



# PROBLEM SOLVING ABILITY OF SENIOR SECONDARY SCHOOL STUDENTS IN RELATION TO THEIR STYLE OF LEARNING AND THINKING

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## **ABSTRACT**

*The present study is an attempt to explore the problem-solving ability of senior secondary school students in relation to their style of learning and thinking. To find out the effect of style of learning and thinking with respect to gender, academic discipline, and management of the school on problem-solving ability of senior secondary school students, the data have been collected from 160 students from four senior secondary schools of Cuttack District, Odisha by administering Problem Solving Ability Scale and SOLAT Test. The collected data have been scored as per the manual and analyzed following descriptive statistics on both variables such as problem-solving ability and learning and thinking styles. Further, to find out the main effect and interactional effect of style of learning and thinking and gender, academic discipline, and management of the school on problem-solving ability of senior secondary school students Two-way ANOVA was computed. The study revealed that Style of Learning and Thinking and gender have main effect on Problem Solving Ability. It also found that there is no significant main and interactional effect on Problem Solving Ability in relation to Style of Learning and Thinking of Senior Secondary School Students with respect to their academic discipline and management of the school.*

**KEYWORDS:** *Problem Solving Ability, Style of Learning and Thinking, Secondary School Students.*

## INTRODUCTION

In society, all the people from infancy to old age are affected with one or more than one problem. A problem refers to a situation, condition, or issue that is unresolved or undesired. Problem-solving is a process that is used to understand the important aspect of the problem and give direction towards solutions or answers (Anboucarassy, 2015). It is the basis for continuous improvement, communication, and learning (Stottler and Tregoe, 2019). In the context of the educational process, problem-solving ability is the prediction of achievement in the school environment. The ability of problem-solving has a vital role in students' academic performance and their construction of the concepts (Adesoji, 2008). Students, having problem-solving ability, can acquire knowledge of wide applicability, and the development of the same ability to transfer that skill, acquired through problem-solving in schools, to find solutions for their personal and community problems. The degree of problem-solving ability depends on one's level of cognitive abilities and skills which an individual possesses in different sub-processes like thinking and learning. Cognitive ability is a general mental capability that includes different cognitive processes such as attention, thinking, learning, memory, language, reasoning, decision making and problem-solving, etc. Thinking and learning style are the most crucial factors which influence the problem-solving ability of students. These processes play a key role in solving any kind of problem. When the individual knows his/her learning and thinking style, she/he integrates it in the process of learning and thinking so she/he can learn more easily, fast and solve the problems effectively. The more successful the individual is at solving the problems she/he faces, the more control she/he will take over his/her own life. A person educated in an area having no relationship to his/her learning and thinking style may lack confidence and she/he may be less successful; she/he may as a result become frustrated (Bhat, 2014). Studies reveal that students' problem-solving ability varies depending on their learning style and most students preferred activist-reflector learning style (Woodel- Johnson, 2010., Aljaberi, 2015), assimilator learning style, and this learning style affects the problem-solving ability than the other learning styles (Bhat, 2014). Problem-solving education influences administrative, legislative, and judicial thinking styles (Fathi and Qamrani, 2016) and it has a positive relationship with learning (Anbouracassy, 2015). In this context, this study has been undertaken to analyze the problem-solving ability of learners in relation to their styles of learning and more clearly which may be helpful for the policy planners, makers, and teachers to organize the curriculum and instruction, selection of appropriate device for effective learning.

### Objectives

1. To find out the problem-solving ability in relation to style of learning and thinking of senior secondary school students with respect to their gender.
2. To find out the problem-solving ability in relation to style of learning and thinking of senior secondary school students with respect to their academic discipline.
3. To find out the problem-solving ability in relation to style of learning and thinking of senior secondary school students with respect to their management of the school.

## Hypotheses

**H0<sub>1</sub>** There is no significant effect of learning and thinking style and gender on problem-solving ability of senior secondary school students.

**H0<sub>2</sub>** There is no significant interactional effect of learning and thinking style and gender on problem-solving ability of senior secondary school students.

**H0<sub>3</sub>** There is no significant effect of learning and thinking style and academic discipline on problem-solving ability of senior secondary school students.

**H0<sub>4</sub>** There is no significant interactional effect of learning and thinking style and academic discipline on problem-solving ability of senior secondary school students.

**H0<sub>5</sub>** There is no significant effect of learning and thinking style and management of the school on problem-solving ability of senior secondary school students.

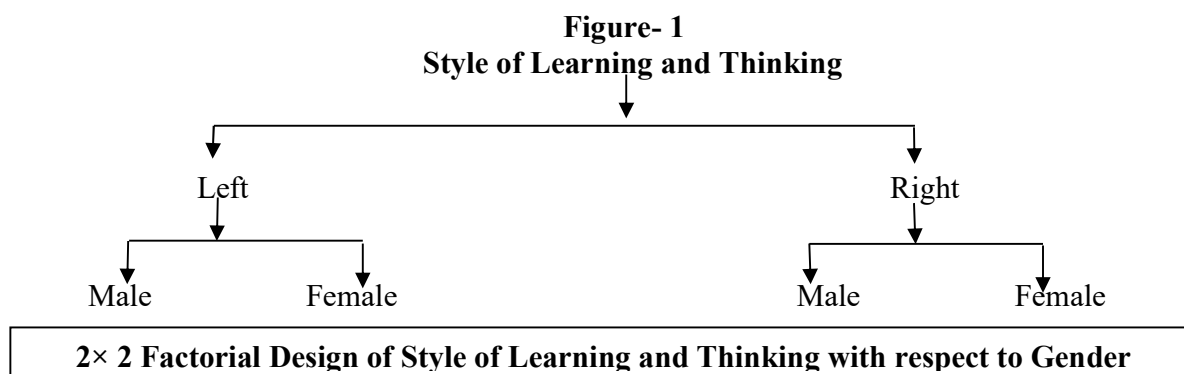
**H0<sub>6</sub>** There is no significant interactional effect of learning and thinking style and management of the school on problem-solving ability of senior secondary school students.

## METHODOLOGY

The present study aims to determine the problem-solving ability of senior secondary school students in relation to their style of learning and thinking. Hence, keeping in view the nature, objectives, and hypotheses of this study, the causal-comparative research method was employed. The sample was drawn using stratified disproportionate sampling technique and 160 students of four senior secondary schools which come under two CBSE and two State Boards were selected as the sample of the study. The required data was collected from the respondents through employing the adapted version of the Problem-Solving Ability Scale developed by Michael Fosmeir (2011) and the Style of Learning and Thinking (SOLAT) Test developed by D. Venkataraman (1994).

## ANALYSIS AND INTERPRETATION OF THE RESULTS

The collected data were analyzed by adopting descriptive and inferential statistical techniques. The descriptive statistics were computed to find out the measures of central tendency, standard deviation, skewness, and kurtosis of problem-solving ability and style of learning and thinking of the total sample. Further, Two-way ANOVA was computed to find out the problem-solving ability in relation to the style of learning and thinking of senior secondary school students with respect to their gender, academic discipline, and management of the school. The two levels of independent variables of style of learning and thinking (left SOLAT and Right SOLAT) and two levels of moderator variables gender (Male and Female), academic stream (Arts and Science) and school management (CBSE and CHSE, Odisha) were taken into consideration to find out the main and interactional effects of the independent variable on problem-solving ability higher secondary school students. The details have been presented in the following figures and tables.

**Objective-1****Effect of Style of Learning and Thinking with respect Gender on Problem-Solving Ability****Table -1**

**Comparison in the Mean and S.D Scores of Problem-Solving Abilities of Students belonging to Two Level of Style of Learning and Thinking and Two-Level of Gender (N = 160)**

Group		Style of Learning and Thinking	
		Left	Right
Gender	Male	N=24 M=27.38 SD=8.00	N=56 M=27.71 SD=4.33
	Female	N=20 M=25.55 SD=3.54	N=60 M=26.8 SD=4.27

**Table -2**

**Summary of Two-Way ANOVA depicting Problem Solving Ability with Style of Learning and Thinking of Senior Secondary School Male and Female Students**

Source of Variance	Df	SS	MS	F-ratio	P-Value	Level of Significance
Style of Learning and Thinking	1	590.976	590.976	7114.726	0.008	0.05
Gender	1	1612.403	1612.403	19411.618	0.005	0.05
Style of Learning and Thinking*Gender	1	0.083	0.083	0.001	0.982	
Error	156	25098.995	160.891			

Figure- 1. i.e., 2×2 factorial design and table-1 show that the Mean and SD scores of left SOLAT of Males and Females as 27.38 & 8.00 and 25.55 & 3.54 respectively, and right SOLAT Male and Female as 27.71 & 4.33 and 26.8 & 4.27 respectively. The summary of the two-way analysis of variance depicted the main and interactional effect of style of learning and thinking and gender on problem-solving ability of higher secondary school students has been calculated in Table-2.

## Main Effects

### a. Style of Learning and Thinking

Table- 2 shows that the obtained value of 'F' ratio for the main effect of level of style of learning and thinking on problem-solving ability is 7114.726. The obtained p-value (0.008) is less than 0.05 level of significance at degree of freedom 1/156. It means there is significant main effect of the level of style of learning and thinking on the problem-solving ability of senior secondary school students. The table-1 also depicted that the mean score of Left Style of learning and thinking of Male students as 27.375 and Female students as 25.55. Further, the mean score of Right Style of learning and thinking, Male students is 27.714 and Female students are 26.8. Hence, it is clear that the mean score of Right Style of learning and thinking is higher than the Left Style of learning and thinking.

### b. Gender

From Table- 2, it is evident that the calculated value of 'F' ratio for the main effect of gender of senior secondary school students on problem-solving ability is 19411.618. The obtained p-value (0.005) is less than 0.05 level of significance at degree of freedom 1/156. Hence, there is significant main effect of gender on the problem-solving ability of senior secondary school students. Table- 1 also depicted that the mean score of Left Style of learning and thinking male students as 27.375 and female students as 25.55. Further, the Mean score of Right Style of learning and thinking Male students is 27.714 and Female students is 26.8. Therefore, it is clear that the mean score of style of learning and thinking male students is higher than the style of learning and thinking female students.

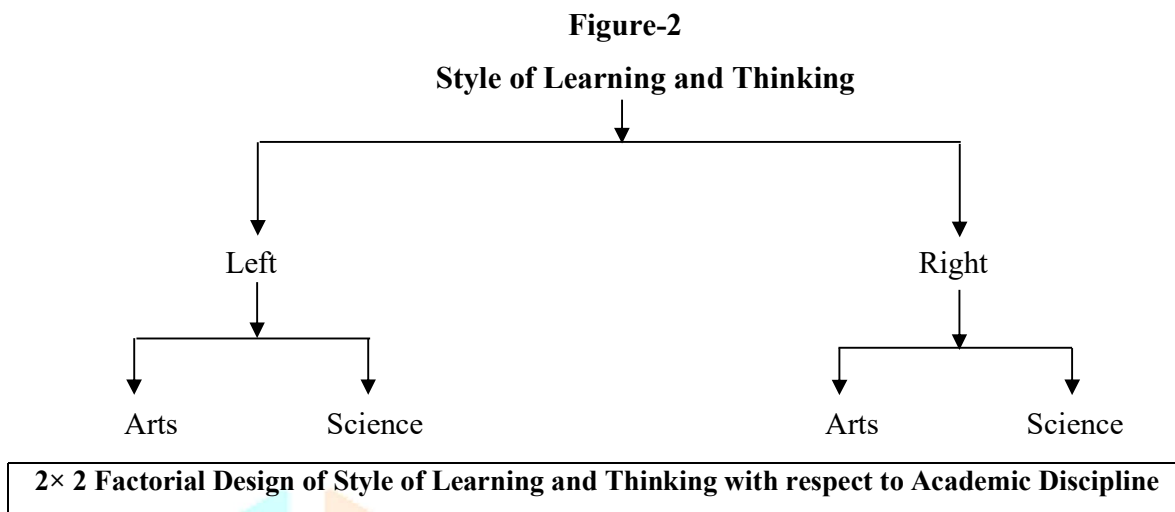
### Interactional Effects

Table- 2 indicates that the calculated value of 'F' ratio for interactional effect of style of learning and thinking and gender of senior secondary school students on the problem-solving ability is 0.001. The obtained p-value (0.982) is greater than 0.05 level of significance at degree of freedom 1/156. Hence, there is no significant interaction effect of gender on problem-solving ability of senior secondary school students. It means that the style of learning and thinking and gender do not take together effect on problem-solving ability of senior secondary school students. So, Hypothesis-2 i.e., "there is no significant interaction effect of style of learning and thinking and gender on problem-solving ability of senior secondary school Students" is accepted.



**Objective-2**

**Effect of Style of Learning and Thinking with respect Academic Discipline on Problem Solving Ability**



**Table- 3**

**Comparison in the Mean and S.D Scores of Problem-Solving Abilities of Students Belonging to Two Level of Style of Learning and Thinking and Two-Level of Academic Discipline (N = 160)**

Group		Style of Learning and Thinking	
		Left	Right
Academic Discipline	Arts	N=27 M=27.814 SD=7.413	N=53 M=25.943 SD=3.310
	Science	N=17 M=24.529 SD=3.648	N=63 M=28.333 SD=4.754

**Table- 4**

**Summary of Two-Way ANOVA Depicting Problem Solving Ability with Style of Learning and Thinking of Senior Secondary School Arts and Science Students**

Source of Variance	df	SS	MS	F-ratio	P-Value	Level of Significance
Style of Learning and Thinking	1	556.309	556.309	4.660	0.276	0.05
Academic Discipline	1	166.374	166.374	1.394	0.447	0.05
Style of Learning and Thinking*Academic Discipline	1	119.383	119.383	0.692	0.407	
Error	156	26917.245	172.546			

As per Figure-2 and Table-3, Mean and SD scores of left SOLAT Arts and Science are 27.814 & 7.413 and 24.529 & 3.648 respectively, and scores of right SOLAT Arts and Science are 25.943 & 3.310 and 28.333 & 4.754 respectively. The summary of the two-way analysis of variance depicted the main and interactional effect of style of learning and thinking and academic discipline on problem-solving ability of higher secondary school students has been given in table- 4.

**Main Effects****(a) Style of Learning and Thinking**

Table- 4. shows that the obtained value of 'F' ratio for the main effect of level of Style of learning and thinking on problem-solving ability is 4.660. The obtained p-value (0.276) is greater than 0.05 level of significance at degree of freedom 1/156. It means there is no significant main effect of level of style of learning and thinking on problem-solving ability of senior secondary school students. Table-3 also depicted that the Mean score of Left Style of learning and thinking Arts students is 27.814 and Science students is 24.529. Further, the mean score of Right Style of learning and thinking Arts students is 25.943 and Science students is 28.333. Hence, it is clear that there is no significant difference in the Mean score of style of learning and thinking with respect to the academic discipline of senior secondary school students.

**(b) Academic Discipline**

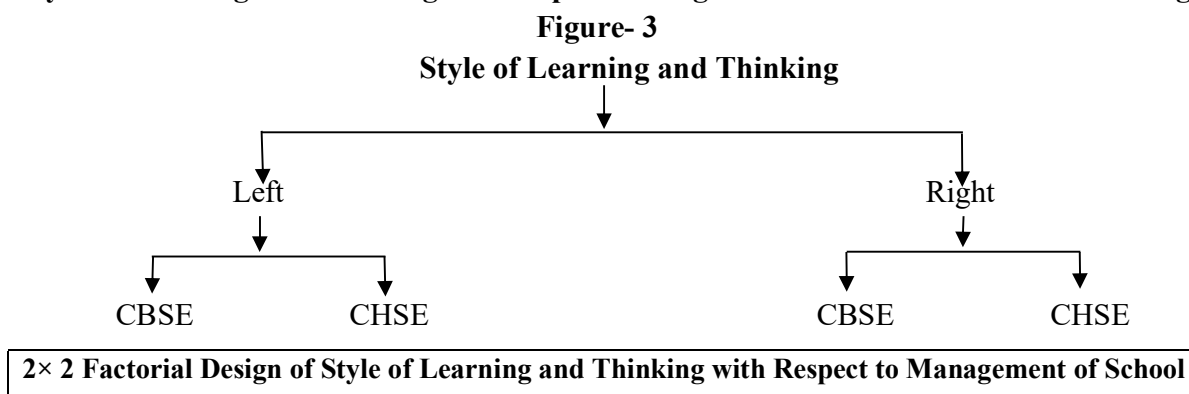
From Table-4, it is evident that the calculated value of 'F' ratio for the main effect of academic discipline of senior secondary school students on problem-solving ability is 1.394. The obtained p-value (0.447) is greater than 0.05 level of significance at the degree of freedom 1/156. Hence, there is no significant main effect of academic discipline on problem-solving ability of senior secondary school students. Table-3 also depicted that the mean score of Left style of learning and thinking Arts students is 27.814 and Science students is 24.529. Further, the Mean score of Right Style of learning and thinking Arts students is 25.943, and Science students is 28.333. So, there is no significant difference in the Mean score of SOLAT Arts and Science students.

**Interactional Effects**

Table- 4 indicates that the calculated value of 'F' ratio for interactional effect of style of learning and thinking and academic discipline of senior secondary school students on the problem-solving ability is 0.692. The obtained p-value (0.407) is greater than 0.05 level of significance at degree of freedom 1/156. Hence, there is no significant interaction effect of style of learning and thinking and academic discipline on problem-solving ability of senior secondary school students. It means that the style of learning and thinking and academic discipline do not take together effect on problem-solving ability of senior secondary school students. So, Hypothesis-4 i.e., "there is no significant interaction effect of style of learning and thinking and academic discipline on problem-solving ability of senior secondary school students" is accepted.

**Objective-3**

**Effect of Style of Learning and Thinking with respect Management of School on Problem-Solving Ability**



**Table- 5**

**Showing Comparison in the Mean and S.D Scores of Problem-Solving Ability of Students Belonging to Two Level of Style of Learning and Thinking and Two Level of Management of School (N = 160)**

Group		Style of Learning and Thinking	
		Left	Right
Management of School	CBSE	N=21 M=27.33333 SD=5.365972	N=59 M=27.08475 SD=4.047548
	CHSE	N=23 M=25.69565 SD=7.333276	N=57 M=27.40351 SD=4.587778

**Table- 6**

**Summary of Two-Way ANOVA Depicting Problem-Solving Ability with Style of Learning and Thinking of Senior Secondary School Students CHSE and CBSE Board**

Source of Variance	Df	SS	MS	F-ratio	P-Value	Level of Significance
Style of Learning and Thinking	1	690.630	690.630	4.199	0.289	0.05
Management of School	1	196.075	196.075	1.192	0.472	0.05
Style of Learning and Thinking*Management of School	1	164.471	164.471	0.955	0.330	
Error	156	268664.919	172.211			

Figure-3 and Table-5 show that the Mean and SD scores of left SOLAT CBSE and CHSE are 27.33333 & 5.365972 and 25.69565 & 7.333276 respectively, and right SOLAT CBSE and CHSE are 27.08475 & 4.047548 and 27.40351 & 4.587778 respectively. The summary of the Two-Way Analysis of Variance depicted the main and interactional effect of style of learning and thinking and management of the school on problem-solving ability of higher secondary school students has been given in table- 6.



## Main Effects

### (a) Style of Learning and Thinking

Table-6 shows that the obtained value of 'F' ratio for the main effect of level of style of learning and thinking on problem-solving ability is 4.199. The obtained p-value (0.289) is greater than 0.05 level of significance at degree of freedom 1/156. It means there is no significant main effect of level of style of learning and thinking on problem-solving ability of senior secondary school students. Table- 5 also depicted that the mean score of Left Style of learning and thinking CBSE Board students is 27.33333 and CHSE Board students is 25.69565. Further, the mean score of Right Style of learning and thinking CBSE Board students is 27.08475, and CHSE Board students is 27.40351. Hence, it is clear that there is no significant difference in the mean score of the Left Style of learning and thinking and Right Style of learning and thinking with respect to the management of the school of senior secondary school students.

### (b) Management of School

From Table 6, it is evident that the calculated value of 'F' ratio for the main effect of management of school on problem-solving ability of senior secondary school students is 1.192. The obtained p-value (0.472) is greater than 0.05 level of significance at degree of freedom 1/156. Hence, there is no significant main effect of management of the school on the problem-solving ability of senior secondary school students. Table- 5 also depicted that the mean score of Left style of learning and thinking CBSE Board students is 27.33333 and CHSE Board students is 25.69565. Further, the mean score of Right Style of learning and thinking CBSE Board students is 27.08475, and CHSE Board students is 27.40351. So, it is clear that there is no significant difference in the mean score of SOLAT between CBSE Board and CHSE Board students.

## Interactional Effects

Table- 6 indicates that the calculated value of 'F' ratio for interactional effect of style of learning and thinking and management of the school of senior secondary school students on the problem-solving ability is 0.955. The obtained p-value (0.330) is greater than 0.05 level of significance at degree of freedom 1/156. Hence, there is no significant interaction effect of style of learning and thinking and management of the school on problem-solving ability of senior secondary school students. It means that the style of learning and thinking and management of the school do not take together effect on problem-solving ability of senior secondary school students. So, Hypothesis-6 "there is no significant interaction effect of style of learning and thinking and management of the school on problem-solving ability of senior secondary school students" is accepted.

## MAJOR FINDINGS

The main findings drawn from the analysis and interpretation of results have been given below.

1. It was hypothesized in the null hypothesis that there is no significant effect of learning and thinking style and gender on problem-solving ability of senior secondary school students. After analysis and interpretation of data, it was found that the data does not support the assumption and the research studies were forced to reject the hypothesis. The study depicts that there is significant main effect of learning and thinking style and gender on problem-solving ability of senior secondary school students. Further, there is no significant interactional effect of style of learning and thinking and gender on problem-solving ability of senior secondary school students. After analysis and interpretation of data, it was found that the data support the assumption and the research studies were forced to accept the hypothesis.
2. In the second objective, it was hypothesized that there is no significant effect of learning and thinking style and academic discipline on problem-solving ability of senior secondary school students and there is no significant interactional effect of learning and thinking style and academic discipline on problem-solving ability of senior secondary school students respectively. After analysis and interpretation of data, it was found that the data support the assumption and the research studies were forced to accept the hypothesis.
3. For the third objective it was hypothesized that there is no significant effect of learning and thinking style and management of the school on problem-solving ability of senior secondary school students and there is no significant interactional effect of learning and thinking style and management of the school on problem-solving ability of senior secondary school students respectively. After analysis and interpretation of data, it was found that the data support the assumption and the research studies were forced to accept the hypothesis.

## DISCUSSION AND CONCLUSION

Thinking and learning play an important role in everyone's life. Having the knowledge of learning and thinking style one can respond most effectively to the situation being presented and solve his or her problems. Many studies show that problem-solving ability depends on the style of learning and thinking of students and each student prefers different learning and thinking styles and techniques to solve the problem. In this study, it is concluded that the style of learning and thinking has main effect on problem-solving ability of students. The finding of this study is supported by the research studies conducted by Fathi and Qamrani (2016) which found that problem-solving education has influence on administrative, legislative, and judicial thinking styles. The study conducted by Bhat (2014) and Aljaberi (2015) depicts that students' problem-solving ability varies depending on their learning style and problem-solving ability has a positive relationship with learning and thinking styles (Woodel-Johnson, 2010., Anbouracassy, 2015). Moreover, the analysis of this study reveals that gender has significant main effect on problem-solving ability of senior secondary school students. But there is no significant interactional effect of style of learning and thinking and gender on problem-solving ability of senior secondary school students. However, the analysis also reveals that there is no significant main and interactional effect on problem-solving

ability in relation to the style of learning and thinking of senior secondary school students with respect to their academic discipline and management of the school.

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