It is hoped that findings of the this study will contribute to further understanding of the role of metacognition for improving level of achievement in mathematics. Moreover this will help educators for an effective and efficient pedagogical strategy or model for improving learning mathematics with understanding.

OPERATIONAL DEFINITION OF THE TERMS

Metacognition

The term metacognition refers to the act of thinking about thinking, or the cognition of cognition. It is the ability to control our own thoughts. Although it is a complex construct, indeed it is the knowledge and regulation of cognitive phenomena which means, control of our own thoughts. Metacognition includes the ability to control, 1) person variables (knowledge about one's self, and others' thinking), 2) task variables (knowledge that different types of tasks exert different types of cognitive demands), and; 3) strategy variables (knowledge about cognitive and metacognitive strategies for enhancing learning and performance).

Mathematics Achievement

Achievement in Mathematics means the knowledge, understanding and the skills in mathematics which a learner acquires by undergoing a prescribed course over a period of time in school and has been assessed through Examination.

OBJECTIVES OF THE STUDY

- To explore the influence of Metacognition on Level of Achievement in Mathematics.
- To study the level of Achievement in Mathematics with respect to Dimensions of Metacognition

HYPOTHESES

- There is no significant association between level of Mathematics Achievement and Level of Metacognition
- There is no significant difference between level of Mathematics Achievement with respect to Dimensions of Metacognition

DESIGN OF THE STUDY

Research design is a catalogue of the various phase facts relating to the formulation of research effort. The system of the study is descriptive in approach, synchronic in nature. It is a cross sectional study, survey type in application, applied systematic random sampling technique to collect data from the field.

TOOLS USED FOR THE STUDY

- **Metacognitive Inventory** constructed and standardized by the investigator
- **Mathematics Achievement** was measured by the mathematics mark obtained by the sample in the State Board Public Examination for the year 2011-12.

ANALYSIS OF THE DATA

There is no significant association between level of Achievement in Mathematics and level of Metacognition

Table: 1 Association between Level of Achievement in Mathematics and Level of Metacognition

Level of Metacognition	Level of Achievement in Mathematics			Total	Chi'-square value	P value
	Low	Moderate	High			
	89	114	54			
Low	(34.6)	(44.4)	(21.0)	257		
	[33.6]	[24.4]	[22.1]			
	128	221	122			
Moderate	(27.2)	(46.9)	(25.9)	471	15.661	0.004**
	[48.3]	[47.2]	[SO.OJ			
	48	133	68			
High	(19.3)	(53.4)	(27.3)	249		
	[18.1]	[28.4]	[27.9]			
Total	**265**	**468**	**244**	**977**		

Note: 1. The value within ( ) refers to Row Percentage

2. The value within [ ] refers to Column Percentage

3. ** denotes significance at 1% level

Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance. So there is significant association between level of Metacognition and level of Achievement in Mathematics. Hence based on row percentage, students who have scored High level of Achievement in Mathematics are influenced by High level of Metacognition.

2. There is.no significant difference between level of Achievement in Mathematics with respect to Dimensions of Metacognition

Table: 2 Difference between Level of Achievement in Mathematics with respect to Dimensions of Metacognition

Dimensions of Metacognition	Level of Achievement in Mathematics	Mean	SD	F value	P value
Planning	Low	33.70"	3.76	4.194	0.015*
	Moderate	34.49b	3.82		
	High	34.49b	3.74		
Logical Thinking	Low	32.58ab	4.26	3.840	0.022*
	Moderate	33.1lb	4.14		
	High	32.23a	4.24		
Creative Analysis	Low	30.36	5.00	0.837	0.433
	Moderate	30.73	4.83		
	High	30.91	4.96		
Problem Solving	Low	30.29a	5.24	10.504	0.000**
	Moderate	31.54b	4.59		
	High	32.16b	4.44		
Evaluation	Low	32.28a	4.82	4.389	0.013*
	Moderate	33.30b	4.45		
	High	33.1-f	4.69		
Metacognition	Low	159.22a	19.32	4.362	0.013*
	Moderate	163.18b	17.66		
	High	162.96b	18.33		

Note: 1. ** denotes significance at 1% level

2. * denotes significance at 1% level

3. Different alphabet between type of school denotes significant at 5% level of significance

using Duncan Multiple Range test Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance. Hence there is significant difference between level of Achievement in Mathematics with respect to Problem Solving.

Since P value is less than 0.05, the null hypothesis is rejected at 5% level of significance. Hence there is significant difference between level of Achievement in Mathematics with respect to Planning, Logical Thinking, Evaluation and Metacognition. Since P value is greater than 0.05, the null hypothesis is rejected at 5% level of significance. Hence there is significant difference between level of Achievement in Mathematics with respect to Creative Analysis.

Hence it is evident that Planning, Logical Thinking, Problem Solving, Evaluation and Metacognition influence the level of Achievement of the students in Mathematics.

FINDINGS OF THE STUDY

Only 25% of the students have high Metacognition, and the remaining 75% comprises of moderate and low level of Metacognition. It shows that almost two third of the students lagging on Metacognition. The dimensions of Metacognition are Planning, Logical Thinking, Creative Analysis, Problem Solving and Evaluation. The dimensions of Metacognition namely Planning, Logical Thinking, Problem Solving and Evaluation contribute for the enhancement of Mathematics Achievement. Only 25% of the students have high level of Achievement in Mathematics and the remaining 75% comprises of moderate and low level of Achievement in Mathematics. Students who have scored high level of Achievement in Mathematics are influenced by high level of Metacognition. Hence the study dogmatically proved that the Metacognition plays a chief role for enhancing Mathematics Achievement of the students.

LIMITATIONS OF THE STUDY

- The study is confined to Villupuram District of Tamilnadu.
- The study is contemplated only on students who are studying in XI standard of mathematics group only.
- The study is limited to the students who are studying in urban, semi-urban, and rural region.

- The study is limited to the students studying in three types of school namely Government, Aided and Matriculation schools.

CONCLUSION

Mathematics is living subject which seeks to understand patterns that permeate both the word around us and the mind within us. It is therefore, important for the parents and the teachers to understand the nature of the students mind and its functioning in different styles of learning and thinking. They can help students to improve their learning by incorporating metacognitive strategies into classes, and by helping them to become aware of own thinking and monitor their learning strategies. This study has demonstrated that students are capable of mastering new skills if they are taught through instructional methods. As students become more skilled at using metacognitive strategies, they gain confidence and become more independent as learners.

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