

The Interaction Effect of Gender, Locale and Type of Management of the School on the Problem Solving Ability of the Higher Secondary Students of Kerala

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Abstract: Problem solving ability is considered as one of the major skills associated with effective learning. Present educational system is giving due considerations for developing problem solving ability among children to cope with the need of the society. Though this ability can be acquired through various steps designed by cognitive scientists, we cannot assure that each one has acquired the ability. Many studies have proven the fact that problem solving ability is different among different persons. So, this paper is an attempt to study the differences in problem solving abilities among the higher secondary students with respect to three variables VIZ, gender, locale and type of management of the school and to find out the interaction effects of the three variables. In the case of gender and locale the F value is 7.677 and there is significant interaction on the problem-solving ability at 0.05 level of significance. Similarly, in the case of locale and management the F value is 15.964 which is also significant at 0.05 level of significance. But we cannot find significant interaction between gender and type of management of the school on the problem-solving ability of the higher secondary students. It is also found that there is significant interaction effect (F value 7.667) on the problem-solving ability of the higher secondary students based on the interaction of gender, locale and type of management of the school combined.

Key terms: Problem, Problem Solving Ability, Interaction Effect, Higher Secondary Students

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I. Introduction

Problem solving is one of the core skills essential for excelling in academic activities. It is the cognitive activity involving several operations to reach a solution. Today's world is full of competitions where one should have enough potential to cope with the situation. Problem solving includes several skills integrated to deal with unfamiliar situations. World Health Organisation (1999) considers problem solving as one of the generic life skills. We can use several strategies to improve problem solving ability. Solving a problem means to find or create new solutions for the problem or to apply the new rules to be learned (Mayer & Wittrock, 1996).

The prominence on problem solving started in the early nineties when the behaviorist and the cognitive psychologists began thinking of new ways of goal attainment. They conducted several experiments on animals and defined learning in terms of trial and error, insight learning and information processing. In cognitive psychology problem solving is termed as a felt difficulty. When we feel a need or when we have an intention to achieve something, we will naturally find ways to satisfy the need ourselves. Hence, we can say it is an intentional process and these intentional activities may lead to success and achievement of the goal. The above-mentioned intentional activities may lead to meaningful learning, help to retain information more and help to achieve the goal of problem solving. So, problem solving has much importance in education.

II. Background of the Study

Many have studied problem solving ability using different approaches to evolve a perfect definition of it. It was Bruner (1961) who first coined the word Discovery Learning. The discovery learning can be effectively implemented and achieved through problem solving ability. By 1970 Piaget's constructivism was an interesting conception where students began to construct their own knowledge and methods which are relevant in various situations. According to Gagne's hierarchy of learning we can see problem solving as the highest level of learning. According to Polya (1887-1985) a famous mathematician problem solving ability can be taught and has to be taught. He doesn't consider problem solving as something with which organisms are born with, but he presented various principles to make problem solving as a serious attempt. So, several

psychologists have studied problem solving ability as an essential aspect to deal effectively with the academic activities as well as real life endeavours.

Need And Significance Of The Study

Effective problem-solving skills are very essential for many reasons. It can be areal-life activity. Each child and adult have to face a lot of problems and solve many problems with a positive attitude. Well defined problems are very helpful in future learning of Mathematics and Science. It improves their scientific and mathematical knowledge. Student's educational, personal and professional lives will be benefited with good and effective problem-solving skills. So, the whole world demands a change in education to produce skilled thinkers and innovators which can be possible only by giving due importance to problem solving ability. According to Stones (1994), through problem solving, there occurs an integration of concepts and skills to overcome strange situations. Various studies and pedagogical reviews have proved that the adolescent students lack the ability to solve problems. As problem solving is a transition from initial state to the goal state, they don't even have the ability to capture the givens in the problem. If they are able to identify the givens in the problem, they can easily use various strategies associated with the problem. The students when they confront a problem get scared and don't look at the problem either. Many studies have identified the individual differences in solving problems (Jonassen and Grabowski, 1993). So this paper is an attempt to study the differences in problem solving abilities of the higher secondary students of Kerala with respect to three variables VIZ, gender, locale, type of management of the school.

Statement Of The Problem

The present study is focused on the interaction effect of gender, locale and type of management of the school on the problem-solving abilities of the higher secondary students of Kerala. The main objective is to analyse the interaction effect of gender, locale and type of management of the school on the problem-solving ability of the higher secondary students of Kerala. Hence the study is entitled as 'The Interaction Effect of Gender Locale and Type of Management of the School on the Problem-Solving Ability of the Higher Secondary Students of Kerala.

Variables Of The Study

The study is constituted with only one major dependent variable that is problem solving ability. The variables selected for analysis (independent variables) are gender, locale and type of management of the school.

Definition Of Key Terms

Interaction Effect: The combined effect of independent variables on dependent variable

Problem Solving Ability: The cognitive capability of the problem solver to perform physical or mental operations based upon his knowledge to achieve the goal of solving a problem. This is measured as the score of the problem-solving ability with three components namely, comprehending the problem, clarifying the problem and finding solution to the problem (Manoj, 2006).

Higher secondary students: Students who are studying in XI and XII standards in any of the recognized schools of Kerala under The Department of Higher Secondary Education, Kerala.

Objectives

The present study has the following specific objectives.

- 1) To find out the significant differences in the problem-solving abilities among the higher secondary students of Kerala based on gender
- 2) To find out the significant differences in problem solving abilities among the higher secondary students of Kerala based on locale
- 3) To find out the significant differences in the problem-solving abilities among the higher secondary students of Kerala based on the type of management of the school
- 4) To find out the interaction effect of gender, locale and type of management of the school on the problem-solving abilities of the higher secondary students of Kerala.

Hypotheses

The study is designed with the following hypotheses

- 1) There exist significant differences in the problem-solving abilities among the higher secondary students of Kerala based on gender
- 2) There exist significant differences in the problem-solving abilities among the higher secondary students of Kerala based on locale

- 3) There exist significant differences in the problem-solving abilities among the higher secondary students of Kerala based on type of management of the school
- 4) The interaction of gender, locality and type of management of the school has no significant effect on the problem-solving abilities of the higher secondary students of Kerala.

Method Of Study

The major aim of the study is to find out the interaction effect of gender, locale and type of management of the school on the problem-solving abilities among the higher secondary students of Kerala. For this survey method is adopted to get data from a large sample based on the relevant variables.

Sample For The Study

The sample for the study is selected from the population of the higher secondary students of Thrissur and Kottayam districts of Kerala State. The sample group is selected from the higher secondary school students who are studying in the Government and Aided schools. The sample consists of 431 higher secondary students giving due representation to gender, locale and type of management of the school.

Tools Used For The Study

To measure the variable problem-solving ability the researcher developed and administered Problem Solving Ability Test. The test contains 30 questions from the three domains of problem-solving ability viz. comprehending the problem, clarifying the problem and finding the solution to the problem. The tool is properly standardized and established with validity and reliability.

Statistical Techniques Used

The data gathered for the study is analyzed by using SPSS. Major techniques applied for the analysis are test of significance of difference between means and 2x2x2 factorial design.

Analysis And Findings

The collected data were administered for analyses. Details of the analysis and the results are given below. Data and results of the test of significance of difference in the problem-solving ability among the higher secondary school students based on gender is given in Table: 1.

Table: 1 Test of significance of difference in the mean score of the problem-solving ability among the higher secondary students based on gender

Gender	N	Mean	Standard Deviation	t	Significance
Male	177	25.28	7.016	0.808	>0.05
Female	254	25.74	6.198		

Table: 1 shows that the obtained t-value is 0.808 which is less than the table value at 0.05 level of significance. This means that there exists no significant difference between male and female students in their problem-solving ability.

Data and results of test of significance of difference in problem solving ability among the higher secondary school students based on locale is given below.

Table: 2 Test of significance of difference in the mean score of the problem-solving ability among the higher secondary students based on locale

Locale	N	Mean	Standard Deviation	t	Significance
Rural	137	23.66	6.136	4.13	<0.05
Urban	294	26.4	6.554		

From the Table: 2, it is clear that rural students have a mean value of 23.66 and standard deviation of 6.136. In the case of urban students, the mean value is 26.40 and the standard deviation is 6.554. The obtained t-value is 4.13 which is greater than the table value at 0.05 level of significance. The mean score of urban higher secondary students is greater than the mean score of rural higher secondary students for their problem-solving ability based on locale. This means that there is a significant difference between the rural and urban higher secondary students in their problem-solving ability.

Table: 3 Test of significance of difference in the mean score of problem-solving ability among the higher secondary students based on the type of management of the school

Type of Management	N	Mean	Standard Deviation	t	Significance
Government	291	26.13	6.243	2.77	P<0.05
Aided	140	24.28	6.985		

It is clear from Table: 3 that the mean scores of the Government and Aided higher secondary students are 26.13 and 24.28 and the standard deviations are 6.243 and 6.985 respectively. The t-value is 2.77 which is greater than the table value at 0.05 level of significance. The mean score of government higher secondary students is greater than the mean score of aided students. This means that there exists significant difference between the Government and Aided students in their problem-solving ability.

Table: 4 Data and results of the test of significance of difference in the problem-solving ability of higher secondary students based on gender, locale and type of management of the school

Source	Type III Sum of Squares	Degree of Freedom	Mean Square	F	Significance
Intercept	187586.332	1	187586.33	4863.665	0
Gender	4.563	1	4.563	0.118	0.731
Locality	538.19	1	538.19	13.954	0
Type of Management	126.743	1	126.743	3.286	0.071
Gender * locale	296.096	1	296.096	7.677	0.006
Gender * Management	35.113	1	35.113	0.91	0.341
Locale * Management	615.701	1	615.701	15.964	0
Gender * Locale * Management	295.697	1	295.697	7.667	0.006
Error	16314.656	423	38.569		
Total	299358	431			

Table: 4 shows that the obtained F-value for gender is 0.118 ($p > 0.05$) which is not significant at 0.05 level of significance. This means that there exists no significant interaction of gender on the problem-solving ability of the higher secondary students. In the case of locale, the F-value is 13.95 which is significant at 0.05 level of significance. This means that there exists significant interaction of locale on the problem-solving ability of the higher secondary students. In the case of type of management of the school the F-value is 3.286 which is not significant at 0.05 level of significance indicating that there exists no significant interaction of type of management of the school on the problem-solving ability of higher secondary students. The obtained F-value for the combined interaction effect of gender and locality is 7.677 which is significant ($p > 0.05$) at 0.05 level of significance. This means that there is significant interaction between gender and locality on the problem-solving ability of the higher secondary students. In the case of gender and type of management of the school the F-value is 0.910 which is not significant ($p > 0.05$) at 0.05 level of significance. This shows that there is no significant combined interaction effect of gender and type of management of the school on the problem-solving ability of the higher secondary students. But in the case of locale and management the F-value is 15.964 which is significant ($p < 0.05$) at 0.05 level of significance and indicates significant interaction on the problem-solving ability of the higher secondary students. In the case of gender, locale and type of management of the school taken together, the F-value is 7.667 which is significant at 0.05 level of significance. So, it can be concluded that there is significant interaction effect of gender, locale and type of management of the school on the problem-solving ability of the higher secondary students. Hence the hypothesis that the interaction of gender, locality and type of management of the school does not significantly affect the problem-solving ability of the higher secondary students is rejected.

Table: 5 Comparison of mean score of male and female higher secondary students from rural and urban locality in the government and aided schools

Gender	Locality	Type of Management	Mean	Standard Error
Male	Rural	Government	28.577	1.218
		Aided	19.581	0.947
	Urban	Government	26.322	0.694
		Aided	29.321	1.174
Female	Rural	Government	26.13	1.295
		Aided	24.6	0.926
	Urban	Government	26.922	0.482
		Aided	26.208	1.268

From Table: 5, shows that the rural male students studying in government schools have higher problem-solving ability when compared to those studying in aided schools. In the case of urban male students, the scores are higher for those studying in aided schools. The pattern is just similar in the case of female students also. Rural female students studying in government schools have higher problem-solving ability than those studying in aided school students. For urban female students, the scores are higher in aided schools.

Generalizations And Suggestions

The present study revealed certain facts with respect to the problem-solving abilities of the higher secondary school students of Kerala. It can be noticed that there are certain differences in the problem-solving ability scores of the students with respect to certain variables. This opens certain clues in front of the teachers regarding the improvement of the problem-solving abilities of the students. Some of the suggestions are listed below.

- Give due importance to develop problem-solving ability in the curriculum.
- Encourage students to approach the content in a problem-based model.
- Develop a positive attitude among students towards problem solving as a learning method.
- Evaluate the problem-solving ability of students frequently.
- Provide enough freedom to students to do experimentations in their area with respect to problem solving.
- Consider various strata while using problem solving approach.
- Teachers should take care in providing problem-based situations to students belonging to different categories keeping in mind of the differences among students.
- Encourage students to adopt multidimensional approach to tackle the same problem which will enhance their capacity to identify the most appropriate method for a particular problem.
- Give practice sessions for all students to grasp the idea of problem solving.
- As the study is based on the interaction effect of three variables VIZ, gender, locale and type of management of the school, the above-mentioned suggestions are to be generalized keeping in mind of the interaction effects of the variables.

III. Conclusion

The present study revealed that higher secondary students do not differ significantly in the problem-solving ability with respect to gender. But based on locale and type of management of the school, we can see significant difference in the problem-solving ability of the higher secondary students. So, the first hypothesis that there exists significant difference in the problem-solving ability among the higher secondary students with respect to gender is rejected but the hypotheses two and three are accepted as the study shows significant differences in the problem-solving ability of the higher secondary students from different localities and different types of schools.

Similarly, in the case of interaction effect, we can see significant interactions between gender and locale and locale and management but no significant interaction between gender and type of management. The combined interaction of the three variables gender, locale and type of management shows significant effect on the problem-solving ability of the higher secondary among variables.

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