International Journal of Multidisciplinary Research and Development

IJMRD 2015; 2(2): 511-517
www.allsubjectjournal.com
Impact factor: 3.672
Received: 03-02-2015
Accepted: 18-02-2015
E-ISSN: 2349-4182
P-ISSN: 2349-5979

Anil Kumar Agnihotri
Principal Mehar Chand College of Education Vpo Bhanopli, Tehsil-Nangal District-Roopnagar, Punjab-140133

Correspondence:
Anil Kumar Agnihotri
Principal Mehar Chand College of Education Vpo Bhanopli, Tehsil-Nangal District-Roopnagar, Punjab-140133
University Kerala-India

Problem Solving Ability among Senior Secondary School Students of Himachal Pradesh

Anil Kumar Agnihotri

Abstract
Solving problems involves both analytical and creative skills. Fostering skills required for students take control of their learning journey by teaching them problem-solving skills empowers students. It demonstrates that there are choices and there are a range of solutions or options. Effective problem solving skills is about making informed choices in a variety of situations. Not only are problem-solving skills useful in a scholarly context but they can help students understand and develop solutions when coping with many of life's problems or challenges within a varied and problematic environment. Whatever the problem solving situation that may arise for students, they will need to be aware of some fundamental steps in order to solve authentic complex problems in and diverse situations. At the senior secondary school level different streams i.e. Science, Arts and Commerce have diverse level of difficulty regarding the curriculum. Therefore when a student chooses a stream to study then he/she must be aware about his/her problem solving ability. As, it is found in the present study that the students of Science and Commerce streams have the higher level of problem solving ability as compare to the students of Arts stream.

Keywords: Problem Solving Ability, School Students, Arts, Science, Commerce Stream

Introduction
Problem Solving Ability is the framework or pattern within which the creative thinking takes place. It is the ability to think and reason on given level of complexity. People who have better Problem Solving Ability are generally observed to solve the problems of higher complexity faster than more intelligent people. Therefore Problem Solving Ability in the young boys and girls should also be given proper attention by the educationists and trainers. Life is largely a process of satisfying wants-wants for food, clothing, shelter, information, school grades, new experiences, excitement, approval of others, and so on. Some wants are easily satisfied, such as wants for air, water, or space in which to move; others are relatively difficult to satisfy, such as wants for success, for wealth, for the approval of others; and some cannot be satisfied at all, such as wants for unlimited longevity, omnipotence, or an unrestricted sensory range. Wants that are easily satisfied are usually taken as a matter of course and are seldom given more than passing attention. Wants that cannot be satisfied at all are, in general, recognized as such and ignored. The wants that most people spend their lives in striving to satisfy are those that are neither easy nor impossible. For example, the want for a college education is difficult, but not impossible, to satisfy. The want to enjoy good health is not easy to satisfy; it requires attention and effort. The want to be successful in business can be satisfied but only by individuals who are willing to work diligently. Wants are sometimes called "motives" and range from those of a strictly personal nature such as the want for a drink of water, or to lie down and rest, or to listen to symphony music to wants that are part of a complex social situation such as the want to promote the election of a friend for governor, or to integrate children of all races in the same school classroom, or to manufacture superior razor blades with greater efficiency. Wants may also range from those that are approved by society such as the want to build a new hospital for crippled children, or to pass a law prohibiting the dissemination of enemy propaganda, or to clear the rubbish from vacant lots within the city limits to those that are contrary to society's code of ethics and public law such as the want to possess property without paying for it, or to exceed the speed limit on residential streets, or to sell opium to addicts. In other words, some wants are socially inappropriate, and either should not exist at all, or should be appropriately modified. The words in the title of this chapter often used without exact meaning and sometimes even

With mystical connotation. For example, "thinking" is often loosely defined as "the action of the mind," or "reasoning," or "being logical." Such definitions are no better understood than the words they defined. The scientifically trained psychologist must either define his terms with exactness of meaning or not use them at all.

What is a problem? In general, it is any conflict or difference between one situation and another situation we wish to produce our goal. The thinking that we do in problem solving is thus goal-directed and motivated by the need to reduce the discrepancy between one state of Affairs and another.

Problem solving is one of Deakin University's Graduate Learning Outcomes which states that problem solving is about: 'creating solutions to authentic (real world and ill-defined) problems'. Problem solving skills can also be defined as the journey a student takes when working through details of a certain problem/s in order to reach a solution/s.

One of the major responsibilities of education is to develop the ability of problem solving. The success, efficiency and happiness in life to a large extent depend upon this ability. A child is not born with this ability but has to develop this ability in course of his life time with the help of his parents, teachers and society at large. Therefore it is very important for the parents and teachers to understand the psychology of problem solving.

Psychologists have tried to study carefully, the behaviour involved in the process of problem solving in animals as well as in human beings. They have suggested different steps involved in the process solving according to their respective findings and viewpoints. **John Branford and Barry Stain (1984)** advocated five steps that are basically associated with the task of problem solving. They referred to these steps as 'IDEAL' thinking and arranged them in the following order:

I= Identifying the problem.

D=Defining and representing the problem.

E=Exploring possible strategies.

A=Acting on the strategies.

L=Looking back and evaluating the effects of one's activities

Bourne, Dominowski and Loftus (1979), on the other hand, enumerated three steps or stages in problem solving: preparation, production and evaluation, by proclaiming "We prepare, we produce and we evaluate in the task of problem solving."

Solving problems involves both analytical and creative skills. Fostering skills required for students take control of their learning journey by teaching them problem-solving skills empowers students. It demonstrates that there are choices and there are a range of solutions or options. Effective problem solving skills is about making informed choices in a variety of situations. Not only are problem-solving skills useful in a scholarly context but they can help students understand and develop solutions when coping with many of life's problems or challenges within a varied and problematic environment. Whatever the problem solving situation that may arise for students, they will need to be aware of some fundamental steps in order to solve authentic complex problems in and diverse situations. Different Research Scholars have taken this problem in different scenarios as given below:

Marjorie Montague, Craig Enders and Samantha Dietz (2011) the purpose of the study was to improve mathematical problem solving for middle school students with learning disabilities by implementing a research-based instructional program in inclusive general education math classes. A total of 40 middle schools in a large urban district *were* matched on state assessment performance level (low, medium, and high performing) and socioeconomic status. One school from each pair was randomly assigned to **the** intervention condition, and one eighth grade math teacher participated at each school (n = 40). Because of attrition at the outset, 24 schools completed the study (8 interventions, 16 comparisons). The intervention, a research-based cognitive strategy instructional program, was implemented for 7 months, and periodic progress monitoring was conducted. A cluster-randomized design was used, and the data were consistent with a three-level model in which repeated measures were nested within students and students were nested within schools. The results indicated that students who received the intervention (n = 319) showed significantly greater growth in math problem solving over the school year than students in the comparison group (n = 460) who received typical classroom instruction. Moreover, the intervention effects did not differ for students with learning disabilities, low-achieving students, and average-achieving students. Thus, the findings were positive and support the efficacy of the intervention when implemented by general education math teachers in inclusive classrooms.

M. Manjula & P.N. Nataraj (2012) conducted the study on the topic titled as "A Study of Problem Solving Ability among the Matriculation School Students" The present investigation focuses on the study of problem solving ability among the matriculation school students of Cuddalore district. Normative survey method has been used to collect data. By using random sampling technique 644 IX standard matriculation school students have been chosen and involved in this study. The collected data has been studied and subjected to statistical analysis. The results revealed that (i) the problem solving ability of students is low in matriculation schools at Cuddalore district. (ii) This investigation also reveals that there is no significant difference in respect of the sub samples, type of family, mother's education, father's occupation and mother's occupation, while in respect of gender, locality, fathers" education and parental monthly income there is significant difference on their problem solving ability.

Bilal Adel Al-khatib (2012) the purpose of this study is to investigate the effect of using brainstorm strategy in developing creative problem solving skills among female students in princess Alia University College. The sample of the study consisted of (98) female students. The sample was distributed into two classes, the first represents the experimental group totalling (47) students taught through brainstorming strategy within the course of developing thinking skills in the academic year 2010/2011, and the second represents the control group totalling (51) students. The instruments of this study were a program to use brainstorming strategy and Torrance creative thinking test.

Both validity and reliability were checked by the researcher. The findings of the study showed that there are statistical significant differences at the level of ($\alpha = 0.05$) between the experimental group and the control group in the total score and the sub scores of the creative thinking in the favour of the experimental group indicating the effectiveness of using brainstorming strategy in developing creative thinking skills. The researcher recommended the use of this strategy in universities as well as conducting more studies regarding its effect by using other samples in different environments.

Adebola s. Ifamuyiwa, mstan, sakiru i. Ajilogba (2012) in This study, which adopted a pre-test, post-test, control group quasi-experimental design involving a 2 x 2 factorial matrix, investigated the effect of Oyedeji Problem-Solving Model on secondary school students' achievement and retention in Further Mathematics. The moderating effect of gender on the dependent measures was also investigated. Eighty senior secondary two (SS2) students from two purposely selected schools participated in the study. Three instruments namely; Teachers' Instructional Guide, Further Mathematics Achievement Test (FMAT) ($r = 0.76$) and Student Retention Test ($r = 0.75$) were developed, validated and used to collect data to test the six null hypotheses raised to guide the study. Data collected were analyzed using analysis of covariance (ANCOVA) at the .05 level of significance. Findings showed that problem-solving strategy had significant main effect on students' achievement and retention in Further Mathematics. This showed with evidence that problem-solving instructional strategy is more effective in enhancing students' achievement and retention in Further Mathematics than the conventional teaching method. Thus, Mathematics and Further Mathematics teachers are advised to use Oyedeji problem-solving strategy to teach their students Mathematics and Further Mathematics.

M. F. Salman, J. O. Ayinla, C. O. Adeniyi, L.O. Ogundele, S. K. Ameen (2012) here it is examined the effects of problem-solving instructional strategy on Senior Secondary School students‟ attitude towards Mathematics in Ondo, Nigeria. The target population for the study was Senior Secondary Two (SS II) students in Ondo, Nigeria. Purposive sampling technique was employed to select 173 SS II students for the study. A quasi-experimental, non-randomized, non-equivalent, pre-test, post-test control group involving a 2 x 3 factorial design was employed for the study. The dependent variable was students‟ attitude to Mathematics. The independent variables were the problem-solving instructional strategy and the scoring levels. The test scores were analyzed using mean scores, standard deviations, t-test and Analysis of variance on the two null hypotheses formulated. An alpha level of 0.05 was used to determine the significant level. Findings from this study showed that the experimental group significantly performed better in Mathematics than the control group. Based on this finding, it is recommended among others that teachers of Mathematics should a dopt the use of problem-solving instructional strategy in teaching Mathematics at all levels of education.

Nirupma Thakur (2013) the present investigation focuses on the study of problem solving ability among the undergraduate mathematical gifted students of Jabalpur, Madhya Pradesh. Normative survey method used to collect data. By using random sampling technique, 40 mathematical gifted students (20 boys and 20 girls), studying in different Government and Private Colleges selected. The collected data has been studied and subjected to statistical analysis. The results revealed that (i) the problem solving ability of mathematical gifted students are high in colleges at Jabalpur. (ii) This investigation also reveals that there is significant difference in respect of the sub samples, gender, mother's education, category of educational institutions, while in respect of fathers" education there is no significant difference on their problem solving ability.

İlker Ozmutlu (2014) conducted his study on the topic titled as "Investigation of problem solving ability of students in school of physical education and sports (Kafka's University Sample)" The aim of this research is to examine the problem solving abilities of School of Physical Education and Sports students. To achieve this aim, in the academic year 2013 – 2014, a research group did a study of 433 students of the School of Physical Education and Sports, Kafka's University. This sample consisted of 184 female and 249 male students. Within the research model in this study, the Problem Solving Inventory (PSI) was used to measure the students' problem solving abilities. The scale was developed by Heppner and Peterson (1982) and its Turkish version was prepared by Şahin and Heppner (1993). The SPSS 14.0 packaged software was used for data analysis and interpretation. The only sample Kolmogorov-Smirnov Test was used to determine if the data is normally distributed and it was determined that they are not distributed normally and then instead of the t test, the Mann-Whitney U test and instead of one way ANOVA test, the Kruskal-Wallis Test was used, and also frequency test was used. This study showed that the students of the School of Physical Education and Sports have problem-solving abilities, and there are no t-test factors in terms of gender, department, type of learning and type of school they graduated from. However, there is a significant difference between the class factor and problem-solving abilities.

Sunday Bankole Adeyemi (2014) conducted his study on the topic titled as "effect of gender on secondary school students' achievement in map work" This study is carried out to investigate the effects of gender on Secondary School Students' achievement in map work. One hundred and sixty-four subjects randomly drawn from SSII geography students in Ilesa East and West Local Government Council areas of Osun State, Nigeria, took part in the study. Four types of instruments (one stimulus and three testing instruments) were used to collect relevant data for the study. Data were subjected to both parametric and non-parametric analysis, using mean scores, standard deviation, analysis of covariance (ANCOVA) and multiple classification analysis (MCA). Results showed significant-main effect of gender $F(1,163) = 3.671$; $P<0.05$) in Declarative Knowledge Achievement Test (DKTAT). Gender is also found to have significant main

effect in Procedural Knowledge Achievement Test (PKTAT) ($F(1,163) = 3.937$; $P<0.05$). The result is however not significant in map reading and interpretation Achievement Test (MARIAT) ($F(1,163) = 0.0566$; $P> 0.05$). This implies that while the hypothesis is rejected for both post-test DKAT and PKAT means scores, it is not rejected for post-test MARIAT mean scores, it was therefore concluded that geography is not gender sensitive as we were made to believe over ages, i.e. gender has no effect on students' achievement in geography in general, and map work in particular where differences were found in favour of the female students. Suggestions were finally made on how to encourage the female students to show more interest in the study of geography in general.

Rationale of the Study

In our education system students of senior secondary level face diversification of the study courses like science, arts and commerce. The selection of particular study course by a student at this level is left to their interest which may not make them to select a right course of study. Again the interest of the students is influenced by their parents' interest and status sometimes. In Such decisions along with the interest of the student some of the very important factor like Problem Solving Ability should also be taken care of. Problem Solving Ability is generally required in general life as well as in educational matters. In some of the educational subjects like science where the subjects require abstract thinking and reasoning, the Problem Solving Ability of the student is expected to be higher comparatively. In the present scenario we should try to compare and developmental trends of the Problem Solving Ability among the high and senior secondary school students to know whether students differ in this ability.

Objectives of the Study

The following objectives were formulated for the present study:

1. To compare the Senior Secondary School Students (Boys & Girls) of Science Stream with respect to their Problem Solving Ability.
2. To compare the Senior Secondary School Students (Boys & Girls) of Commerce Stream with respect to their Problem Solving Ability.
3. To compare the Senior Secondary School Students (Boys & Girls) of Arts Stream with respect to their Problem Solving Ability.
4. To compare the Senior Secondary School Students of Science and Commerce Streams with respect to their Problem Solving Ability.
5. To compare the Senior Secondary School Students of Science and Arts Streams with respect to their Problem Solving Ability.
6. To compare the Senior Secondary School Students of Arts and Commerce Streams with respect to their Problem Solving Ability.

Delimitations of the Study

The present study was delimited in the following aspects:

1. The study was limited only to Government Senior Secondary Schools of Himachal Pradesh.
2. The study was confined to students studying in 12^{th} class only.
3. The study was delimited to only one district Hamirpur of Himachal Pradesh.

Method

The main objective of the present study is the stream wise comparison of the Senior Secondary School Students of Himachal Pradesh with respect to their Problem Solving Ability. For this purpose it is needed to collect information about the levels of Problem Solving Ability of Senior Secondary School Students studying in Government Senior Secondary Schools of Himachal Pradesh. In other words the focus of the present investigation is to study the existing present status of the selected variable in the sampled students. Hence in view of the above descriptive method of research has been used in the present study.

Sample

The objective of the present study is the stream wise comparison of the Senior Secondary School Students of Himachal Pradesh with respect to their Problem Solving Ability. For this it is needed to draw a sample of students studying in 10+2 class in Government Senior Secondary Schools of Himachal Pradesh.

In the present study as per the convenience of the study, the researcher has selected the Senior Secondary School Students of district Hamirpur of Himachal Pradesh, as the population. After that the researcher has selected conveniently two educational blocks out of five. After that the researcher has selected conveniently five Senior Secondary Schools. Lastly, the researcher has arranged the list of all the students of five sampled Senior Secondary Schools and prepared name slips and put them into a box and then draws out 30 slips from each Senior Secondary School, consisting ten students (five boys and five girls) from each of the stream (Science, Arts and Commerce respectively) one by one by ensuring the representation of all the units of the sample. Therefore the sample of the present study consisted of 150 (75 boys and 75 girls) Senior Secondary School students.

Tools Used For Data Collection

In the present study, Problem Solving Ability test constructed by L.N. Dubey has been used to collect data. There are 20 items in Problem solving ability test.

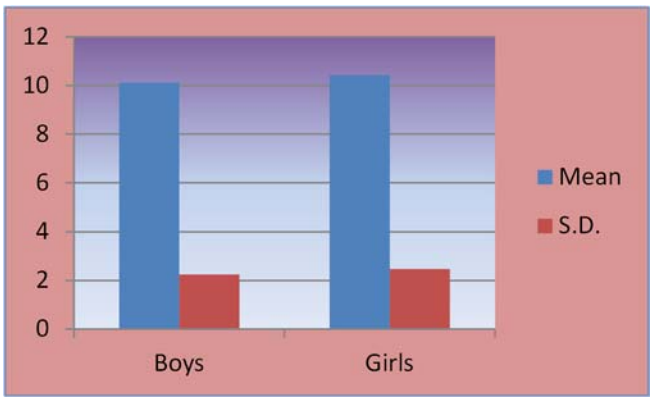
Analysis and Interpretation

In the present study the researcher has analyzed and interprets the obtained data by taking in to consideration each objective. Therefore objective wise analysis and interpretation of each objective was done.

1. Objective no.1 of the study aims to compare the Senior Secondary School Students (Boys & Girls) of Science Stream with respect to their Problem Solving Ability.

Table 3.1: t-Value of students (Boys & Girls) of Senior Secondary School of Science stream with their problem solving Ability

S. S. S. Students	N	Mean	S.D.	t-value	Level of significance
Boys	25	10.12	2.25	0.92	Not- significant at 0.05 level
Girls	25	10.43	2.47		

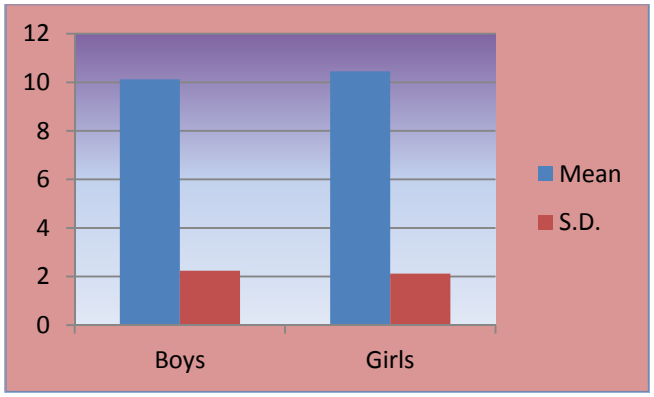


It is evident from the table 3.1 that t-value from Boys & Girls of Science stream of senior secondary school students with respect to their scores of 'Problem Solving Ability' came out to be 0.92 which is not significant at 0.05 level. This indicates that two groups of Boys & Girls of science stream students do not differ significantly from each other on scores of 'Problem Solving Ability'. Hence, it may be interpreted that Boys of S.S. School Students of science stream exhibit more or less equal level of their problem solving ability in comparison to the Girls S.S. School Students of Science stream.

2. Objective no.2 of the study aims to compare the Senior Secondary School Students (Boys & Girls) of Commerce Stream with respect to their Problem Solving Ability.

Table 3.2: t-Value of students (Boys & Girls) of Senior Secondary School of Commerce stream with their problem solving Ability

Sr. Sec. S. Students	N	Mean	S.D.	t-value	Level of significance
Boys	25	10.12	2.24	1.07	Not- significant at 0.05 level
Girls	25	10.45	2.12		



It is evident from the table 3.2 that t-value from Boys & Girls of Commerce stream of senior secondary school students with respect to their scores of 'Problem Solving Ability' came out to be 1.07 which is not significant at 0.05 level. This indicates that two groups of Boys & Girls of commerce stream students do not differ significantly from each other on scores of 'Problem Solving Ability'. Hence, it may be interpreted that Boys of S.S. School Students of commerce stream exhibit more or less equal level of their problem solving ability in comparison to the Girls S.S. School Students of Commerce stream.

3. Objective no.3 of the study aims to compare the Senior Secondary School Students (Boys & Girls) of Arts Stream with respect to their Problem Solving Ability.

Table 3.3: t-Value of students (Boys & Girls) of Senior Secondary School of Arts stream with their problem solving Ability

Sr. Sec. S. Students	N	Mean	S.D.	t-value	Level of significance
Boys	25	9.94	2.59	0.60	Not Significant at 0.05 level
Girls	25	9.73	2.34		

It is evident from the table 3.3 that t-value from Boys & Girls of Art stream of senior secondary school students with respect to their scores of 'Problem Solving Ability' came out to be 0.60 which is not significant at 0.05 level. This indicates that two groups of Boys & Girls of Art stream students do not differ significantly from each other on scores of 'Problem Solving Ability'. Hence, it may be interpreted that Boys of S.S. School Students of Arts stream exhibit more or less equal level of their problem solving ability in comparison to the Girls S.S. School Students of Arts stream.

4. Objective no.4 of the study aims to compare the Senior Secondary School Students of Science and Commerce Streams with respect to their Problem Solving Ability.

Table 3.4: t- Value of Senior Secondary Students (Science& Commerce stream) with respect their problem solving Ability

Stream	N	Mean	S.D.	t-value	Level of significance
Science	50	10.60	1.93	0.22	Not Significant at 0.05 level
Commerce	50	10.50	2.41		

It is evident from the table 3.4 that t-value from Science & Commerce stream of senior secondary school students with respect to their scores of 'Problem Solving Ability' came out to be 0.22 which is significant at 0.05 level. This indicates that two groups of science & Commerce stream students do not differ significantly from each other on scores of 'Problem Solving Ability'. Hence, it may be interpreted that S.S. School Students of science stream exhibit more or less equal level of their problem solving ability in comparison to the S.S. School Students of Commerce stream.

5. Objective no.5 of the study aims to compare the Senior Secondary School Students of Science and Arts Streams with respect to their Problem Solving Ability.

Table 3.5: t- Value of Senior Secondary Students (Science & Arts stream) with respect their problem solving Ability

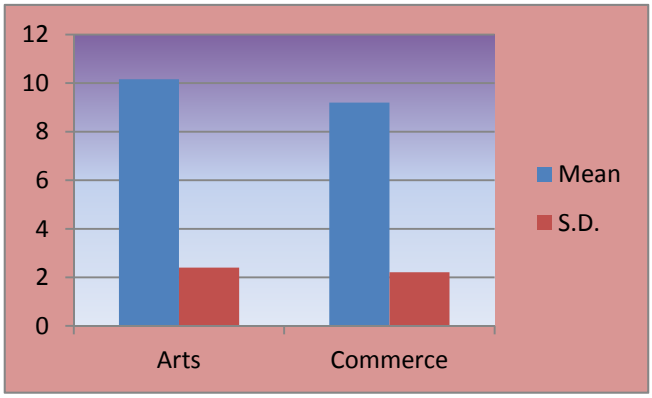
Stream	N	Mean	S.D.	t-value	Level of significance
Science	50	10.78	2.61	3.42	Significant at 0.05 level
Arts	50	9.10	2.29		

It is evident from the table 3.5 that t-value from Science & Arts stream of senior secondary school students with respect to their scores of 'Problem Solving Ability' came out to be 3.42 which is significant at 0.05 level. This indicates that two groups of Science & Arts stream students differ significantly from each other on scores of 'Problem Solving Ability'. Hence, it may be interpreted that S.S. School Students of Science stream exhibit higher level of their problem solving ability in comparison to the S.S. School Students of Arts stream.

6. Objective no.6 of the study aims to compare the Senior Secondary School Students of Arts and Commerce Streams with respect to their Problem Solving Ability.

Table 3.6: t- Value of Senior Secondary Students (Arts & Commerce stream) with respect their problem solving Ability.

Stream	N	Mean	S.D.	t-value	Level of significance
Arts	50	10.16	2.40	2.07	Significant at 0.05 level
Commerce	50	9.20	2.21		



It is evident from the table 3.6 that t-value from Arts & Commerce stream of senior secondary school students with respect to their scores of 'Problem Solving Ability' came out to be 2.07 which is significant at 0.05 level. This indicates that two groups of Arts & Commerce stream students differ significantly from each other on scores of 'Problem Solving Ability'. Hence, it may be interpreted that S.S. School Students of Commerce stream exhibit higher level of their problem solving ability in comparison to the S.S. School Students of Arts stream.

Findings of the Study

On the basis of the statistical analysis the investigator has arrived on the following findings:

1. There is no significant difference between two groups of S.S. School Students Boys & Girls of Science stream on scores of 'Problem Solving Ability'.
2. There is no significant difference between two groups of S.S. School Students Boys & Girls of Commerce stream on scores of 'Problem Solving Ability'.
3. There is a significant difference between two groups of S.S. School Students Boys & Girls of Arts stream on scores of 'Problem Solving Ability'.
4. There is no significant difference between two groups of S.S. School Students of Science & Commerce stream on scores of 'Problem Solving Ability'.
5. There is a significant difference between two groups of S.S. School Students of Science & Arts stream on scores of 'Problem Solving Ability'.
6. There is a significant difference between two groups of S.S. School Students of Arts & Commerce stream on scores of 'Problem Solving Ability'.

Conclusion

On the basis of the present study the researcher conclude that at the senior secondary level different streams i.e. Science, Arts and Commerce have diverse level of difficulty regarding the curriculum. Therefore when a student chooses a stream to study then he/she must be aware about his/her problem solving ability. As, it is found in the present study that the students of Science and Commerce streams have the higher level of problem solving ability as compare to the students of Arts stream. On the other hand there was no significant difference in the level of problem solving ability on the gender basis.

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