PROBLEM SOLVING SKILLS AND ACADEMIC PERFORMANCE AMONG CLASS XI STUDENTS

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ABSTRACT

Problem solving refers to active efforts to discover what must be done to achieve a goal that is not readily available. It is a significant skill that is required to develop through the process of education. It focuses on developing students' productive human beings in today's rapidly changing world, alongwith developing proficiency in problem solving and logical reasoning. In academic pursuit problem solving is regarded as one of the key learning strategy as well as learning outcome in teaching and learning situation. Students who promote problem-based learning as an approach to learning are expected to be more successful in academic performance. The present study has made an attempt to investigate the relationship between problem solving skills and academic performance higher secondary school students, particularly Class XI of Dhemaji District of Assam. The personal information form and Problem Solving Inventory (PSI) developed by Heppner (1988) was adopted for collecting the pertinent data and found that (i) problem solving confidence is significantly associated with academic performance of higher secondary students; (ii) there is a positive correlation between overall problem solving skills and academic performance, and (iii there is no significant difference between male and female higher secondary students on problem solving confidence, approach-avoidance style, personal control and overall problem solving.

(Key Words: Problem Solving, Academic Performance, Class XI Students, Personal Control, Problem Solving Confidence Level**)**

1. INTRODUCTION

Problem solving is a significant skill that is required in all fields of human endeavour. It is a topic of great significance to a wide range of areas, like counseling and clinical psychology, social work, medical and health care, etc. It is a subject of unique interest to many such as school psychologists, health care professionals, and social service specialists. That everyone is born into this world with a lot of abilities and talents, and that all along the way he/she sets short-term and long-term goals to achieve leaves him/her with many problems to solve. So to say, life is replete with daily hassles and stressful events. And in academic pursuit problem solving is regarded as one of the key learning strategy as well as learning outcome in teaching and learning situation. In order to make students productive human beings in today's rapidly changing world, alongwith developing proficiency in other skills, focus should be given on development of proficiency in problem solving and logical reasoning.

Problem solving is very relevant for educators, school psychologists, and student affairs professionals. Educators are often interested not only in imparting knowledge about specific topics but also in increasing students' problem-solving abilities; thus, the advent of problem-based learning has made problem solving central to the educational process. Problem solving is directly related to the academic achievement of students, or it may be considered as a potent agent of high academic performance of the learners.

2. THEORETICAL BACKGROUND AND REVIEW OF LITERATURE

Problem solving refers to active efforts to discover what must be done to achieve a goal that is not readily available. Obviously, if a goal is readily attainable, there isn't a problem. But in problem solving situations, one must go beyond the information given to overcome obstacles and reach the goal (Weiten, 1992). Problem-solving has been defined as an overt or cognitive process that makes available a variety of potentially effective response strategies for coping with problematic situations (Alvarez, Colter & Jason, 2001). The problem solving skills of a person depends on his/her critical personal resource for dealing with stressors. Problem solving is further defined as the complex inter-play of cognitive, affective, and behavioural processes for the purpose of adapting to internal or external demands or challenges (Heppner & Krauskopf, 1987).

The study of problem solving has a rich and varied history. One of first systematic studies of problem solving was conducted by E L Thorndike, a behaviourist, whose subjects were cats. According to the behaviourists, problem solving is essentially a "mindless" process whereby learned responses automatically play themselves out. This stimulus-response is preferred by them for all varieties of behaviour, not just problem solving (Robinson, 2008).

It has been suggested for some time that ineffective problem solving results in stressful outcomes and psychological maladjustment (D'Zurilla & Goldfried, 1971; Goldfried & D'Zurilla, 1969; Howard & Scott, 1965; Luchton, 1974; Mahoney, 1974; Mechanic, 1968, 1974; Spivack, Platt, & Shure, 1976; Spivack & Shure, 1974). It makes sense that effective problem solvers are flexible, adaptable, and are able to develop suitable methods to solve problems and reach personal goals (Durlak, 1983).

Heppner (1988) developed a 'Problem Solving Inventory' (PSI) in the context of higher secondary schools in relation to students' academic performance which focuses on three constructs: 1) an individual's perceived confidence, self-assurance, or self-efficacy in his or her problem solving, 2) an individual's seeming approach or avoidance style in problem solving, and 3) an individual's perceived sense of personal control over his or her emotions or affective processes during problem solving (Houtz & Selby, 2009).

Elliott et al. (1990) examined the relation between problem-solving appraisal, academic aptitude, study habits, and academic performance in a group of academically unprepared college students enrolled in a course designed to enhance academic skills. The results of their study revealed that the PSI (especially the Problem Solving Confidence factor) did predict scores on the Survey of Study Habits and Attitudes (Brown & Holtzman, 1967) after variance due to gender and academic aptitude were removed. Although the PSI was not predictive of course grade, the PSI (especially the Problem Solving Confidence factor) was predictive of the semester GPA. Thus, the PSI might be used to identify students at risk of academic failure.

Perhaps one of the most dramatic changes found using the PSI in an educational setting has been reported by Woods (1994). He used a problem-based learning curriculum in teaching undergraduate engineering students. The magnitude of change that Woods has consistently found from this training is very large. Thus, the PSI can also be used as a measure of problem-based learning, most likely across a wide range of curricula.

3. THE RATIONALE OF THE STUDY

Students who promote problem-based learning as an approach to learning are expected to be more successful in academic performance and to be better prepared for self-directed, lifelong learning. Most researchers see problem solving as consisting of a sequence of activities, including problem orientation, generation of alternatives, selection of strategies, and evaluation of outcomes (Hill-Briggs, 2003). Pretz et al. (2003) defined problem solving as a set of mental activities composed of (a) recognizing the problem, (b) defining and representing the problem, (c) developing a solution strategy, (d) organizing one's knowledge about the problem, (e) allocating mental resources for solving the problem, (f) monitoring one's progress toward the goal, and (h) evaluating the solution.

Theoretical accounts of problem solving postulates specific cognitive behavioural skills as important aspect involved in academic achievement. Effective problem solving can decrease negative affective states by enabling a student more effectively managing the problems. In addition to the link with problems, there is a large body of empirical research demonstrating the relation between problem solving and other variables. Studies have found problem solving to be related to mathematical achievement, verbal and general reasoning ability, spatial ability, field independence, divergent thinking, positive attitudes, and resistance to distraction (Geary, 2004). Problem-solving confidence behaviours distinguish successful problem solvers from poor problem solvers (Mayer, 1999). For example, successful problem solvers (a)

quickly and accurately identify the mathematical structure (e.g. compare) of a problem that is generalizable across a wide range of similar problems, (b) remember a problem's structure for a long time, and (c) distinguish relevant from irrelevant information (Quilici & Mayer, 1996).

However, the empirical evidence supporting the relationship between problem solving and academic performance is limited in India in general, and no studies have been found indicating the problem solving confidence level, approach-avoidance style and personal problem solving control abilities among the secondary school students in particular. In addition, comparing the gender difference in problem solving ability will extend the possibility of differently training the students in problem solving skills. Thus, in the above context, a need is felt to investigate the relationship between problem solving skills and academic performance in higher secondary school students.

4. STATEMENT OF THE PROBLEM

On the basis of the above background, the present study was stated as "*Problem Solving Skills and Academic Performance among Class XI Students"* with a view to answer the following questions:

5. RESEARCH QUESTIONS

1) Does problem solving confidence affect academic performance of students?
2) Does approach-avoidance style have an effect on academic performance of the students?
3) Does personal control have an effect on academic performance of the students?
4) Does problem solving ability differently influence gender?

6. OBJECTIVES OF THE STUDY

1) To study the problem solving confidence level and academic performance of class XI students.
2) To study the approach-avoidance style and academic performance of class XI students.
3) To study the personal control level and academic performance of class XI students.
4) To investigate the gender differences in problem solving confidence level, academic performance style and personal control among class XI students.

7. HYPOTHESES

1. There is a significant improvement in academic performance of class XI students who have greater perceived problem solving abilities.

   H_0 : There is no significant relationship between academic performance and problem solving abilities of class XI students.
2. There is a significant improvement in academic performance of class XI students who have greater approach-avoidance style.

   H_0 : There is no significant relationship between academic performance and approach – avoidance style of class XI students.
3. There is a significant improvement in academic performance of class XI students who have greater personal control level.

   H_0 : There is no significant relationship between academic performance and personal control level of class XI students.
4. There is significant gender difference in problem solving confidence, academic performance style and personal control among class XI students.

   H_0: There is no significant gender difference in problem solving confidence, academic performance style and personal control among class XI students.

8. OPERATIONAL DEFINITIONS OF KEY TERMS

1) **Problem solving confidence:** Problem-Solving Confidence is defined as self-assurance while engaging in a wide range of problem-solving activities, a belief and trust in one's problem-solving abilities (Heppner, 1982).
2) **Approach-avoidance style:** Approach-Avoidance Style is defined as a general tendency to approach or avoid different problem-solving activities. Additionally, lower scores on this factor are associated with approaching problems, and higher scores are associated with avoiding problems (Heppner, 1982).
3) **Personal control:** Personal Control is defined as believing one is in control of one's emotions and behaviors while problem solving. This factor seems to reflect emotional over-reactivity and behavioural control (Heppner, 1982).

4) **Academic Performance:** Academic performance is defined as the achievement of students after completing a course. It measures students' learning in various subjects that can be determined by formative and summative evaluation.

9. RESEARCH DESIGN

The purpose of the present study was to investigate the relation between problem solving skills and academic performance among class XI students.

(a) Variables:

Problem solving confidence, approach-avoidance style, problem solving and personal control were the independent variables. Gender was also considered as an independent variable, and academic performance was the dependent variable in the present study.

(b) Population:

The universe for the present study was defined as all the class XI students studying in Secondary Schools of Dhemaji District in Assam.

(c) Sample:

Six Higher Secondary Schools were selected through using purposive sampling method of Dhemaji District in Assam. In selecting the respondents, incidental sampling was used. As such, all the class XI students of six Higher Secondary Schools under research, who were found present during the time of data collection, were considered as sample for collecting the pertinent data of the study. The sample consisted of four hundred class XI students (228 males and 172 females).

(d) Tools:

The personal information form and Problem Solving Inventory (PSI) developed by Heppner (1988) was adopted for collecting the pertinent data for the study. The personal information form sought information regarding name, age, gender, school, class, section, caste/tribe, mother tongue, and academic scores of the respondents.

The Problem Solving Inventory (PSI) of Heppner (1988) is a 35-item self-report measures to which individuals respond on a 6-point scale to each item. The PSI measures three constructs as well: 1) an individual's perceived confidence, self-assurance, or self-efficacy in his or her problem solving; 2) an individual's seeming approach or avoidance style in problem solving; and 3) an individual's perceived sense of personal control over his or her emotions or affective processes during problem solving.

(d) Statistical Analysis

Pearson's product-moment correlation was used to compute the correlation between problem solving confidence, approach-avoidance style, personal control, problem solving and academic performance.

Independent t-test was used to find out the significant difference between the means of male and female higher secondary school students on problem solving confidence, approach-avoidance style, personal control, problem solving and academic performance.

10. ANALYSIS AND INTERPRETATION OF DATA

The purpose of the present study was to investigate the relation between problem solving skills and academic performance of the class XI students, and to find out the difference between male and female adolescent problem solving abilities. After the collection of data, 400 students (n=400; 228 males and 172 females), from six schools were analyzed.

(a) Descriptive Characteristics of the Sample

Table-1 indicates the Mean and Standard Deviations of the independent and dependent measures of problem solving subscales and academic performance of male and female students. Male students were found to have greater problem solving confidence (M=29.21, SD=8.61) than female students (M=27.94, SD= 7.19). The Mean value on approach-avoidance style (M=52.32, SD=9.30) of male students were

higher than the Mean value of female students (M=50.98, SD=8.23). However, there is no mean difference on personal control of male and female students. On the other hand, there was a difference between male and female students on problem solving M=101.52, SD=17.33, (M=98.85, SD=13.28). But there is a mean difference between male and female students on academic performance, which implies female students have better academic performance when comparing with the mean value of male students.

Table-1: Mean and SD of Problem Solving Ability subscale and academic performance

Problem Solving Sub-Scale	Male		Female	
	M	SD	M	SD
Problem solving confidence	29.21	8.61	27.94	7.19
Approach-avoidance style	52.32	9.30	50.98	8.23
Personal control	19.71	6.65	19.88	4.72
Problem solving	101.52	17.33	98.09	13.28
Academic performance	39.91	85.68	430.09	80.80

(b) Correlation Coefficient Analysis

Pearson's product-moment correlation was computed to find out the correlation between problem solving subscales and academic performance.

Table 2: Correlation Coefficient Values of Problem solving subscale and Academic performance

Variables	N	M	SD	r
Academic performance and Problem solving confidence	400	18.66	8.04	31**
Approach-avoidance style	400	51.74	8.87	28**
Personal Control	400	19.78	5.89	26**
Problem solving	400	100.37	15.76	37**

**p < .01

Table-2 indicates that there was a significant positive correlation between problem solving confidence, approach-avoidance style, personal control, problem solving and academic performance. This indicated that higher secondary students who had higher between problem solving confidence, approach-avoidance style, personal control, problem solving had better academic performance. Hence, hypothesis stated "there is no significant relationship between academic performance and problem solving abilities of higher secondary school students", there is no significant relationship between academic performance and approach – avoidance style of higher secondary school students", there is no significant relationship between academic performance and personal control level of higher secondary school students" were rejected.

(c) Gender difference on Independent and Dependent Measures

Independent *t*-test was carried out to find the significant difference between male and female students on all independent and dependent measures. The result analysis in Table-3 shows that there was no significant difference between male and female students on Problem solving confidence, Approach-avoidance style, Personal control, and Problem solving. On the contrary there was a significant difference between male and female students on academic performance. This difference was significant t (398) = -4.76, p < .01. That is female students (M=430.72, SE = 80.80), have greater academic performance when compared with male students (M=389.91, SE = 85.68). Hence, hypothesis stated "There is no significant gender difference in problem solving confidence, approach-avoidance style, personal control, and Problem solving and academic performance among higher secondary school students (Figure 1and 2).

Table-3: Difference between male and female students with regards to problem solving confidence, approach-avoidance style, personal control, problem solving, and academic performance

Variables	Gender	n	M	SD	t (df=398)
Problem solving confidence	Male	228	29.21	8.61	1.55
	Female	172	27.94	7.19	
Approach-avoidance style	Male	228	52.32	9.30	1.50
	Female	172	50.98	8.23	
Personal Control	Male	228	19.71	6.65	-0.29
	Female	172	19.88	4.72	
Problem Solving	Male	228	101.52	17.33	1.68
	Female	172	98.85	13.28	

Academic Performance	Male Female	228 172	389.91 430.09	85.68 80.80	-4.76**

** p < .01

Table 2 indicated a significant difference between higher secondary males and females in academic performance. The mean score of male and female higher secondary students indicated that female students were high academically achievers when compared to male higher secondary students. This result is in contradictory with the study of Gupta (2013) who found sex had no significant impact on the academic achievement of students In addition there was no significant difference between male and female higher secondary students on problem solving confidence, approach-avoidance style, personal control and overall problem solving.

11. FINDINGS

The results of the present investigation have led to the following findings:

1. Problem solving confidence is significantly associated with academic performance of higher secondary students.
2. Approach-avoidance style and academic performance is positively correlated among higher secondary students.
3. There is a significant positive relationship between personal control and academic performance among higher secondary students.
4. Positive correlation is found between overall problem solving skills and academic performance among higher secondary students.
5. There is no significant difference between male and female higher secondary students on problem solving confidence, approach-avoidance style, personal control and overall problem solving.
6. A significant difference is found between male and female higher secondary students on academic performance.

12. OBSERVATION AND DISCUSSION

Problem solving confidence had a significant positive relationship with academic performance. This denotes that students who had greater problem solving capacities were good achievers academically. This finding corresponds with those of previous studies Udeani and Adeyemo (2011) who found a positive significant relationship between students' learning styles and their academic achievement. Geary (2004) also identified an association between mathematical achievement, verbal and general reasoning ability, spatial ability, field independence, divergent thinking, positive attitudes, and resistance to distraction. Hedjazi, Shakiba and Monavvarifard (2012) established a significant positive relationship between academic achievement and creative and confidence problem-solving style.

Table 2 also indicates a positive relationship between approach avoidance style and academic performance. This shows the general tendency of students to approach or avoid different problem-solving activities and their relationship to academic performance. Tian, Heppner and Hou (2014) found a negative relationship between problem solving appraisal and psychological distress. This implies that the approach of students to problem solving is an important element in psychological well-being which can also have an impact in academic performance.

Personal control was found to have a significant positive association with academic performance. This indicates that students who have control of one's emotions and behaviours while problem solving have greater academic performance. This factor reflects emotional over-reactivity and behavioural control of students during the problem solving phase. This result is in line with the existing study by Hsieh, Sullivan and Guerra (2012) who found the association between personal control, self-efficacy, goal orientation, coping strategies and self-regulation and students' grades.

The overall problem solving was significantly associated with academic performance, which entail that students who have higher problem solving capacity were superior academic achievers. This result was in correspondence with Salami and Aremu (2002) who established a significant association between problem solving ability and study behavior which indicated problem solving confidence, approach-avoidance style and personal control were effective in predicting study behaviour.

13. CONCLUSIONS

Problem solving confidence, approach avoidance style and personal control are significantly associated with academic performance of higher secondary students. This shows that problem solving skills of the higher secondary students plays a vital role in achieving their academic performance. A significant difference is found between male and female students on academic performance. However there is no significant difference between male and female higher secondary students on problem solving skills. Thus the teaching method of the classroom environment may be altered according to the gender of the students.

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