International Research Journal of Education and Technology
ISSN 2581-7795

Problem solving ability and academic achievement on mathematics among IX standard students

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INTRODUCTION

Problem solving occurs when an organism or an artificial intelligence system needs to move from a given state to a desired goal state which is the frame work or pattern within which creative thinking and reasoning takes place. It is the key to success and has been regarded as the most significant aspect of human behavior. Knowledge and understanding are fundamental to studying mathematics and from the base from which to explore concepts and develop mathematical reasoning to make deductions and solve problems. Using an appropriate mathematical concepts and problem solving ability in both familiar and unfamiliar situations including those in real - life situations (Ois, 2011).

Problem solving plays a critical role in the initial learning of mathematical concepts and skills, not just as a context for practicing concepts and skills as discussed above. Research shows that understanding develops during the process of problem solving in which important math concepts and skills are embedded (Schoen & Charles, 2003). It plays a vital role in the academic achievement of students. The central aim of all formal educational efforts is academic achievement, on the part of the students. More over in some cases the students are forced to seek academic education, due to over enthusiasm and ambition of the parents. Such students do not pursue the education with one essential will and year, which enables them to have a negative attitude towards academic achievement. Lack of proper guidance at the right moment hinders the interest, aptitudes, abilities and capacities of an individual. All these problems have contributed to develop negative attitude towards education and effects on academic performance.

Aims of Problem Solving Ability

The aim of Problem solving ability and learning mathematics are to encourage and enable students:

- To recognize that permeates the world around us
- To appreciate the usefulness, power and beauty of mathematics
- To enjoy mathematics and develop patience and persistence when solving problem
- To understand use the language, symbols notation of mathematics
- To develop mathematical curiosity and use inductive and detective reasoning when solving problems
- To become confident in using mathematics to analyze and solve problems both school and in real - life situations
- To develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics
- To develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others
- To develop a critical appreciation of use of information and communication technology in mathematics
- To appreciate the international dimension of mathematics

Dimensions of Problem Solving Ability

There is a considerable movement back and forth as one move from one step to another in the task of problem solving. In general the following steps may be followed in the task of problem solving.

- **Problem awareness**
- **Problem understanding**
- **Collection of the relevant information**
- **Formulation of hypothesis**
- **Selection of the correct solution**
- **Verification of the concluded solution**

Need for the Study

Problem solving ability is a heart in the study of mathematics and highest level of learning in the hierarchy proposed by Gagne. It is a deliberate or purposeful act on the part of an individual to realize the set goals by inventing some novel method or symbolically following some planned steps for the removal of interferences or obstacles in the path. Learners those have differential levels of problem solving ability are supposed to have different levels of academic achievement and has a great impact on it. It is a process of overcoming difficulties that appears to interface with the attainment of a goal. Mathematics is synonymous with solving problems, doing word problems, creating patterns, interpreting figures, developing geometric construction, proving theorems, etc. The goal of teaching mathematics to be effective were students able to solve their problem which shows that learning mathematics aimed to develop their cognitive and affective domain that can support problem solving abilities. Therefore, the investigator was used to find out the ground realities entitled as "***Problem solving ability and academic achievement on mathematics among IX standard students***"

Operational Definition

- **Problem Solving Ability:** Here it refers that ability to understand goal of the problem and rules could be applied to represent the key to solving the problem.
- **Academic achievement:** Here it refers to the marks obtained by an individual in the final examination
- **Mathematics:** Mathematics is a part of science which has four fundamental operations of addition, subtraction, multiplication and division. Here it refers to ninth standard mathematics subject.

Objectives of the Study

1. To find out whether there is any significant difference in Problem solving ability and academic achievement among IX standard students between
    a. Boys and Girls (Gender)
    b. Government, Government – aided and Private (School)
    c. Rural and Urban (Locality)
    d. Tamil and English (Medium of Instruction)
    e. Tuition and No Tuition (Special coaching)
    f. Nuclear and Joint (Type of Family)

Hypotheses of the Study

Based upon the objectives of the study, the following hypotheses were framed.

1. There is no significant difference in mean scores of standard IX students problem solving ability and academic achievement with respect to

    a. Boys and Girls (Gender)
    b. Government, Government – aided and Private (School)
    c. Rural and Urban (Locality)
    d. Tamil and English (Medium of Instruction)
    e. Tuition and No Tuition (Special coaching)
    f. Nuclear and Joint (Type of Family)

Variables of the study

- **Independent Variable:**
  Problem solving ability
- **Dependent Variable:**
  Academic Achievement
- **Demographic Variables:**
  Gender, Nativity, School type, Medium of Instruction, Special Coaching, Type of family.

Sample of the Study

The present study was conducted in secondary and higher secondary schools located in Coimbatore district. The sample consists of 381 secondary school students of government, government-aided and private schools. The investigator collected data from 178 male students and 203 female students using purposive sampling technique

Tools used for the Study

Problem solving ability questionnaire was developed by the investigator under six dimensions namely problem awareness, problem understanding and collection of the relevant information, formulation of hypothesis, selection of the correct solution and **v**erification of the concluded solution. To find academic achievement of IX standard students, the researcher collect the Quarterly yearly marks in the ninth standard students from their concerned subject teacher.

Statistical Techniques Used

The researcher followed both qualitative and quantitative analyses. The hypotheses of the study were used to analyze the data. Descriptive analysis (Percentage, Mean, Standard Deviation) & Differential analysis (t-test)

Analysis of Problem Solving Ability Tool (Pilot Study)

Thirty five items were found satisfying the said condition and they are included in the final investigation were 60 items.

Final Study of Tool Preparation

This stage is concerned with the distribution of the final items in the tool. The 35 items were distributed in the final tool. All the 35 statements formed significantly and positively discriminating the high and low groups were considered as valid statements for the Problem solving ability Tool.

Data Analysis and Interpretation

The analysis of interpretation of data in every research work requires keen observation of calculation, there classification and categorization. This deals with the problem solving ability and academic achievement of IX standard students.

Table 4.1 shows the Mean and Standard Deviation of Problem solving ability and Academic Achievement

H01: There is no significant difference in mean scores of standard IX students problem solving ability and academic achievement

Mean and Standard Deviation of Problem solving ability and Academic Achievement

Variable	**N**	**Mean**	**SD**
Problem solving ability	381	59.92	20.69
Academic achievement	381	19.60	44.88

From above table, it is observed that the mean value of problem solving ability students is 59.92 with SD 20.69. It is also observed that the mean value of academic achievement of students is 19.60 with SD 44.88.

Hypotheses

There is no significant difference in means score of standard IX students problem solving ability and academic achievement with respect to their demographical variables were listed below table.

Analysis of significant difference between Problem solving ability and academic achievement on mathematics among IX standard students

Variables	**N**	**Mean**	**S.D**	**'t' - value**	**Level of significant**
Gender Boys	178	19.51	4.579	0.354	**NS**
Girls	203	19.67	4.418		
Locality Rural	133	20.10	4.075	1.67	NS
Urban	246	19.32	4.694		
Medium Tamil	221	17.64	3.641	11.432*	Significant
English	160	22.31	4.133		
Special coaching Tuition	66	19.23	4.406	0.750	NS
No Tuition	315	19.68	4.509		
Family Nuclear	261	19.70	4.473	0.631	NS
Joint	120	19.38	4.532		

From the above table, it was found that the calculated 't' - value 0.354 ,1.67,0.750, 0.631 are less than the table value 1.96 at 0.05 significant level of significant. Therefore, the formulated null hypothesis is accepted and there is no significant difference between boy's students and girls students in their problem solving ability. From the observed mean score girls,

rural students and no tuition, nuclear family have better problem solving ability than boys and urban students.

From the above table, it was found that the calculated 't'- value 11.432 is greater than the table value 1.96 at 0.05 level of significant. Therefore, the formulated null hypothesis is rejected and there is significant difference between Tamil and English medium IX standard students in their problem solving ability. From the observed mean score English medium students have better problem solving ability than Tamil medium students.

DISCUSSION

The purpose of the study is to find out the problem solving ability and academic achievement among IX standard students. The ability to understand what the goal of the problem is and what rules could be applied to represent the key to solving the problem. Sometimes the problem requires some abstract thinking and coming up with a creative solution. Academic achievement may be defined as excellence in all academic disciplines, in classroom activities as well as co- curricular activities. It includes excellence in sporting behavior, confidence, communication skills, punctuality, arts, culture and the like which can be achieved only when an individual is well adjusted.

- It was found that there is influence of problem solving ability on the academic achievement of students. Problem solving is an individualized process, which requires various strategies to tackle.
- The classroom teacher can develop a scientific approach to solve problems that the students are expected to face in social life. The implication of this study is that all pupils can be provided with an environment, which is suitable according to their behavior so that their creativity may be flourished.
- Moreover, home and school can play important roles in developing a positive attitude for the development of creativity among students.
- Teacher can use pedagogical strategy for foster problem solving ability. The low level of problem solving ability is a pointer towards learning deficiency syndrome and needs

attention of school authorities. Therefore, school authorities need to take steps to diagnose the crucial difficulty areas in basic education.

- For this purpose, the high school teachers are required to be trained for use of diagnostic and criterion based evaluation procedures to make teaching-learning process more effective as well as child centered to enhance level of problem solving ability.
- Teaching methodology and technique may need to be revised to increase the problem solving ability.
- It is the responsibility of the teachers to identify such students who have low problem solving abilities and try to modify their learning and thinking power through various audiovisual aids.
- Teachers must encourage students to adopt a reasonable risk-taking attitude while solving problems.
- Risk-taking attitude leads the students to overcome mental fixation while solving problems in skill tests, such as, reasoning skills test, problem solving ability test, personality test, and so on.
- The findings of the study also exhibited that demographic variable such as gender has significant effect on the academic achievement of high school students.
- The girl students possess significantly higher academic achievement than their male counterparts did. Studies such as this one can assist with the understanding of students problem solving ability from an empirical point of view.
- In brief, it has been concluded that problem solving ability of the students help them building strong cognitive ability, which should be in a better position to reap the benefits of high academic achievement, enrolled in reliable future career choice and job availability.

CONCLUSION

From the findings of the present study, it is observed the government school students have low level of problem-solving ability. It means achievements in academic level do not inculcate problem-solving ability. Problem solving is an individual process which requires

various strategies to tackle. Proper Teaching strategy used in classroom by teachers, emphasis on understanding in spite of rote learning, through moderate motivation, encouraging divergent thinking can help students to develop their problem solving ability. Educational planners and policymakers must take some initiative to develop the problem solving ability among students. Education in today's world should not simply be about acquiring high score/ degrees. It is more about being able to apply acquired abilities in a real world.

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