

STUDY OF MATHEMATICAL ACHIEVEMENT OF SENIOR SECONDARY SCHOOL STUDENTS IN RELATION TO THEIR METACOGNITION

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Mathematics

Mathematics is a backbone of the students to achieve and developed the skill in reasoning and the thinking level. It has been rightly said that Mathematics sharpens the minds of the people in the same way as some stone sharpens the tools. Mathematics helps in the development of intellectual powers like power of imagination, observation, originality, creativity, systematic thinking and reasoning.

According to Merriam-Webster Dictionary of Education, “Mathematics is the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configuration and their structure, measurement, transformations and generalizations.”

Napoleon once said, “The process and improvement of mathematics are linked with prosperity of state” so to overcome these problems, mathematics should be taught effectively to the students. In today’s high-tech world, it is important that our young children grow to become confident in their ability to do mathematics in and ever increasingly high tech globally competitive society.

Achievement

Achievement is the one of the most important goals of education. Academic and scholastic achievement has become an index of child’s future in this highly competitive world.

Acc. to Good (1959) achievement is the accomplishment or proficiency in a given skill or body of knowledge. Academic achievement is unique responsibility of an educational institution.

Acc. to Hawes and Hawes (1987) Achievement is defined as successful accomplishment on performance in particular subjects, area or course usually by reason of skill, hard work and interest. It is summaries in various types of grades, marks, scores or descriptive commentary.

Mathematical Achievement

Mathematical achievement refers not only to obtaining excellent marks in the greater level final examination but it also refers to the attainment of the mathematical ability and skills. Mathematical ability is the thought as the power of solving with speed and accuracy the difficult and complex problems in terms of objectives of teaching Mathematics which requires knowledge and the application of the mathematical concepts and skills which the students have learnt during the whole period of schooling. By mathematical achievement of an individual we mean the achievement in thinking, writing, reasoning, arithmetic, as constructed with the skill development.

According to Kulkarni, Lal and Naidu (1970) Mathematical achievement refers to the understanding of mathematical concepts, application to knowledge to new situations and logical reasoning as involved in the interpretation of data, identification of missing links, etc. Gronlund (1971) defined Achievement in Mathematics as “a systematic procedure for determining the amount a student has learnt through instruction”.

According to Imam and Khatoon (2012) achievement implies the net result of an individuals’ effort over a period of time. It shows the level of proficiency attained in scholastics or academic work. Achievement is an enduring personality characteristic in which the individual is predisposed towards success and relatively concerned with failure.

Metacognition

Metacognition is defined as "cognition about cognition", or "knowing about knowing". It comes from the root word "meta", meaning beyond. It can take many forms; it includes knowledge about when and how to use particular strategies for learning or for problem solving. There are generally two components of metacognition: knowledge about cognition, and regulation of cognition Metacognition is defined most simply as “thinking about thinking” and it includes knowledge about oneself as a learner and the factors that might impact performance, knowledge about strategies, and knowledge about when and why to use strategies. Metacognitive regulation is the monitoring of one’s cognition and includes planning activities, awareness of comprehension and task performance, and evaluation of the efficacy of monitoring processes and strategies. Metacognition is a complex construct and not directly observable.

Flavell (1979) originally coined the term metacognition in the late 1970, means “cognition about cognitive phenomena,” or more simply “thinking about thinking”. Subsequent

development and use of the term have remained relatively faithful to this original meaning. For example, researchers working in the field of cognitive psychology have offered the following definitions:

According to Kuhn & Dean (2004) Metacognition is awareness and management of one's own thoughts.

Statement of the Problem

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Operational Definitions

Mathematical Achievement: Achievement implies the net result of an individuals' effort over a period of time. It shows the level of proficiency attained in scholastics or academic work. Achievement is an enduring personality characteristic in which the individual is predisposed towards success and relatively concerned with failure.

Metacognition: Metacognition is "knowledge concerning one's own cognitive processes and products or anything related to them." Thus concept of metacognition includes two components: i.e. knowledge of cognition and regulation of cognition. Knowledge of cognition deals with all the concept of knowledge, self intelligence, self memory, attention, study habits etc. and regulation of cognitive processes includes all those mechanisms through which we regulate our thinking process, such as orientation, planning monitoring, testing repairing, evaluating, reflecting etc.

Objectives of the study

To investigate the significance of relationship between mathematical achievement and metacognition of senior secondary school students.

Hypotheses of the study

There will be no significant relationship between mathematical achievement and metacognition of senior secondary school students.

Significance of the study

Mathematics is one of the oldest sciences, in fact, its knowledge is essential for the understanding of various other subjects. Its knowledge is indispensable for wide variety of professions such as school teacher, college teacher, systematic analysis, operational research, trade, industry, business etc. It is a pivot of all processes of civilization. Mathematics helps us to develop all our intellectual powers like power of imagination, memorization, logical

thinking and reasoning. Therefore, seeing the importance of the subject mathematics and the role of mathematicians in the development of civilization, the investigator has chosen this field for her research study.

Metacognition enables one to be successful learner; Metacognition refers to higher order thinking which involves active control over the cognitive processes engaged in learning. Activities such as planning how to approach a given learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive in nature. These abilities are no doubt essential for learning both individually and in cooperative groups. Learners, who are aware of what they know, what they understand, what they do not know, what they do not understand, and why they do not understand for instance, are those who have metacognitive awareness

It is evident from the review of the related literature that there are not too many studies on mathematical achievement in relation to their meta- cognition in our country. So the researcher is inspired to study the relation between mathematical achievement and metacognition. The main reason for undertaking such a study is that information will be gathered with the help of present study will likely to have considerable significance both theoretically and practically.

Delimitations of the Study

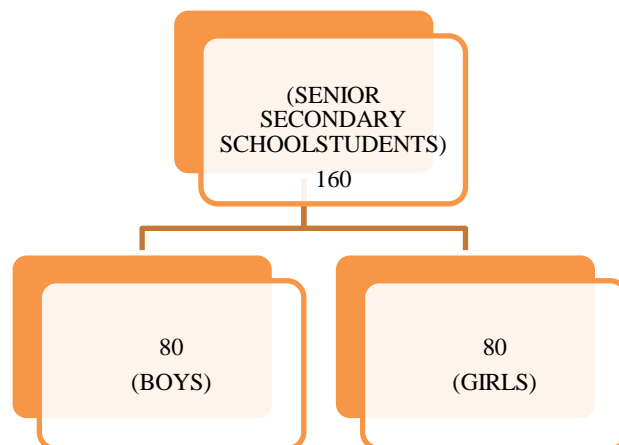
1. The study was limited to Ludhiana district only.
2. The study was conducted on senior secondary school students only.
3. The study was conducted on sample of 160 students only

Design of the Study

The present study has been undertaken study of mathematical achievement of senior secondary school students in relation to their metacognition. It is a survey type study. Hence, Descriptive survey method was employed by the investigator.

Sample of the Study

For the present study, sample of 160 students of XI class (Science group) was selected from the four schools of Ludhiana district. Out of which 80 students were boys and 80 were girls.



List of schools from where the data has been collected

Sr. No.	Name of School	No. Boys	Of No. Girls	of Total
1	Govt. Sr. Sec. School, Machhiwara (Ludhiana)	15	25	40
2	Govt. Sr. Sec. School, Bharat Nagar (Ludhiana)	23	17	40
3	Govt. Sr. Sec. School, Payal (Ludhiana)	25	15	40
4	Govt. Sr. Sec. School, Model Town (Ludhiana)	17	23	40

Tools Employed

1. Mathematics Achievement Test (MAT-IAKT) by Imam and Khatoon (2012).
2. Metacognition Inventory (MCI-G) by Govil (2003).

Statistical Techniques Used

The following statistical techniques were employed in order to analyze the data:-

1. Descriptive Statistics: - Mean Median, Standard Deviation, Kurtosis and Skewness to ascertain the nature of distribution of scores.
2. t- test was used to ascertain the significance of the difference between the means of mathematical achievement and metacognition.
3. Karl Pearson's coefficient of correlation techniques to find the relation between the variables.

Conclusions

As the present study is intended to find out the relationship between Mathematical Achievement and Metacognition of senior secondary school students, Pearson's Product Moment correlation technique was employed.

Table 1.1: Coefficient of Correlation between Mathematical Achievement and Metacognition of senior secondary school students (N=160)

Category of senior secondary students	N	R
Total	160	0.82**

** Significant at .01 level * Significant at .05 level

Table 1.1 shows that

- The coefficient of correlation between Mathematical Achievement and Metacognition of senior secondary school students as 0.82 which is significant at .01 level of confidence which shows that there exists a significant relationship between Mathematical Achievement and Metacognition of senior secondary school students. Therefore the hypothesis stating that there will be no significant relationship between Mathematical Achievement and Metacognition of senior secondary school students stands rejected. It concludes that there is significant relationship between Mathematical Achievement and Metacognition of Senior secondary school students.

Educational Implications

A research work is meant for developing new dimensions and forwarding innovative steps in related field of work. This study will prove expendably in the field implications. The study in hand was conducted to find out the mathematical achievement of senior secondary school students in relation to their metacognition. The Educational Implication for the present study is as follows:-

- (1) The study revealed that the relationship between mathematical achievement and metacognition is significant. Therefore, every effort should be made to increase student's metacognitive abilities in the school.
- (2) Teacher should attempt to increase students' metacognitive by focusing on the learning environment, enhancing students' interest in the course materials and increasing their confidence in taking exams. The teachers should try to increase students' ability to regulate their thinking and monitor their cognitive strengths and weaknesses.
- (3) The results revealed that mathematical achievement is related to metacognition. The present study is helpful to our educational system as to promote metacognitive strategies in the students as it is helpful in achieving high scores in mathematics.

Therefore educational institutions should encourage the students in regulating their learning process and strategies by using different activities e.g. concept mapping, discussion forums etc. to enhance mathematical achievement.

- (4) In this rapidly changing world, the challenge of teaching is to help students develop skills which will not become obsolete. Metacognitive strategies are essential for the twenty-first century. They will enable students to have academic success as well as to successfully cope with new situations. Teachers should capitalize on their talents as well as access a wealth of resources that will create a metacognitive environment which fosters the development of good thinkers who are successful problem-solvers and lifelong learners.

Suggestions for further study

- (1) The present study was conducted on a sample of 160 senior secondary school students. A similar study may be conducted on a large sample for broader generalization.
- (2) The research on the variables of Mathematical Achievement and Metacognition may be conducted on the students of high school and college level as well.
- (3) Mathematical Achievement can also be studied in relation to some other variables such as mathematical creativity, attitude towards mathematics etc.
- (4) The study of same nature can be undertaken for different district and states.

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