

Self-Confidence among Secondary School Students: An Analysis on the Basis of Problem Solving Ability (PSA) & Gender

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ABSTRACT: *The present study was undertaken to study the effect of problem solving ability and gender on self-confidence of secondary school students. The variable, self-confidence was treated as dependent variable, while problem solving ability and gender were treated as independent variables. A sample of 400 secondary school students was selected through multi-stage random sampling technique. Problem Solving Ability Test for school students (PSA) by Dubey (2011) [7] and Self-Confidence Inventory (PSCI) developed by Pandey (2007) [10] were used to collect the data. The obtained data were analyzed using Two Way ANOVA with 3×2 factorial design. Levene's Test of Homogeneity of Variance was also applied to test the assumption of homogeneity of variance for ANOVA. Main effect of problem solving ability and gender on self-confidence of secondary school students was found to be significant. Similarly, significant interaction effect of problem solving ability and gender was also reported on self-confidence of secondary school students. Thus, the more emphasize on development of problem solving ability in the school curriculum is considered important because of its impact on developing effective self-confidence among students. School authorities need to take steps to diagnose the crucial difficulty areas in basic education. For this purpose, the 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.*

Keywords: *Problem Solving Ability, Gender and Self-Confidence*

INTRODUCTION

The personality pattern is a unified multidimensional structure in which the concept of self is the core or centre of gravity (Breckenridge & Vincent, 1965) [5]. The self is a composite of a person's thoughts and feelings, strivings and hopes, fears and fantasies, his view of what he is, what he has been, what he might become, and his attitude pertaining to his worth. Self-Confidence is a positive attitude of oneself towards one's self concept. It is an attribute of perceived self. Self-Confidence refers to a person's perceived ability to tackle situations successfully without leaning on others and to have a positive self-evaluation. Self-Confidence is the conviction that one is generally capable of producing desired results. Increase in self-confidence helps to develop innate qualities of self-worthy and competency by the reinforcement. Self-confidence is related with success. A confident attitude, a belief and a faith in oneself and one's ideas are essential in getting ahead but it should also be remembered that self-confidence grows with success that means it is desirable to develop those qualities within oneself that makes for success. It has been found that the child who perceives himself to be able, confident, adequate and a person of worth has more energy to spend on academic achievement and will use his intelligence confident may not come up to the optimum level of attainment. In general, self-confidence refers to an individual's ability to act effectively in a situation to overcome obstacles and to get things to go alright. Self-confidence is central to good psychological adjustment, personal happiness and effective functioning in children and adults. The term self-confidence is used to refer to individuals' judgment about themselves. Agnihotri (1987) [1] defined self-confidence as "a positive attitude of oneself towards one's self-concept. It is an attribute to tackle situations successfully without depending on others and to have a positive self-evaluation." Children with over all high self-concept are confident about their abilities to accomplish their goals, academic competence and relationship with parents and peers. Children with low self-confidence tend to be apprehensive about voicing unpopular or unusual ideas and avoid attractive attention. There are many factors which affect self-confidence viz. intelligence, personality, motivation, school environment, heredity, home environment, learning, experiences at school, interests, aptitudes, family background, socio economic status of the parents and many more other factors influenced the self-confidence. However, the success, efficiency and happiness in life largely depend upon their cognitive abilities like problem solving ability, logical thinking etc. Among these, problem-solving ability plays an important role in developing self-confidence of school students. Enhancing students' problem solving capacity is one of the greatest educational challenges and is a major demand placed on any educational institution. Problem solving involves application of thinking and reasoning to various kinds of problems encountered in life. Problem solving is an integral part of developmental activities and provides opportunities for children to practice by applying their learning in different situations that they have learned in classroom. Problem solving is a process of overcoming difficulties that appear to infer with the attainment of a goal. In spite of inference, it is also a procedure of making adjustment. Thus, problem solving is cognitive processing directed at transforming a problem from the given state to the goal state when the problem solver is not immediately aware of a solution method. Problem solving is also related to other terms such as thinking, reasoning, decision making, critical thinking, and creative thinking. Skinner (1984) [13] defined, "problem-solving as the framework or pattern within which creative thinking and learning takes place".

Various studies have been conducted on problem solving ability with different variables. Bilimlari (2008) [4] found that problem solving ability and self-confidence have negative relationship. Kumar and Singh (2013) [9] and Srimadevi and Saraladevi (2016) [14] reported that problem solving ability has a significant effect on self-confidence. Singh & Kaur (2008) [12] observed that gender has a significant effect on self-confidence. Senthamarai, Sivapragasam and Senthilkumar (2016) [11] showed that level of problem solving ability in mathematics of secondary

school students is average. Gupta, Kavita & Pasrija (2016) ^[8] examined the significant interaction effect of locality and problem solving ability on the academic achievement of the students. Bala and Shaafiu (2016) ^[2] revealed a positive correlation between academic achievement and problem solving ability. Bhat (2014) ^[3] explored that 79% variance contributed by the predicting variable (problem solving ability) to the criterion variable (achievement in mathematics).

Therefore, it was identified that various studies were conducted on problem solving ability including students, teachers and prospective teachers with respect to a number of variables. But the fact is that most of the studies were conducted in abroad rather than Indian setting. A very few studies were conducted on self-confidence among school students in relation to their problem solving ability. Thus, the lack of researches in the present area provoked the researcher to take up the present topic and to study the effect of problem solving ability and gender on self-confidence of school students. For the present study, the variable, self-confidence has been treated as dependent variable whereas problem solving ability (High, Average & Low) and gender (Male & Female) were treated as independent variables.

VARIABLES USED

- ❖ **Dependent Variable:** Self-Confidence
- ❖ **Independent Variables:** (a) Problem Solving Ability [High, Average and Low]; (b) Gender [Male & Female]

OBJECTIVES OF THE STUDY

1. To study the main effect of (a) Problem Solving Ability [High, Average & Low] and (b) gender [Male & Female] on self-confidence among secondary school students.
2. To find out the interaction effect of problem solving ability and gender on self-confidence among secondary school students.

HYPOTHESIS OF THE STUDY

H₀₁ There exists no significant main effect of (a) Problem Solving Ability [High, Average & Low] and (b) gender [Male & Female] on self-confidence among secondary school students.

H₀₂ There exists no significant interaction effect of problem solving ability and gender on self-confidence among secondary school students.

METHODOLOGY

In the present study, descriptive survey method was used. The independent variables i.e. Problem Solving Ability [High, Average & Low] were divided into three levels and gender (Male & Female) were divided into two categories.

SAMPLE

At the outset, a sample of 400 secondary school students was selected through multi-stage random sampling technique. The sample was further classified on the basis of their problem solving ability and gender. As per the norms given in manual the problem solving ability test has been classified into (high, average and low) group with respect to male and female students. The strength of high problem solving ability preferred students was 113, average problem solving ability preferred students was 181 and low problem solving ability preferred students was 106. In this way, as per the requirement of the 3x2 cells of the paradigm, distribution of cells for analysis of interaction effect of problem solving ability and gender on self-confidence has been illustrated in fig 1.

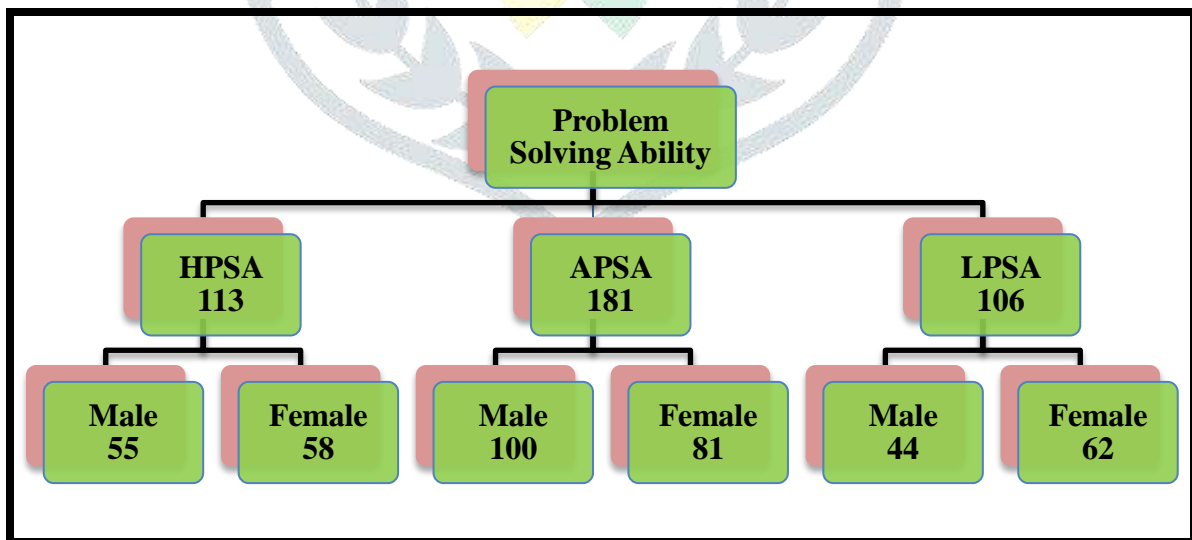


Fig. 1: Schematic Layout of 3x2 Factorial Design For Effect of Problem Solving Ability and Gender on Self-Confidence of secondary school students

TOOLS USED

Self-confidence inventory has been constructed and standardized by Pandey (2007) ^[10]. The inventory contains 60 statements under major nine areas which pertain to study the self-confidence of the students. There is no time limit. Nine areas of the inventory are (a) Social and Emotional Maturity (b) Intellectual Adequateness (c) satisfaction (d) Optimism (e) Independency (f) Self-Assuredness (g) Self-Feelingness (h) Evaluation about himself (I) Decisiveness. Reliability of inventory was examined through two different methods, namely Split half method and

Test-retest method. Reliability coefficients of the inventory were found to be 0.89 and 0.88. The inventory, besides having high face validity, has sufficiently high validity with other similar inventories and allied measures by other authors.

Problem Solving Ability Test (PSA) is developed by Dubey (2011)^[7]. This test is presented with 20 statement representing different problems and person needs to responds to them by selecting the right solution from given 4 alternatives. This test is for the secondary school students included both boys and girls. The age range was from 12 to 17 years. The split-half reliability co-efficient was found to be 0.78 and rational equivalence method was found to be 0.76. The validity of this scale was determined by finding correlation of scores with standardized test. With as view to ascertaining validity coefficient of the problem solving ability test along with the Tondon's group intelligence test is 0.68 and test of reasoning ability is 0.85.

STATISTICAL TECHNIQUES USED

The data were analyzed using descriptive as well as inferential statistics. The Two-Way Analysis of Variance (ANOVA) with 3×2 factorial design was computed using SPSS version 20 to study the main effects and interaction effects of the independent variables i.e. problem solving ability and gender on self-confidence of secondary school students. Levene's Test of Homogeneity of Variance was used to test the assumption of homogeneity of variance before applying Two-Way ANOVA. Wherever F-value was found significant, then t-test was employed for further exploration.

DATA ANALYSIS AND DISCUSSION

The main objective of the present study was to find out the main and interaction effects of problem solving ability and gender on self-confidence of secondary school students, data was subjected to analysis of variance of (3×2) factorial study with a randomized group design. In this section the first independent variable i.e. problem solving ability coded as (A) was varied into three types – High problem solving ability (A₁), Average problem solving ability (A₂) and Low problem solving ability (A₃). The second independent variable i.e. gender coded as B was varied at two levels – Male (B₁) and Female (B₂). Means and SDs of different sub-samples have been presented in the Table 1 and Fig. 2. The summary of ANOVA (3×2) has also been presented in Table 2, which is analyzed in terms of main effects and interaction effects.

Table 1

Means and SDs of Sub Samples of (3x2) Design for Self-Confidence with respect to Problem Solving Ability and Gender

Problem Solving Ability (PSA)	Gender (B)	N	Mean	SD
High Problem Solving Ability (A ₁) 113	Male (B ₁)	55	18.90	13.57
	Female (B ₂)	58	19.01	14.69
Average Problem Solving Ability (A ₂) 181	Male (B ₁)	100	28.73	13.97
	Female (B ₂)	81	30.14	13.09
Low Problem Solving Ability (A ₃) 106	Male (B ₁)	44	37.43	17.18
	Female (B ₂)	62	44.80	15.17

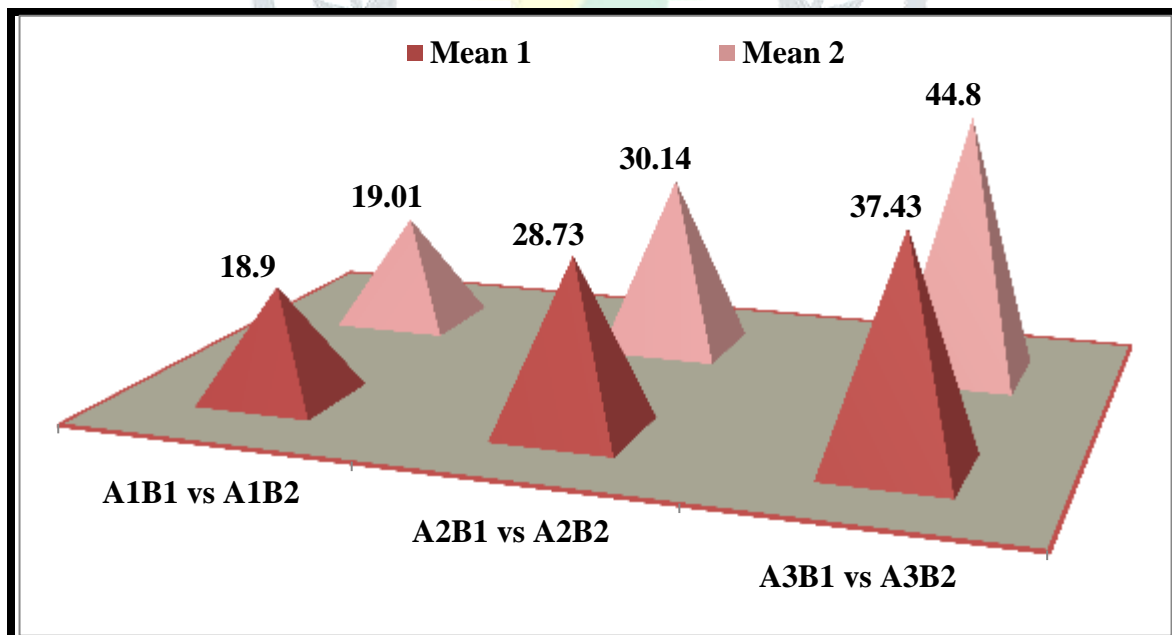


Fig. 2: Mean Scores of Sub Samples of 3x2 Design for Self-Confidence of Secondary School Students

Table 2

Summary of Two way ANOVA (3×2 Factorial Design) For Self-Confidence of Secondary School Students with respect to Problem Solving Ability and Gender

Sources of Variance	df	Sum of Squares (SS)	Mean sum of squares (MSS)	F-ratios
Main Effects				
A (Problem Solving Ability)	2	26435.379	13217.689	63.46**
B (Gender)	1	819.937	819.937	3.93*
Double Interaction Effects				
A×B Interaction	2	1088.62	412.250	2.97 *
Between Cells	5	29912.844	208.269
With in cells	394	82057.933
Total	399

*Significant at 0.05 level; **Significant at 0.01 level; NS = Not Significant

❖ Main Effects of Problem Solving Ability and Gender on Self-Confidence of secondary school students

Problem Solving Ability (A)

It is cogent from the Table 2 that F-ratio (63.46) for main effect of problem solving ability on self-confidence is found to be significant at 0.01 level which indicates that students with high, average and low problem solving ability differ significantly with respect to their self-confidence. Therefore, the null hypothesis H_{01} (a), "There exists no significant effect of problem solving ability on self-confidence of secondary school students is not retained. This result is in tune with the findings of Kumar and Singh (2013)^[9] and Srimadevi and Saraladevi (2016)^[14] who reported that problem solving ability has a significant effect on self-confidence. Further, t-test is employed to find out the significance of difference between mean self-confidence scores for different groups. The results are shown in the Table 3

Table 3

't'-values for the mean scores of Self-Confidence of secondary school students with respect to Problem Solving Ability

Sr. No.	Groups	N		Mean		SD		t-values
1.	HPSA vs. APSA	113	181	18.96	29.36	14.09	13.56	6.29**
2.	HPSA vs. LPSA	113	106	18.96	41.74	14.09	16.37	11.05**
3.	APSA vs. LPSA	181	106	29.36	41.74	13.56	16.37	6.90**

** Significant at 0.01 level

HPSA: High Problem Solving Ability

APSA: Average Problem Solving Ability

LPSA: Low Problem Solving Ability

Note: Lower mean score indicates higher self-confidence here as directed in the Manual.

Table - 3 exhibits a comparative description of self-confidence of secondary school students on the basis of problem solving ability. It discloses that t-value (6.29) for the students belonging to high and average problem solving ability is significant at 0.01 level. From the analysis of mean scores, it can be concluded that students belonging to high problem solving ability (18.96) adopt significantly lower self-confidence as compared to students having average problem solving ability (29.36). As seen in the Table- 3, t-value (11.05) for student belonging to high problem solving ability and for low problem solving ability is significant at 0.01 level. From the mean scores, it is inferred that students having high problem solving ability have high self-confidence as compared to students having low self-confidence. The same table depicts that t-value (6.90) for students having average problem solving ability and low problem solving ability differ significantly with respect to their self-confidence. From the comparison of mean scores, it is deduced that students with average problem solving ability also have significantly higher self-confidence (29.36) than the students with low problem solving ability. The mean scores for the effect of problem solving ability on self-confidence have also been presented in the Fig.3

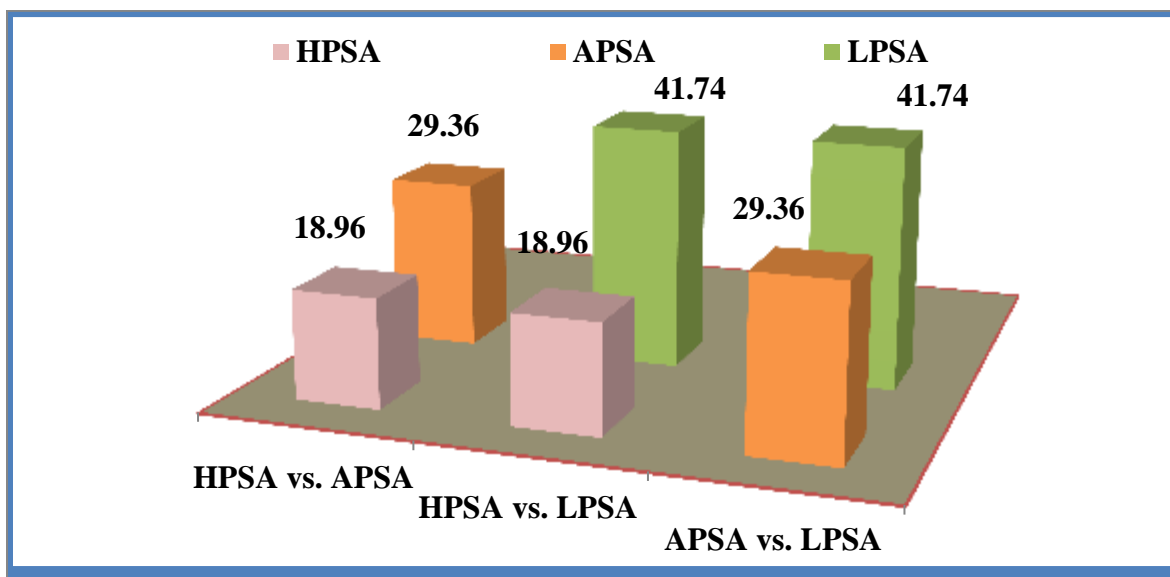


Fig. 3: Mean Scores for Main Effect of Problem Solving Ability of Secondary School Students

Gender (B)

From Table – 2, it is evident that F-ratio (3.93) for main effect of gender on self-confidence of school students is found to be significant at 0.05 level leading to the inference that male and female students differ significantly with respect to their self-confidence. Therefore, the null hypothesis H_{01} (b), “There exists no significant effect of gender on self-confidence of secondary school students” is not retained. This result has been found to be supported by the findings of Singh & Kaur (2008)^[12] who found that gender has a significant effect on self-confidence. From the comparison of mean scores, it is deduced that female secondary school students (31.45) have significantly lower self-confidence as compared to male secondary school students (27.93). This result is in agreement with the results of Devi & Sharma (2014)^[6] who found male students have higher self-confidence than female students. However, results of the study conducted by Vyas and Gunthey (2017)^[15] reported no significant difference in self-confidence in relation to gender.

❖ Double interaction Effects of Problem Solving Ability (PSA) and Gender on Self-Confidence of secondary school students

Problem Solving Ability (A) x Gender (B)

It is shown in the Table 2 that F- ratio for the interaction between problem solving ability and gender is (1.97) which is found to be significant at 0.01 level leads to the conclusion that problem solving ability and gender interact with each other in relation to self-confidence of school students. Therefore, the null hypothesis H_{02} , “There exist no significant interaction effect of problem solving ability and gender on self-confidence of secondary school students” is not retained. It is inferred that there is a significant interaction effect of problem solving ability and gender on self-confidence of school students. For further investigation, t-test was employed to find out the significant difference between mean scores of self-confidence of different groups for problem solving ability and gender. The results have been shown in the Table 4. The mean scores for self-confidence of different groups for problem solving ability and gender have been also presented in the form of Fig.4.

Table - 4

t-values for Mean Scores of Self-Confidence of School Students for Different Groups of Problem Solving Ability and Gender (A x B)

Sr. No.	Groups	N		Mean		SD		't'-values
1.	A_1B_1 vs. A_1B_2	55	58	18.90	19.01	13.57	14.69	0.041(NS)
2.	A_1B_1 vs. A_2B_1	55	100	18.90	28.73	13.57	13.97	4.22**
3.	A_1B_1 vs. A_2B_2	55	81	18.90	30.14	13.57	13.09	4.84**
4.	A_1B_1 vs. A_3B_1	55	44	18.90	37.43	13.57	17.18	5.99**
5.	A_1B_1 vs. A_3B_2	55	62	18.90	44.80	13.57	15.17	9.67**
6.	A_1B_2 vs. A_2B_1	58	100	19.01	28.73	14.69	13.97	4.13**

7.	A_1B_2 vs. A_2B_2	58	81	19.01	30.14	14.69	13.09	4.69**
8.	A_1B_2 vs. A_3B_1	58	44	19.01	37.43	14.69	17.18	5.82**
9.	A_1B_2 vs. A_3B_2	58	62	19.01	44.80	14.69	15.17	9.44**
10.	A_2B_1 vs. A_2B_2	100	81	28.73	30.14	13.97	13.09	0.69(NS)
11.	A_2B_1 vs. A_3B_1	100	44	28.73	37.43	13.97	17.18	3.20**
12.	A_2B_1 vs. A_3B_2	100	62	28.73	44.80	13.97	15.17	6.88**
13.	A_2B_2 vs. A_3B_1	81	44	30.14	37.43	13.09	17.18	2.65**
14.	A_2B_2 vs. A_3B_2	81	62	30.14	44.80	13.09	15.17	6.19**
15.	A_3B_1 vs. A_3B_2	44	62	37.43	44.80	17.18	15.17	2.33**

** Significant at 0.01 level

* Significant at 0.05 level

NS – Not Significant

 A_1 : High Problem Solving Ability B_1 : Male A_2 : Average Problem Solving Ability B_2 : Female A_3 : Low Problem Solving Ability**Note: Lower mean score indicates higher self-confidence here as directed in the Manual**

An inspection of the Table - 4 reveals that t-value (0.041) for male students having high problem solving Ability (A_1B_1) and female students having high problem solving ability (A_1B_2) is found to be insignificant at 0.05 level which indicates that students of these groups do not differ significantly in relation to their self-confidence. The same Table – 4 exhibits that t-value (4.22) for male students having high problem solving ability (A_1B_1) and male students having average problem solving ability (A_2B_1) is found to be significant at 0.01 level leading to the inference that students of these groups differ significantly with respect to their self-confidence. From the mean scores, it can be concluded that male students having problem solving ability adopt significantly better self-confidence (18.90) as compared to male students having average problem solving ability (28.73). The t-value (4.84) vide Table - 4 for male students with high problem solving ability (A_1B_1) and female students with average problem solving ability (A_2B_2) is found to be significant at 0.01 level. From the mean scores it can be deduced that male students with high problem solving ability possess significantly good self-confidence (18.90) as compared to female students with average problem solving ability (30.14). As it is depicted in the Table – 4, the t-value (5.99) for male students with high problem solving ability (A_1B_1) and male students with low problem solving ability (A_3B_1) is found to be significant at 0.01 level leading to the conclusion that students of these groups differ significantly with respect to their self-confidence. From the mean scores, it may therefore, be concluded that male students with high problem solving ability have significantly good self-confidence (18.90) as compared to male students having low problem solving ability (37.43). Similarly, the table further explores that t-value (9.67) for male students with high problem solving ability (A_1B_1) and female students with low problem solving ability (A_3B_2) is significant at 0.01 level. It is clear from the mean scores that female students with low problem solving ability have significantly poor self-confidence (44.80) as compared to male students with high problem solving ability (18.90).

The Table – 4 discloses that t-value (4.13) for female students with high problem solving ability (A_1B_2) and male students with average problem solving ability (A_2B_1) is found to be significant at 0.01 level. It may therefore, be inferred from mean scores that female students with high problem solving have significantly good self-confidence (19.01) as compared to male students having average problem solving ability (28.73). The t-value (4.69) for female students with high problem solving ability (A_1B_2) and female students with average problem solving ability (A_2B_2) is found to be significant at 0.01 level leading to the conclusion that students of these groups differ significantly in relation to their self-confidence. From the comparison of mean scores it may, therefore, be concluded that female students with high problem solving ability have good self-confidence (19.01) as compared to female students with average problem solving ability (30.14). The t-value (5.82) vide Table - 4 for female students with high problem solving ability (A_1B_2) and male students with low problem solving ability (A_3B_1) is found to be significant at 0.01 level. From the means scores, it can be concluded that female students with high problem solving ability have significantly good self-confidence (19.01) as compared to male students with low problem solving ability (37.43). As it is shown in the Table - 4 that t-value (9.44) for female students with high problem solving ability (A_1B_2) and female students with low problem solving ability (A_3B_2) is found to be significant at 0.01 level. From the comparison of mean scores, it can be deduced that female students with high problem solving ability have significantly good self-confidence (19.01) as compared to female students with low problem solving ability (44.80).

An examination of the Table - 4 depicts that t-value (0.69) for male students with average problem solving ability (A_2B_1) and female students with average problem solving ability (A_2B_2) is found to be insignificant at 0.05 level leading to the conclusion that students of these groups don't differ significantly with respect to their self-confidence. As seen in the Table - 4, the t-value (3.20) for male students with average problem solving ability (A_2B_1) and male students with low problem solving ability (A_3B_1) is found to be significant at 0.01 level. From the mean scores, it

is inferred that male students with average problem solving ability have significantly higher self-confidence (28.73) as compared to male students with low problem solving ability (37.43). The Table - 4 also shows that t-value (6.88) for male students having average problem solving ability (A_2B_1) and female students with low problem solving ability (A_3B_2) is found to be significant at 0.01 level. It may be concluded that from the mean scores that self-confidence of female students with low problem solving ability is significantly lower self-confidence (44.80) as compared to male students with average problem solving ability (28.73). This Table – 4 also examines that t-value (2.65) for female students with average problem solving ability (A_2B_2) and male students with low problem solving ability (A_3B_1) is found significant at 0.01 level. It can be inferred from the comparison of mean scores that female students with average problem solving ability possess significantly higher self-confidence (30.14) as compared to male students with low problem solving ability (37.43). Further, it is shown in the Table - 4 that t-value (6.19) for female students with average problem solving ability (A_2B_2) and female students with low problem solving ability (A_3B_2) is found to be significant at 0.01 level. It is concluded from the mean scores that female students with average problem solving ability have significantly higher self-confidence (30.14) as compared to female students with low problem solving ability (44.80). The same Table – 4 further discloses that the t-value (2.33) for male student with low problem solving ability (A_3B_1) and female students with low problem solving ability (A_3B_2) is found to be significant at 0.01 level that leads to the inference that students of these groups differ significantly with respect to their self-confidence. From comparison of mean scores, it can be concluded that male students with low problem solving ability (A_3B_1) have significantly good self-confidence (37.43) than female students with low problem solving ability (A_3B_2). The mean scores of interaction effect corresponding to problem solving ability and gender on mathematics achievement have been depicted in Fig.5.

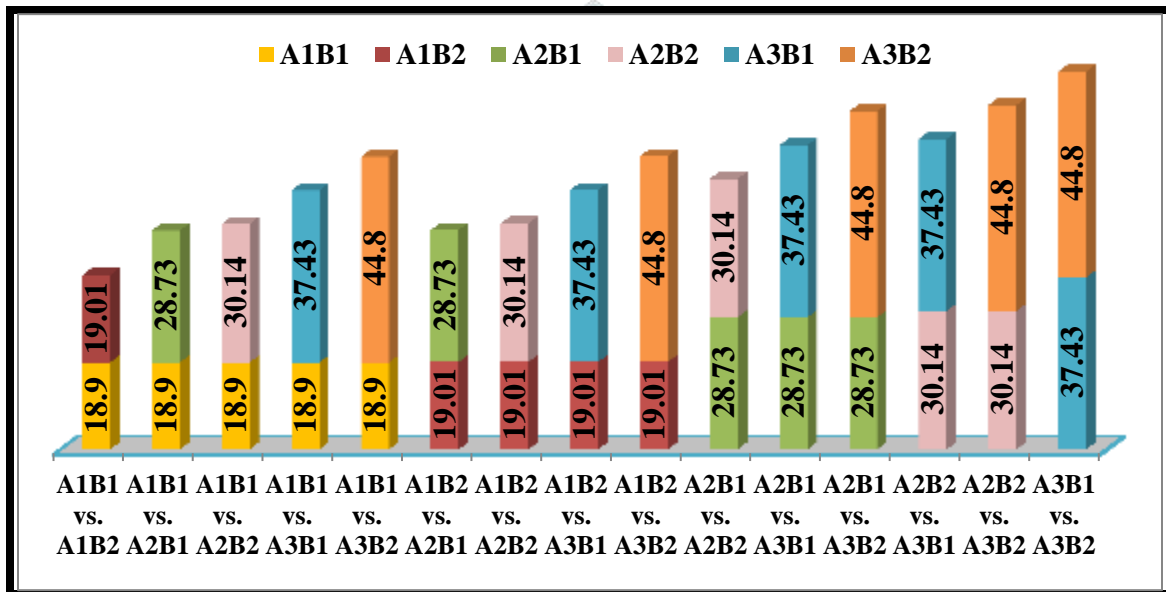


Fig 4 : Mean Scores for interaction Effect of Problem Solving Ability and Gender on Self-Confidence of secondary school students

The interaction effect of problem solving ability (A) and gender (B) on self-confidence of secondary school students (3x2 design) is also presented in the form of line graph in Fig.5. A_1 , A_2 and A_3 are marked on the X-axis at any distance; and on Y-ordinate a scale is taken for mean values. As, there are six cells, mean of each cell is used to plot the points. The means $M_{11} = 18.90$, $M_{21} = 28.73$ and $M_{31} = 37.43$ are marked to plot the line B_1 . Similarly, the means $M_{12} = 19.01$, $M_{22} = 30.14$ and $M_{32} = 44.80$ are marked for plotting the line B_2 . An interaction effect is generally represented by the set of non-parallel lines. From the graph, it is clear that the lines are non-parallel. Thus, the line graph represents a significant interaction effect of the two variables (problem solving ability and gender) on self-confidence of secondary school students.

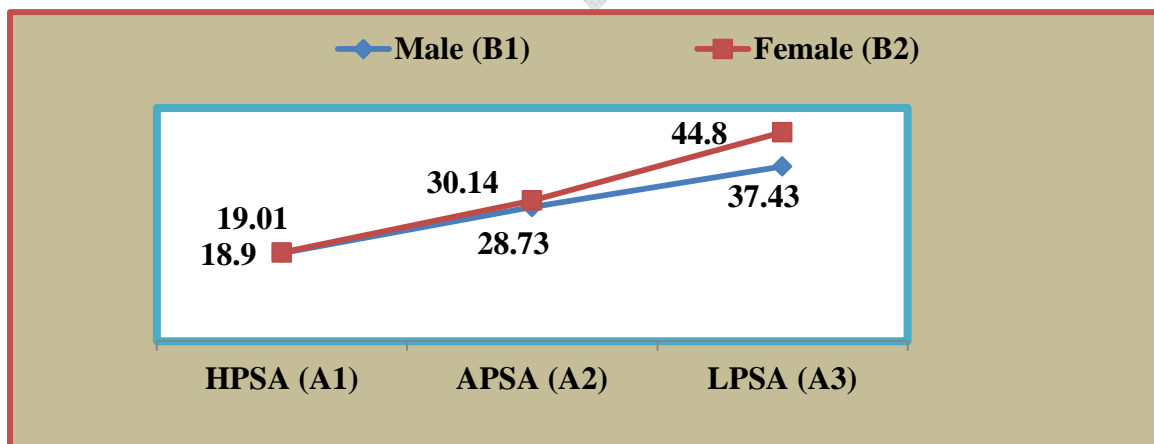


Fig. 5: Interaction Effect of Problem Solving Ability (A) x Gender (B) on Self-Confidence of secondary school students

EDUCATIONAL IMPLICATIONS

The results of the present study reflect that problem solving ability has a great impact on self-confidence of students. So it is highly recommended that teacher should adopt new and technological enhanced method of teaching. Prudent teachers should understand and employ the available information on problem solving abilities and then design a curriculum and learning environment for students. 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 audio-visual aids. The findings of the study also exhibited that demographic variable such as gender has significant effect on self-confidence of secondary school students. The male students possess significantly higher self-confidence than their female counterparts did. As educators, it is important for us to foster the development of self-confidence among female students. For this purpose, the 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 self-confidence.

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