



**ORIGINAL RESEARCH PAPER**

**Education**

**Problem Solving Ability in Mathematics as a correlate of Divergent Production Abilities of Higher Secondary School Students**

**KEY WORDS:** Problem solving ability, divergent production ability.

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**ABSTRACT**

Mathematics in the real sense is a science of space and quantity that helps us in solving the problems of life needing numeration and calculations. It provides opportunity for the intellectual gymnastic of the man's inherent powers. It is an exact science and involves high cognitive abilities and powers. The present study has been conducted on a sample of 388 higher secondary students. Problem Solving Ability Test and Divergent Production Abilities Test were used to collect data. Pearson's product moment correlation, 't' test, etc were used to analyse the data. The results revealed a substantial relationship between problem solving ability and divergent production abilities for the higher secondary students.

**INTRODUCTION**

Mathematics is the fundamental subject, which inculcates scientific curiosity, scientific spirit, scientific skill and scientific attitude of mind. Without mathematical knowledge and skill there can be no complete knowledge of science and thus no scientific and technical advancement. The fulfillment of the aim of mathematics leads to realization of education. Hence mathematics is a pivot for better educational system and programmes. Problem solving is a deliberate or purposeful act on the part of an individual to realize the set of goals by inventing some novel methods or systematically following some planned steps for the removal of interferences or obstacles in the path. It occurs in novel or difficult situations in which a solution is not attainable by habitual methods of applying concepts and principles derived from past experience in very similar situations. Current research on problem solving involves the information processing theory. To solve problems, learners must search for long term memory for relevant principles, knowledge and strategies that might apply to the problem (Gilhooly and Green, 1988). Students will become increasingly effective problem solvers, more reflective and rational in life situations. They will be able to solve more and more complex problems with greater independence and self confidence.

Divergent thinking is a thought process or method which is usually applied with the goal to generate ideas. It is often used for creative and problem solving purposes in conjunction with convergent thinking. Guilford observed that most individuals display a preference for either convergent or divergent thinking. Rather than presenting a series of problems for rote memorization or resolution, divergent thinking presents open-ended problems and encourage students to develop their own solutions to problems.

**NEED AND SIGNIFICANCE**

In the study of mathematics students are constantly required to solve different types of problems, learn different methods for the solution of the problems, acquire new information, knowledge, and skills and make use of the acquired knowledge and skills in the practical and applied situations of the life. All such requirements can be easily met by adopting problem solving method for the teaching and learning of mathematics. This method provides valuable opportunity for the development of mental and cognitive abilities of the students. The development of problem solving ability makes the student quite self - reliant and self - confident in solving any type of problems related to curricular or non-curricular areas. Divergent thinking usually includes the ability to elaborate and think of diverse and original ideas with fluency and speed. It has been found that person having higher intelligence and reasoning ability can solve the complex problems quickly. Therefore, it is necessary that on one hand we try to develop intelligence and reasoning ability and on the other hand we should also develop the problem solving ability through proper education and training of our young boys and girls. Hence it is necessary to study the relationship between problem solving ability and

divergent production abilities.

**OBJECTIVES**

1. To find out the relationship between problem solving ability and divergent production abilities of the higher secondary school students.
2. To test the significance of difference in the mean scores of problem solving ability for the sub-samples classified on the basis of gender, locale and type of management.
3. To test the significance of difference in the mean scores of divergent production abilities for the sub-samples classified on the basis of gender, locale and type of management.

**HYPOTHESES**

1. There is significant relationship between problem solving ability and divergent production abilities for the higher secondary school students.
2. There is significant difference in the mean scores of problem solving ability of higher secondary students based on gender, locale and type of management.
3. There is significant difference in the mean scores of divergent production abilities of higher secondary students based on gender, locale and type of management.

**METHODOLOGY**

Normative survey method was used for the study. The sample consisted of 388 higher secondary students. In the selection of the sample, due representation was given to sex of the subjects, locality of the institutions of the subjects and type of management of the school. The investigators used Problem Solving Ability Test, developed and standardized by L.N. Dubey and Divergent Production Abilities Test, developed and standardized by Dr. K.N. Sharma for the collection of data. The data was collected and statistically analysed using mean, standard deviation, 't' test and Pearson's product moment coefficient of correlation.

**ANALYSIS OF DATA AND FINDINGS**

The major findings of the study are given below:-

1. Relationship between problem solving ability and divergent production abilities for the higher secondary school students- Analysis using Pearson's product moment coefficient of correlation.

All the correlations worked out for the general sample and sub samples are given in table 1.

**Table 1** Relationship between problem solving ability and divergent production abilities for the general sample and sub-sample

Problems solving ability and divergent production abilities	r
General Sample	0.42**

Sex	Male	0.50**
	Female	0.37**
Location of Institution	Urban	0.35**
	Rural	0.48**
Type of Management	Govt.	0.30**
	Private	0.53**

\*\*Significant at .01 level

The r's obtained for the general sample and sub-samples show significant positive relationship between problem solving ability and their divergent production abilities. The coefficient of correlation between problem solving ability and divergent production abilities for the general sample is 0.42 which shows substantial relationship. It is significant at .01 level. The correlation between the variables was found to be 0.50 for males, 0.37 for females, 0.35 for urban school students, 0.48 for rural school students, 0.30 for govt. school students and 0.53 for rural school students. The above interpretation in the case of general sample follows for the sub-samples too.

**2. Test of significance of difference in the mean scores of problem solving ability of sub samples - Analysis using 't' test**

**Table 2**

Subsamples		Mean	S.D.	N	t-value
Gender	Boys	11.38	3.18	186	0.55*
	Girls	11.55	3.04	202	
Locale	Urban	10.51	2.89	154	5.16**
	Rural	12.10	3.08	234	
Type of Management	Govt.	10.34	2.67	158	6.46**
	Private	12.25	3.14	230	

\*\*Significant at .01 level

\* Not significant at .05 level.

The difference in the mean scores of problem solving ability of boys and girls are not significant. Hence the hypothesis with regard to gender has been rejected. The difference in the mean scores of problem solving ability of rural and urban school students are significant (t=5.16, p<.01). Therefore, the hypothesis with regard to locality has been accepted. Similarly the difference in the means scores of problem solving ability of govt. and private school students (t=6.46, p<.01) are significant. Hence the hypothesis with regard to type of management that there will be significant difference in the mean scores of problem solving ability between Govt. and private school students has been accepted.

**3. Test of significance of difference in the mean scores of divergent production abilities of subsamples- Analysis using 't' test**

The details are given in Table 3.

**Table 3**

Subsamples		Mean	S.D.	N	t-value
Gender	Boys	37.82	12.82	186	6.086**
	Girls	45.86	13.18	202	
Locale	Urban	42.31	12.54	154	5.16**
	Rural	41.81	14.27	234	
Type of Management	Govt.	42.07	12.28	158	0.079*
	Private	41.9	14.45	230	

\*\*Significant at .01 level

\*Not significant at .05 level

The significance of difference in the mean scores of divergent production abilities of higher secondary male and female students were tested by 't' test. The result shows that difference (6.086) in the mean scores of divergent production abilities of boys and girls are significant (p<.01). Therefore the hypothesis with regard to gender has been accepted. Similarly the difference (5.16) in the

mean scores of divergent production abilities of rural and urban school students are significant at .01 level. Therefore, the hypothesis with regard to locality has been accepted. The table revealed that 't' value (0.079) obtained in the case of type of management is not significant at .05 level. Therefore, the hypothesis with regard to type of management that there will be significant difference in the means cores of divergent production abilities between govt. and private school students has been rejected.

**CONCLUSION**

The study revealed a positive and significant relationship between problem solving ability and divergent production abilities for the higher secondary school students. The study also reveals that there is significant difference in the mean scores of problem solving ability with respect to locale and type of management of the school. The difference in the mean scores of problem solving ability of boys and girls are not significant. In the case of divergent production abilities of the students, there is significant difference in the mean scores with regard to gender and locality. The difference in the mean scores of the divergent production abilities of the students based on type of management of the institution is not significant. According to Goldstein and Levin (1987), problem solving is a higher order cognitive process that requires the modulation and control of more routine or fundamental skills. The problem solving is a process of overcoming difficulties that appear to interfere with the attainment of a goal.

Guilford opined that divergent thinking is the ability to draw on ideas from various disciplines and fields of inquiry to reach a deeper understanding of the world and one's place in it. Since these variables are important from the point of view of educational practices, the teachers as well as parents should provide adequate facilities and conditions to their children for the development of creativity. Emphasis should be given for more organized and meaningful learning and this will result in better achievement and improvement of efficiency in problem solving ability. Through parent- teacher association and adult education programme, parents should be made aware of the importance of creativity in today's world. Teaching and learning should be linked always with actual life situations. Better methods of teaching and other faculty improvement programme can be suggested for govt. and private schools.

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