



## THE STUDY OF MATHEMATICS PROBLEM SOLVING ABILITY IN MATHEMATICS ACHIEVEMENT

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### ABSTRACT :

The study explains the correlation between Mathematics Problem Solving Ability and Mathematics Achievement. The Mathematics Problem Solving Ability is one of the important concepts of mathematics education, it improves problem solving skills among the students and Mathematics Achievement is the measurement of Mathematics teaching learning process in the study. It is conducted to study the Mathematics Problem Solving Ability and Mathematics Achievement, gender wise difference within them and correlation among the variables. Two appropriate tools are used in the study. The sample has been selected across all the four educational divisions of Karnataka by using Stratified random sampling technique, the sample consist of 688 students studying in 9<sup>th</sup> standard during the academic year 2017-18. No difference was observed in Mathematics Problem Solving Ability and in Mathematics Achievement among boys and girls. Problem Solving Ability and Achievement in mathematics among students 9<sup>th</sup> standard students have found to be significantly related with the correlation coefficient value 0.93.

**KEYWORDS :** Mathematics Problem Solving Ability, Mathematics Achievement, Mathematics Problem Solving Ability test, Mathematics Achievement test, Correlation.

### INTRODUCTION

The purpose of education is to bring all round development of an individual or child. Mathematics education is an important part of formal education in our present society. From studies point of view, Mathematics is considered as an indispensable subject, which forms the basis for all other subjects. Mathematics has an important place in the school curriculum. Mathematics education in secondary school level is the foundation for higher education and future for every student in the present society. Mathematics should be studied as a compulsory subject in secondary school level as a part of general education which provides him basic quantum of knowledge for the future of every student. Mathematics deals with the study of the material substance related with space and time. **Mathematics** may be broadly described as the science of space, time, measurement, quantities, shapes and numbers and their relationships with each

other. Mathematics is a fundamental branch of science which deals with the study of numbers and symbols which are arranged using systematic manner.

The Problem Solving Ability and Achievement both are two basic and also important aspects of Mathematics. The problem solving ability can be defined as the pupil go through it analyze and solve the problem. The problems usually describes the situation which is faced by an individual, the existence is unknown to him



but to find a confined place and he feels necessary to come out of it, Similarly the students may asked some questions or he may confronted by any mathematical problem while he going through text book where the solution or answer is not known to him, In these situation the person or student will bound to engage to solve the problem which he has confronted and try to find out the answer, this process is known as problem solving.

Problem solving has a special place in the mathematics school curriculum. The ability to solve mathematics problems develops slowly over a very long period of time because it requires much more than merely the direct application of some mathematical content knowledge. The secondary school education is been taken care by state government of Karnataka and the state has three types of schools they are namely Government, Private Aided and Private Unaided schools and also some schools are there which is ruled by central government. The researcher has selected government schools for the present study. The primary focus of teaching and learning Mathematics is to develop the ability to solve the complex Mathematics problems. Polya in 1945 has done significant work on Problem Solving Ability in mathematics and provided his own 4 steps of Problem Solving. Many studies on Mathematics Achievement have been conducted all over the world, Kilpatrick and Stanic both have done significant work in the field of mathematics problem solving and illustrated it with a rich history of the topic. The achievement term is usually used for academic purpose in school education. Academically Achievement can be considered as the marks scored in their examination. Achievement is nothing but what a person has already learned after teaching. Achievement tests are popular tests in measuring the teaching learning effects in secondary school level especially related to mathematics. Academic achievement of student's should be good in mathematics to have a bright future in their life. Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals. Achievement is nothing but the expectancy of finding satisfaction in mastering challenging and difficult performance. Achievement is nothing but the result of educational experience of an individual. Achievement is nothing but a guideline to the progress of an individual. Measurement of achievement is a sure guideline for the progress of each and every individual in education field. Without the implementation of the achievement test it is impossible to measure educational experience of a student. The present study explains the correlation of Problem Solving Ability and Achievement in Mathematics. The relationship of Problem Solving Ability and Achievement in Mathematics has provides many results which instigated the researcher to conduct the present study.

### PROBLEM SOLVING ABILITY

In modern times, mathematics is being increasingly used in computer technologies, medicine, social science, education and various fields. With the use of computer and other devices there is a more emphasis in the mathematics. Though the academics are more mathematically inclined, the majority of students in school feel it as more abstract. Though the teacher can teach it with the help of modern educational technological devices and more advanced effective methods of teaching, there is a poor performance of the students in the mathematics. Hence, there must be some factors like psychological, social and emotional affecting the learner in learning of mathematics at large.

Problem solving has become a more prominent goal of mathematics instruction, a serious attempt has to be made by the teacher educators and thoughtful attention must be given to what it means to make problem solving the focus of school mathematics in order to cater to the different needs of children. All mathematics educators agree that problem solving is a important, if not the most important goal, of mathematics instruction at every level. Indeed, some have even gone so far as to insist that Problem solvingshould be the focus of school mathematics(National Council of Teachersof Mathematics, 1980, p. 1). According to (Halmos, 1980) Mathematics could surely not exist without these ingredients; they are all essential. It is nevertheless a tenable point of view that none of them is at the heart of the subject, that the mathematician's main reason for existence is to solve problems, and that, therefore, what mathematics really consists of problems and solutions. As cited in (Schoenfeld, 1992, pp. 334-370). As Gagne (1979)

suggested, in the process of mathematical word problem solving, student should be able to translate the concrete to the abstract and the abstract to the concrete. Even Wheatley (1992) proposed that problem-centered learning is a teaching method that encourages student reflection.

Similarly, SakornPimta (2009). Mathematical problem is the tool used as not only to help students develop their thinking ability but it also helps them to develop their basic skills of solving the problems especially a problem in daily life. The goal of teaching mathematics to be effective was that the students were able to solve its problems. As a matter of fact, the experience in solving the problems of the subject is very important to develop students' thinking skills and help them gain more skills in solving the problem in daily life.

Problem solving is a process which helps us in overcoming our day today problems which confronts us in studies, play, jobs etc. Problem solving is one of the intelligent human activity and skill which is related to cognitive abilities. The problem solving ability starts from childhood of each and every individual in this world. Students will receive the information related to this world and organize the information.

### **MATHEMATICS ACHIEVEMENT**

According to Shyam (2014) considering the factors of achievement in mathematics, one possibly ignores those aspects in which individuals differ from one another. The starting point may be achievement in mathematics itself where wide ranging variations occur from the point of non-performance to the point of outstanding achievement in it. If we consider a group of students, a few students are found to be high achievers on the one hand, and a few are low achievers on the other, while a sizable number of students always appear as moderate achievers. Therefore various investigators have explored numerous factors which are found responsible for success or failure in the mathematics in achievement and the studies are as follows.

Studies on Attitude towards Mathematics and Scholastic Achievement in Mathematics and much of the work has been done, based on the assumption that attitude affect Achievement recently - Miller (1993), Endsley (1984), Ashutosh (1989), Jayraman (1989), Nagailiankin (1991), Rajyaguru (1991), Wohlgehager (1992), Hariharan (1992), Driver (1993), Bassa (1993), Segars (1995).

'Generally, it has been observed that male students have more knowledge and understanding of the Mathematical concepts and thinking in comparison to the females. In the Indian situation, it was found that boys' score in the Mathematics is higher than that of girls. The result of research studies conducted by Sathiyagirirajan (1981), Holland & Sandler (1982), Khatoon (1988), Sucin (1992), Driver (1993), Bassa (1993), Leiker (1993), Chakalisa (1994), Narayan (1995), Matpass (1999), Arnold & Judith (1996), PariaDebasis (1996), Wells (1996), Pruett (1997), Jacobi (1997), Marsh (1998), Singh & Singh (2007) Khatoon & Mahmood (2010) and Kaliyan (1997) result support the conventional expectation of the boys superiority over the girls in learning outcomes of the Mathematics. Becker (1981) also found the same result. On the other hand, some researches reveal that the girls' superiority over boys' in the Mathematics Achievement viz; Kulkarni, Lal and Naidu (1970) in their survey found that girls belonged to Delhi and Mysore get more marks in comparison to boys. Endsley (1984), Wohlgehager (1992), Wang (2001) and Ganihar & Wajiha (2009) found that girls achieved significantly higher score in the Mathematics than that of boys'.

There are also studies which reveal sex factor is non-effective. Rule (1981), Koehler (1986), Carmichall (1986), Rajyaguru (1991), Teston (1992), Abdulmajeed (1992), Miller (1993), Harvath (1995), Segars (1995), Srinivasan (1999), Toole (2001) and Choudhury & Kumar (2009) found in their studies that sex factor did not have an effect on the learning outcomes in the Mathematics. Besides it, Houston (1980), Jensen (1982), HeimannVtefreyja (1982), Carmichall (1986), Metcaff (1986) and Prakash & Pandey (1996) found that males and females have significant difference on the Mathematics Achievement'. As cited in Shyam (2014, pp. 53-59). With the help of above-mentioned studies it is clear that the relationship between Mathematics Achievement and other variables exists. Taking the cue from the above studies present the researcher is attempting to find the relationship between mathematics problem solving ability and mathematics achievement. Therefore it is necessary to find out the relationship on the scientific basis.

Achievement can be defined according to De Ceceo and Crawford (1977) that it is nothing but the expectancy of finding satisfaction in mastering challenging and difficult performances. According to Travers (1970) Achievement can also be defined it is the result of what an individual has learned from some educational experiences.

### RESEARCH QUESTIONS

- Do 9<sup>th</sup> standard boys and girls significantly differ in Mathematics Problem Solving Ability?
- Do 9<sup>th</sup> standard boys and girls significantly differ in Mathematics Achievement?
- Is there any significant relationship between Mathematics Problem Solving Ability and Mathematics Achievement among 9<sup>th</sup> standard students?

To answer the above research questions, researcher framed the following objectives

### OBJECTIVES

- To study the significant difference in Mathematics Problem Solving Ability among 9<sup>th</sup> standard boys and girls.
- To study the significant difference in Mathematics Achievement among 9<sup>th</sup> standard boys and girls.
- To study the significant relationship between Mathematics Problem Solving Ability and Mathematics Achievement among 9<sup>th</sup> standard students.

### HYPOTHESES

- There is no significant difference in Mathematics Problem Solving Ability among 9<sup>th</sup> standard boys and girls.
- There is no significant difference in Mathematics Achievement among 9<sup>th</sup> standard boys and girls.
- There is no significant relationship between Mathematics Problem Solving Ability and Mathematics Achievement among 9<sup>th</sup> standard students.

### METHODOLOGY

The present study is descriptive as well as correlation study.

### DATA COLLECTION PROCEDURE

In the present study the data has been collected through survey method.

### TOOLS USED

Variables	Tools	Author
Mathematics Problem Solving Ability	Mathematics Problem Solving Ability test	Developed by the L.N.Dubey
Mathematics Achievement	Mathematics Achievement Test	Developed by the researchers

### Mathematics Problem Solving Ability test

The present tool has been constructed by **L.N.DUBEY**. The tool is constructed for the age group between 12-17 years. The tool consists of 20 multiple choice items. Each one has 4 possible answers with one correct answer.

### Construction of Mathematics Achievement test

The present tool has been constructed by the Researcher for the study. The tool will measure the Mathematics Achievement in of 9<sup>th</sup> class students. A critical literature review has been carried out. Analysis of the dimensions and components covered by different Mathematics Achievement tests which are already

standardized and applied by different researchers lead the present researcher to develop a Mathematical Achievement Test. This test was constructed on the basis of Revised Blooms Taxonomy by keeping in the view of related tools and thoroughly gone through 9<sup>th</sup> standard Mathematics, Kannada medium text book of Karnataka state. Seven Dimensions and under them 80 components were used to construct the tool.

After the process of standardization the researcher retains 60 items out of 80 items on the basis of the discrimination index and difficulty value.

### POPULATION AND SAMPLE

Whole Karnataka students which are studying in 9<sup>th</sup> standard in government high schools during the academic year 2017-18 were constitutes the population of the study. The sample has been selected across all the four educational divisions of Karnataka selecting 3 schools from each division. Totally 688 students will be drawn from the population as sample comprising of 340 boys and 348 girls.

### SAMPLING TECHNIQUE

Stratified Random Sampling technique was adopted for the study.

### VERIFICATION OF HYPOTHESES

**H 1: There is no significant difference in Mathematics Problem Solving Ability among 9<sup>th</sup> standard boys and girls.**

Problem_solving Ability	Independent sample t test						
	Gender	N	Mean	SD	df	t-value	p-value
	Boys	340	13.05	2.36	686	-0.21	P > $\alpha$
Girls	348	13.09	2.86				

The mean Problem Solving Ability scores of the boys was found to be 13.05 and that of girls was 13.09 which shows a very small difference when independent sample T-test was applied to find out significance of mean difference between boys and girls, a non significant difference was observed ( $t=0.210$ ,  $p=0.834$ ) in other words boys and girls had similar scores on Problem solving ability, therefore the null hypothesis is accepted.

**H2: There is no significant difference in Mathematics Achievement among 9<sup>th</sup> standard boys and girls.**

Mathematics Achievement	Independent sample t test						
	Gender	N	Mean	SD	df	t-value	p-value
	Boys	340	41.71	5.69	686	-1.30	P > $\alpha$
girls	348	42.38	7.74				

The mean scores of Mathematics achievement the boys was found to be 41.71 and that of girls was 42.38 which shows a very small difference when independent sample T-test was applied to find out significance of mean difference between boys and girls, a non significant difference was observed ( $t=-1.303$ ,  $p=0.193$ ) in other words boys and girls had similar scores on Mathematics achievement, therefore the null hypothesis is accepted.

**H3: There is no significant relationship between Mathematics Problem Solving Ability and Mathematics Achievement among 9<sup>th</sup> standard students.**

Variables	N	r-value
Problem solving ability achievement	688	0.093

\*. Correlation is significant at the 0.05 level (2-tailed).

The obtained correlation coefficient between Mathematics Problem Solving Ability and Mathematics Achievement was found to be 0.93 significant at 0.05 level in other word the observed correlation between these two variables was positive sign and significant indicating an linear relationship between two variables. As Problem Solving Ability score increase the Mathematics Achievement score will also increase linearly and significantly, so the null hypothesis is rejected.

### CONCLUSIONS

1. The boys and girls have been found to be doesn't differ significantly related to Mathematical Problem Solving Ability.
2. The boys and girls have been found to be doesn't differ significantly related to Mathematical Achievement.
3. The Problem Solving Ability and Achievement in Mathematics among students 9<sup>th</sup> standard students have found to be significantly related.

### SUGGESTIONS

1. The present study was delimited to Karnataka state. Similar study can be conducted in other State or other area of the Country.
2. The present research work was conducted on IX class students of Secondary Government School. Similar study can be conducted on Primary schools also as well as college level.
3. Similar study can be extended to a large sample so that more generalized result can be obtained.
4. The present study investigates the Problem Solving Ability and Achievement in Mathematics of government schools. Similar study can be conducted on other management schools like aided and private institutions.

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