

IDENTIFICATION OF PROBLEM SOLVING STRATEGIES IN MATHEMATICS AMONG HIGH SCHOOL STUDENTS

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Abstract

The major aim of teaching Mathematics is to develop problem solving skill among the students. This article aims to find out the problem solving strategies and to test the students' ability in using these strategies to solve problems. Using sample survey method, four hundred students were taken for this investigation. Students' achievement in solving problems was tested for their Identification and Application of Problem Solving Strategies as a major finding, thirty one percent of the students' achievement in mathematics is contributed by Identification and Application of Problem Solving Strategies.

Keywords: Problem, Problem Solving Strategies, Identification, Application and Achievement.



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Introduction

Mathematics has the origin from the inception of our human civilization, in answering the problems that man had faced. As reasoning and logical thinking are the basis for mathematics, it has its applicability almost in all disciplines. Thus it has been rewarded with the title “Queen of Sciences”. From the past, it has become part of the curriculum in Education. As it is emerged from solving problems it is taught aiming its utility and in improving problem solving skills among pupils.

Need And Significance Of The Study

Problem solving is the process of applying previously acquired knowledge to new and unfamiliar situations. This process involves many strategies and these strategies are very much useful in improving the problem solving skills of the students. But the teaches and students use their own strategies in the process of problem solving. Identifying these problem solving strategies would not only enable the students to get into better problem solving process but also educators for the betterment of teaching, learning process.

Reasoning occurs when an individual is confronted with a problem. By a problem, we mean a situation for which the individual has not ready-made response for the problem. But the ability to solve problems requires some degree of independence, judgement, originality and creativity. It may be easy to imitate the solution of a problem when solving a closely similar problem, yet there is a deep-seated human desire for some device that could solve all problems. Many psychologists and mathematicians have attempted and they have stated steps in problem solving in their own perspective.

Scope of the Study

In this competitive world, students have to improve their problem solving skills with different methods of approach to solve any problem. They may be oriented towards the various strategies of problem solving. In this respect, this study will throw some lights on the problem solving strategies in mathematics. The development of problem solving ability or the students will enhance their education achievement also.

Objectives of the Study

The objectives of the study were as follows:

1. To identify and categorize problem solving strategies that are used by students in solving problems in mathematics.
2. To identify how far these problem solving strategies are applied by students in solving problems in mathematics.
3. To identify students level of achievement in problem solving in mathematics by using these strategies.
4. To find whether there is any significant relationships between identification of problem solving strategies (I.P.S.S.) Application of problem solving strategies (APSS) and achievement of problem solving in Mathematics (A.P.S.M).
5. To identify the significant relationship between A.P.S.M and the combined effect of I.P.S.S and A.P.S.S
6. To know whether boys and girls; English medium and Tamil medium students differ significantly in IPSS, A.P.S.S and A.P.S.M.
7. To identify whether there is any significant relationship between A.P.S.M. and half-yearly marks in mathematics of the students.
8. To know whether there is any significant relationship between the scores in I.P.S.S. and half yearly marks in mathematics of the students.

9. To find whether there is any significant relationship between I.P.S.S and A.P.S.S partialling out the effect of A.P.S.M.; I.P.S.S. and A.P.S.M partialling out the effect of A.P.S.S.; and A.P.S.S. and A.P.S.M. partialling out the effect of I.P.S.S.

Hypothesis of the Study

The research hypothesis was:

1. There is significant relationship between I.P.S.S and A.P.S.S. of students.
2. There is significant relationship between I.P.S.S. and A.P.S.M of students.
3. There is significant relationship between A.P.S.S. and A.P.S.M.
4. Students do not differ significantly in identifying the levels of problem solving strategies.
5. There is no significant difference between boys and girls in I.P.S.S.
6. There is no significant difference between boys and girls in A.P.S.S.
7. There is no significant difference between boys and girls in A.P.S.M.
8. There is no significant difference between English medium and tamil medium students in I.P.S.S.
9. There is no significant difference between English medium and tamil medium students in A.P.S.S.
10. There is no significant difference between English medium and tamil medium students in A.P.S.S.

Research Method

Normative survey method was employed to collect the data for this study.

Research Tools

With the consultation of experts, the following three tools were constructed.

Tool 1: Identification of Problem Solving Strategies (IPSS)

Tool 2: Achievement of Problem Solving in Mathematics (APSM)

Tool 3: Application of Problem Solving Strategies (APSS)

Analysis of Data

In order to find the significant relationship, between any two variables among IPSS, APSS and APSM of the students, correlation value were computed and tabled below:

Table 1: Computation of ‘r’ value between various categories of IPSS, APSS and APSM and Half yearly marks of the sample:

S.NO.	Categories	D.F	‘r’ value	‘t’ value	Level of Significance
1	IPSS vs. APSS	398	0.05	1.02	Not Significant at 5% level
2	IPSS vs. APSM	398	0.03	0.6	Not Significant at 5% level
3	APSS vs. APSM	398	0.6	14.96	Significant at 5% level
4	APSS vs. ALGEBRA Sums Score	0.123	0.8	14.7	Significant at 5% level
5	APSS vs. Application Sums Score	117	0.7	10.51	Significant at 5% level
6	APSS vs. Mensuration Sums Score	160	0.5	7.26	Significant at 5% level
7	APSS vs. Half-Yearly exam marks	400	0.4	8.7	Significant at 5% level
8	IPSS vs. Half-Yearly exam marks	400	0.06	1.2	Not Significant at 5% level

The above table infers that there is no significant relationship of APSS and APSM with IPSS. Similarly there is no significant relation of Identification of Problem Solving Strategies with the Half- Yearly marks of the students. Whereas Application of Problem Solving Strategies has significant relationship with Achievement of Problem Solving in Mathematics. It is reflected on the scores of Algebra Application and Mensuration sums also. There is significant relationship of scores of APSM with Half-Yearly marks of the samples.

Table 2: Computation of ‘t’ value between any two levels among five strategic levels of IPSS of Students:

S. No.	Levels	Mean	S.D.	‘r’	SE _D	t	P
1.	Identifying Vs. Analysing	16.42	5.67	0.58	0.23	0.12	No significant difference
2.	Identifying Vs. Planning	16.42	5.67	0.53	0.28	11.77	Significant
3.	Identifying Vs. Doing	16.42	5.67	0.42	0.31	0.51	No significant difference
4.	Identifying Vs. Testing	16.42	5.67	0.80	0.23	44.91	Significant

5.	Analysing	16.46	3.10				
	Vs.			0.76	0.21	14.32	Significant
	Planning	21.25	5.93				
6.	Analysing	16.46	3.10				No
	Vs.			0.67	0.23	0.51	significant
	Doing	16.63	5.96				difference
7.	Analysing	16.46	3.10				
	Vs.			0.62	0.31	51.76	Significant
	Testing	37.75	7.62				
8.	Planning	21.25	5.93				
	Vs.			0.51	0.29	10.99	Significant
	Doing	16.63	5.96				
9.	Planning	21.25	5.93				
	Vs.			0.42	0.37	34.188	Significant
	Testing	37.75	7.62				
10.	Doing	16.63	5.96				
	Vs.			0.54	0.33	43.66	Significant
	Testing	37.75	7.62				

The above table infers.

Student's 'Identifying' level do not differ significantly from analysing and 'Doing' levels but it differ from 'Planning' and 'Testing' levels.

'Analysing' level of students differ significantly from 'Planning' and 'Testing' levels except 'Doing' level.

There is significant difference between 'Planning' and 'Doing', 'Planning' and 'Testing' levels of students.

Students do differ significantly between 'Doing' and 'Testing' levels.

To find the significant difference, if any, between Boys and Girls in I.P.S.S their mean scores are compared.

Appropriate 't' test is adopted to find the significant different between the mean scores of boys and girls in I.P.S.S.

Table 3: Computation of 't' value between various categories of the samples on IPSS, APSS and APSM:

S.No.	Categories	Mean S.D. and n	't' value	Level of significance at 5% level
1.	Boys Vs Girls on IPSS	$m_1 = 20.24, s_1 = 9.28, n_1 = 255$ $m_2 = 19.17, s_2 = 13.02, n_2 = 145$	0.87	Not significant
2.	Boys Vs Girls on APSS	$m_1 = 65.8, s_1 = 16.39, n_1 = 255$ $m_2 = 74.69, s_2 = 17.4, n_2 =$	5.02	Significant

3.	Boys Vs Girls on APSM	145 $m_1 = 56.26, s_1 = 21.77, n_1 = 255$	2.45	Significant
4.	English Medium Vs Tamil medium on IPSS	145 $m_1 = 19.2, s_1 = 8.05, n_1 = 100$ $m_2 = 61.95, s_2 = 22.6, n_2 = 145$	0.97	Not significant
5.	English medium Vs Tamil medium on APSS	300 $m_1 = 72.95, s_1 = 17.87, n_1 = 100$ $m_2 = 67.72, s_2 = 16.9, n_2 = 300$	2.56	Significant
6.	English medium Vs Tamil medium on APSM	300 $m_1 = 61.10, s_1 = 24.3, n_1 = 100$ $m_2 = 57.7, s_2 = 21.6, n_2 = 300$	1.43	Not significant

The above table implies that there is no significant mean difference between boys and girls on IPSS; English medium and Tamil medium students on IPSS and APSM.

But boys and girls differ in their mean scores on APSS and APSM. English medium and Tamil medium student differ significantly in their mean scores of APSS.

Table 4 : computation of multiple correlation among IPSS, APSS and APSM.

S.No.	Categories	Mean, SD and 'r'	Partial correlation coefficient	Standard error	Multiple correlation coefficient
1.	APSM (1)	$m_1 = 58.18$ $\sigma_1 = 22.4$ $r_{13} = 0.556$	$r_{23.1} = 0.04$	$\sigma_{1.23} = 18.549$	
2.	IPSS (2)	$m_2 = 19.9$ $\sigma_2 = 5.66$ $r_{23} = 0.05$	$r_{31.2} = 0.56$	$\sigma_{2.23} = 5.653$	$R_{1.23} = 0.561$
3	APSS (3)	$m_3 = 69.02$ $\sigma_3 = 17.31$ $r_{21} = 0.032$	$r_{21.3} = 0.004$	$\sigma_{3.12} = 11.92$	

Since $[R_{1.23}]^2 = 0.31$, it is concluded that thirty one percent of students achievement of problem solving in mathematics was contributed by IPSS and APSS.

Findings of the Study

1. There is no significant relationship between IPSS and APSS of the students.
2. There is no significant relationship between IPSS and APSM of the students.
3. Whereas there is significant relationship between APSS and APSM of the students.

4. There is significant relationship between APSM and performance of the students in schools examinations.
5. Boys and girls do not differ significantly on IPSS but they differ significantly on APSS as well as on APSM.
6. English medium and Tamil medium students do not differ significantly in their IPSS and APSM but they differ significantly in their APSS.
7. Thirty one percent of students achievement in mathematics is contributed by IPSS and APSS.

Conclusion:

The present stage of students ability to identify the problem solving strategies is pitiable and a remedial measure is needed to improve the problem solving skill of the students. As rightly pointed out in the National Educational Policy (1986), Mathematics should be visualised as the vehicle to train a child to think, reason, analyse and to articulate logically. Analysing and reasoning are the pavement towards problem solving. In developing problem solving abilities among the students, the teachers, experts and educationalist have a greater role to play.

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