

## EFFECTIVENESS OF ENVIRONMENT BASED EXPERIENTIAL LEARNING PROGRAM ON CRITICAL THINKING SKILLS FROM PSYCHOLOGICAL HARDINESS PERSPECTIVE

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### ABSTRACT

*The present study was undertaken to examine the effectiveness of Experiential Learning Strategies on critical thinking skills of Secondary School students from Psychological Hardiness perspective. The sample comprised of 260 students(132 males and 128 females)studying in four Government Model Senior Secondary Schools of Chandigarh. Psychological Hardiness Scale by Nowack (1990) was administered and students were categorized in High psychological hardiness group and Low psychological hardiness group by using Kelley's Method. Experimental group (N=130) was taught by using Experiential Learning Strategies and control group (N=130) was taught by Traditional Teaching Strategies in Environmental Education. To measure critical thinking skills, students were given an article on environment and asked to analyse it critically and reflect on their thinking process to write essays. The same article was used in both pre- and post tests. Students' essays were graded to find the evidence of critical thinking skills as identified by Delphi study with the help of Critical Thinking Skill rubric devised by Hofreiter et al. (2007). A 2x2 factorial design was used to study the main effects and interaction effects of the independent variables of Teaching strategies and Psychological Hardiness on the dependent variable of Critical Thinking Skills. Significant main effects of Experiential Learning Strategies were revealed on the Critical Thinking Skills of students at .01 level. However no significant main effect of Psychological Hardiness and interaction effect between instructional strategies and psychological hardiness were found on Critical Thinking Skills.*

*Key words: Experiential Learning Strategies, Psychological Hardiness, Traditional Teaching Strategies, of Environmental Education*

### INTRODUCTION

Impact of human activities causes disequilibrium in the environmental set up, resulting in

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various problems for today as well as for future. It has been realized that the impact of human activities on environment has become more accelerated and pronounced in this decade. Some educators believe that a proper and right kind of education to bring behavioural change is the key to solve environmental problems. Environmental Education (EE) is a process which develops attitudes, skills and values to empower individuals to work on their own or in collaboration to combat the current environmental problems and prevent the emergence of new ones so that this beautiful planet is inhabitable for future generations also. Environmental educators must ensure that their practices are congruent with the philosophical aims of the discipline. Chawla (1998) expressed “free encounters with the natural world are becoming inaccessible to younger people in an increasingly urbanized world”. Therefore, techniques for imparting Environmental Education must ensure maximum involvement of learners and provide enough opportunities for students to experience the environment, actual or simulated. Selby (1996) suggested that there should be an integration of cooperative learning structures; and there should be forms of interactive and experiential learning integrated into the program. The appropriateness and relevance of EE methodology to develop critical thinking should be viewed in light of massive global challenges. We have to make choices and decisions after critically examining information and opinions in order to find solutions for environmental problems. As environmental problems are the results of ruthless human activities; there is also an urgent need to develop skills for evaluating the future consequences of our present actions and the actions of others.

Experiential learning is learning through reflection on doing. Thus, one makes discoveries and experiments with knowledge first hand, instead of hearing or reading about others' experiences. The Tbilisi Declaration stated the importance of teaching critical thinking skills to students so that they are prepared to deal with complex social and environmental issues effectively (Intergovernmental Conference on Environmental Education, 1978). Critical thinking thus may help in analysis of an environmental issue or situation based on facts, data or evidence related to it by stepping aside personal beliefs, prejudices, and opinions. It presents a challenging thought process where one resorts to a set of higher cognitive abilities and skills for the proper interpretation, analysis, evaluation and inference, as well as explanation of the factual information resulting in a purposeful, unbiased and self-regulatory judgment. Critical Thinking Skills include observation, analysis, interpretation, reflection, evaluation, inference, explanation, problem solving, and decision making. Ennis (1987) defined critical thinking as “reasonable, reflective thinking that is focused on deciding what to believe or do”. Freeley

and Steinberg (2000) state critical thinking is "the ability to analyse, criticize, and advocate ideas; to reason inductively and deductively; and to reach factual or judgmental conclusions based on sound inferences drawn from unambiguous statements of knowledge or belief". Therefore it is imperative that we utilize experiential approach to teaching-learning about and from the environment with due stress on practical activities and first-hand experience.

The disposition to think critically has been defined as the "consistent internal motivation to engage problems and make decisions by using critical thinking" (Facione, 2000). Consistent internal motivation may be possible due to disposition of Psychological Hardiness. Hardiness is a combination of an internal locus of control, appreciation of challenge as opportunity and commitment to self. Hardiness involves a high sense of commitment to life and work, a strong belief in one's ability to control events and influence outcomes, and greater openness to changes and challenges in life (Maddi and Kobasa, 1984 ; Maddi,1999).But there is lack of studies on the main and interaction effects of experiential learning and psychological hardiness on critical thinking skills of school students. The present investigation was undertaken to study the main effects and interaction effects of the independent variables of Teaching strategies (Experiential Learning Program and Traditional Teaching Method) and Psychological Hardiness(High and Low) on the dependent variable of Critical Thinking Skills.

### **OBJECTIVES**

1. To study whether the groups taught through Experiential Learning Strategy and Traditional Teaching Strategy differ in mean gain scores on Critical Thinking Skills.
2. To study whether the groups with High Psychological Hardiness and Low Psychological Hardiness differ in mean gain scores on Critical Thinking Skills.
3. To study whether there is any interaction effect between Teaching Strategies and Psychological Hardiness on Critical Thinking Skills.

### **HYPOTHESES**

**H<sub>01</sub>**. There exists no significant difference in the mean gain scores on the Critical Thinking Skills between groups taught through Experiential Learning Strategy and Traditional Teaching Strategy.

**H<sub>02</sub>.** There exists no significant difference in the mean gain scores on the Critical Thinking Skills between groups with High Psychological Hardiness and Low Psychological Hardiness group.

**H<sub>03</sub>.** There exists significant interaction between instructional strategy and Psychological Hardiness on the Critical Thinking Skills.

## **METHODOLOGY**

### **Sample**

A sample of 260 students participated in this investigation. The subjects were class IX students studying in four government model schools of Chandigarh.

### **Tools used**

- i) Instructional material for experiential learning program on environmental education for giving treatment to students (developed by investigator)
- ii) Psychological Hardiness Scale by Nowack (1990). This scale has 30 items related to Locus of Control, Commitment and Challenge. Psychological hardiness is conceived as personality-based tendency to diminish the impact of stressful life events by optimistic cognitive appraisals and decisive coping actions.
- iii) Critical Thinking Skill Rubric devised by Hofreiter et al (2007) to evaluate the students essays. The six skills defined by the Delphi study (1998) and used in the rubric are:
  - Interpretation: The ability to understand information.
  - Analysis: The ability to identify the main arguments presented.
  - Evaluation: The ability to judge whether this argument is credible and valid based on the logic and evidence given.
  - Inference: The ability to decide what to believe or do based on solid logic, and to understand the consequences of this decision.
  - Explanation: The ability to communicate the process of reasoning to others.
  - Self-Regulation: The ability to monitor one's own thinking and correct flaws in logic.

The investigator also found the reliability and validity of the essay instrument. An article, “crisis: choosing between pristine nature and petroleum”, was taken from the book titled “Environmental Studies: from crisis to cure” by Raja Gopalan. This article was given to ten experts to check the appropriateness of the contents for secondary school students. After getting 85% unanimity of experts over the content matter, the article was given to 50 students of class-IX studying in English medium school of Chandigarh to establish reliability. Students were asked to critically analyze it and reflect on the thinking process they had used. Essays written by students were graded by two different graders with the help of Critical thinking skill rubric devised by Hofreiter et al (2007). Inter-rater reliability of 0.82 was obtained which is high correlation for essay test.

### **Procedure**

Psychological Hardiness Scale was administered to the whole sample. The sample was divided into two groups namely experiential learning group (n=130) and traditional teaching group (n=130) depending on the teaching strategies employed. Students were categorized in High psychological hardiness group and Low psychological hardiness group by using Kelley’s Method. Researcher used essay instrument to evaluate ability to demonstrate critical thinking skills of whole sample via a written analysis of an article “Crisis: Choosing between Pristine Nature and Petroleum”. Then the group was provided instruction through forty activity/activities plans involving experiential learning strategies for a period of fifty days for one hour on an average excluding the days of post-testing. The same article was used for post-testing after treatment.

### **Administration**

Simple and explicit instructions were given to students. The directions were also provided to each student on a separate sheet. When the test was administered, directions were read aloud. Besides directions, a criteria and scoring sheet was also given to every student. There was no time limit but it takes about 40 minutes-10 minute to read and think about the article and 30 minutes to write the six paragraphs evaluating the argument of the article.

### **Scoring**

The criteria and scoring suggestion for grading the test were used flexibly and with judgment. This is because critical thinking is an open ended activity and graders must use their over

judgment interpreting responses and determining whether they satisfy the relevant criteria. Researcher used critical thinking skill rubric devised by Hofreiter et al. ( 2007) to score the students' essays . The top possible score is 120. Each skill was divided into four sub -skills as identified by the Delphi study and assigned a number from 1 to 5 depending on the quality of the response.

## RESULTS AND DISCUSSION

A 2x2 factorial design was used to study the main effects and interaction effects of the independent variables of Teaching strategies and Psychological Hardiness on the dependent variable of Critical Thinking Skills.

**Table 1. Summary of 2x2 analysis of variance for the variables of teaching strategies and Psychological Hardiness on mean gain scores for the dependent variable of Critical Thinking Skills (CTS)**

Source of Variation	Df	Sum of Squares	Mean sum of Square	F	Sig.
Teaching Strategies (A)	1	1,062.075	1,062.075	24.428**	0.000
Psychological Hardiness (B)	1	63.075	63.075	1.451	0.231
AXB	1	0.008	0.008	0.000	0.989
Error: within treatment	116	5,043.433	43.478		
Total	120	10,573.000			
Corrected Total	119	6,168.592			

F= 3.92 to be significant at 0.05 level for 1/116 degrees of freedom

F= 6.85 to be significant at 0.01 level for 1/ 116 degrees of freedom

\*Significant at 0.05 level

\*\* Significant at 0.01 level

## Interpretation and discussion based on Table 1

### Main effects of teaching strategies (Experiential Learning Strategy and Traditional Teaching Strategy) on Critical Thinking Skills

From Table 1, it is evident that F- value of 24.428 is significant at 0.01 level of confidence for the main effect of teaching strategies namely Experiential Learning Strategy and Traditional Teaching Strategy on Critical Thinking Skills as it is more than 6.85 for 1/116 degrees of freedom. It shows that mean gain scores of the group taught with Experiential Learning Strategy differ significantly from the group taught with Traditional Teaching Strategy on Critical Thinking Skills (CTS). Therefore null hypothesis  $H_{01}$  "There exists no significant difference in the mean gain scores on the Critical Thinking Skills between groups taught through Experiential Learning Strategy and Traditional Teaching Strategy" stands rejected. The mean gain score of Critical Thinking Skills of the group taught through Experiential Learning Strategy was found to be 9.033 which is higher than that of mean gain score of 3.083 of group taught through Traditional Teaching Strategy.

This result is entirely consistent with prior studies (Ernst and Monroe , 2004; Robinson ,2005; Hofreiter et al., 2007)and observations made in the present study. The results of these studies support the use of environment-based education for improving critical thinking skills. Abrami et al. (2008) found a small but positive and significant effect of collaborative learning approaches on critical thinking. So consistent with this observation, in the present study group taught through experiential learning programme was provided with opportunities for collaborative learning by means of various group activities performed like field visits, group discussions, conducting experiments and completing assignments in groups.

A closer investigation reveals that the following factors might have contributed towards the positive outcome of Experiential Learning Strategy on Critical Thinking Skill.

Although there are several definitions of critical thinking, the common purpose uniting them is the need to prepare citizens to understand and evaluate complex arguments about current issues. Therefore experiential learning activities like issue analysis ,suggesting solutions to environmental problems individually as well as in group, class room discussions, debates, completing assignments, creating oral/ written/ visual reports, incorporating data derived from various sources into discussion, debate and displays ,conducting simple experiments and arriving at conclusions ,games, visits to field based sites and making observations and

conducting question -answer sessions in the present study provided direct experiences to students and each student reflected on his/her own experiences by using Critical Thinking Skills. So these activities provided opportunities to students to engage in reasonable and reflective thinking to understand, analyse, evaluate arguments and provide solutions for complex environmental issues. Critical thinking can occur within a given subject field and across subject fields in all those spaces where human beings need to interact and make decisions, solve problems, and figure out what to do. Experiential Learning Strategy adopted by the investigator for the experimental group provided those spaces to learners to use their higher order Critical Thinking Skills.

### **Main effect of High Psychological Hardiness and Low Psychological Hardiness on Critical Thinking Skills**

From Table 1, it is evident that F-Value of 1.451 is not significant for the main effect of Psychological Hardiness on Critical Thinking Skills as it is less than Table Value of 3.92 for 1/116 degrees of freedom. It indicates that there is no significant difference between the mean gain scores on the Critical Thinking Skills of group with High Psychological Hardiness and group with Low Psychological Hardiness. Thus null hypothesis  $H_{02}$  "There exists no significant difference in the mean gain scores on the Critical Thinking Skills between groups with High Psychological Hardiness and Low Psychological Hardiness" is accepted.

The possible reason for the above result can be that all individuals irrespective of their hardiness level are engaged in reasonable and reflective thinking that is focused on deciding what to believe or do. However High Hardy individuals have their own control on the events/activities requiring critical thinking and they think that desired reinforcement or outcome can be achieved through one's own behaviour or personal characteristics like commitment and ability to face challenge whereas Low Hardy individuals are motivated by the powerful others (teacher, school authorities, peer group or society) to engage in critical thinking for the success of events and they think that desired reinforcement or outcome is under the control of powerful others. Therefore both High Hardy and Low Hardy students were able to perform equally well on the Critical Thinking Test and no significant difference was found on the mean gain scores of both the groups.

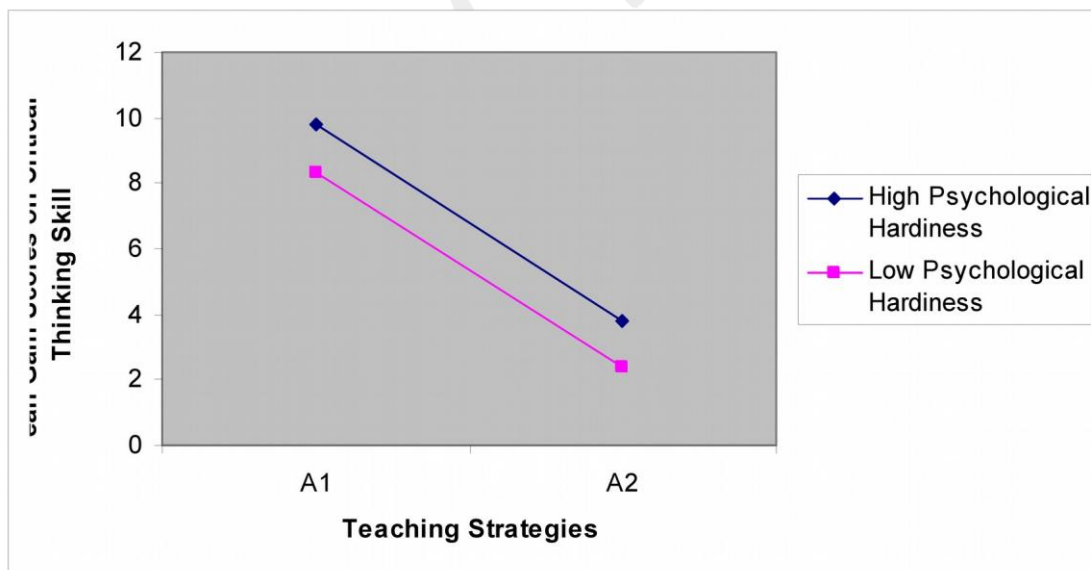
The other reason could be that Critical Thinking Skills do not depend only on psychological disposition of hardiness. On the other hand, Critical Thinking Skills are determined by the



cognitive strategies such as Interpretation, Analysis, Evaluation, Inference, Explanation and Self-Regulation as well as by a multitude of dispositional factors. Many studies support the present finding as cognitive component and dispositional component together determine a person's actual thinking performance (Ennis, 1987; Facione, Sanchez, Facione, & Gainen, 1995; Halpern, 1998).

### Interaction effect between Teaching strategies and Psychological Hardiness (AXB) on Critical Thinking Skills (CTS)

The F-Value of 0.000 (Table 1) for the interaction between Teaching Strategies (A) and Psychological Hardiness (B) with respect to mean gain scores on the Critical Thinking Skills is insignificant as it is lower than Table Value of 3.92 for 1/116 degrees of freedom. Hence null hypothesis  $H_{03}$  "There exists no significant interaction between instructional strategy and Psychological Hardiness on the Critical Thinking Skills" is accepted. The interaction between Teaching strategies and Psychological Hardiness on Critical Thinking Skills is depicted in Fig. 1.



**Fig. 1 Graph indicating interaction effects between Teaching Strategies and Psychological Hardiness on Critical Thinking Skills**

As from fig.1, it is evident that there is no significant interaction between Teaching Strategies and Psychological Hardiness on Critical Thinking Skills and graph shows parallel lines which do not intersect under different levels of Psychological Hardiness in both strategies; A1 (Experiential Learning Strategy) and A2 (Traditional Teaching Strategy).

## EDUCATIONAL IMPLICATIONS

Students taught through Experiential Learning Strategy yielded significantly more gain scores Critical Thinking Life Skills in the present study as compared to the students taught through Traditional Teaching Strategy. This finding offers manifold implications for educators/teachers, teacher educators, NGOs, researchers working in area of Environmental Education and curriculum framers to facilitate experiential learning to lay the foundation for developing Critical Thinking Skills for bringing desirable change as responsible citizenry.

A teacher should organize and facilitate direct experiences to engage students in critical thinking processes under the assumption that this will lead to meaningful and long-lasting learning. He should design experiences carefully, execute safely and process thoughtfully in order to enhance critical thinking skills of his/ her students. He should also evaluate learning outcomes. Such a teacher will develop critical thinking skills in students not only for their student life but also in their future lives also.

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