

EFFECTIVENESS OF CERTAIN LEARNING SITUATIONS IN PHYSICS ON ENHANCING CREATIVE THINKING OF SECONDARY SCHOOL STUDENTS

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ABSTRACT

Creativity is an important aspect of human development. Creative thinking is one of the important thinking skills. Creative thinking skills are the ability of the individuals to use the mind to generate new ideas, new possibilities and new inventions based on originality in its production. Revision of school curriculum to promote thinking skills is essential for competing in the international arena. The present study was intended to prepare certain learning situations for the enhancement of creative thinking among secondary school students, and also to check the effectiveness of the prepared learning situations in enhancing the creative thinking of them. Experimental method was adopted for the study. Non-equivalent two group pretest-posttest design was the experimental design followed. 72 students from Trivandrum district were the sample, selected randomly from among the secondary school students' population. Learning situations for enhancing creative thinking, based on secondary school physics topics and creative thinking test were the tools used for the study. Paired t-test and critical ratio were the statistical techniques employed. From the statistical analysis, it was clear that the prepared learning situations were effective in enhancing creative thinking of secondary school students.

KEYWORDS: Creative Thinking, School Curriculum & Learning Situation

INTRODUCTION

Creativity is an important aspect of human development. Creativity has now become necessary and fundamental aspect to the achievement of a person, organization or country. All acts and thoughts are covered by creativity rather than invention. For achieving the goals of the developed countries, in addition to the excellent academic credentials and noble characters, mastery in thinking skills is essential. Revision of school curriculum to promote thinking skills is essential for competing in the international arena.

Creative thinking is one of the important thinking skills. Creative thinking skills are the ability of the individuals to use the mind to generate new ideas, new possibilities and new inventions based on originality in its production. Through the experiences and the knowledge possessed, individuals strive to find a variety of input ideas in multiple perspectives and dimensions to create new ideas or products.

The phenomenon of creating something new and valuable such as an idea, a joke, a literary work, a painting or musical composition, a solution, an invention etc. is known as creativity. In the revised Bloom's taxonomy of educational objectives (Anderson and Krathwohl, 2001), 'create' as an objective was included. It is regarded as the highest level of cognitive development, requiring synthesis, evaluation and application of all other levels in order to generate, plan and produce coherent new pattern or structure.

In our country, even though several curricula are developed by the state boards/councils or by the national boards like CBSE, ICSE, CISCE etc., all curricula are not the same; however, the basic knowledge of science including Physics, Chemistry, Biology and Maths is compulsory for every student, till 10th grade. The non-uniformity of the curriculum is clearly visible while looking at the quality and scope of science education in India. Higher education in the field of science discipline is under so many issues related to infrastructure facilities, proper quality control of faculty, weak understanding of the difficult concepts etc.

PROBLEM SELECTED AND IT'S SIGNIFICANCE

When we look at the evolution of the school science in India, we can see a clear trend of including more and more content, overwhelmingly in the form of factual information than through laboratory explorations and demonstrations in the syllabus. Thus, the factual information that dominates the syllabi is not supplemented by any kind of activity, so that even the bright students have no option rather than memorizing the facts.

In the present system of education, the students are prepared to know the answers of the questions based on the set syllabi and to reproduce them in the examination, with the aim of qualifying the particular examination. Thus, the knowledge remains confined to the boundaries of marks and degrees. This has suppressed the vast field of curiosity and creativity and of questioning and exploring to a narrow field of examinations, marks and degrees. The problem that we confront is how the students can be made capable of creating new ideas or plans. The aim of the study is to enhance the student's creative thinking, hence the title, effectiveness of Certain Learning Situations in Physics for Enhancing Creative Thinking of Secondary School Students.

OPERATIONAL DEFINITIONS OF KEY TERMS

Learning situations: The prescribed subject matter for a particular subject will not be sufficient to develop the creative thinking of students. It is necessary that learning situations based on a particular subject will be selected with necessary variations and extensions to practice creative thinking skill.

Creative thinking: A way of looking at problems or situations, from a fresh perspective that suggests unorthodox solutions to the problems.

Secondary school students: Students, who completed their upper primary level. The students belonging to 13+ ages were taken for the present study.

HYPOTHESIS

- The learning situations prepared on creative thinking is effective in enhancing creative thinking of secondary school students

OBJECTIVES

- To prepare learning situations based on creative thinking.
- To find out the effectiveness of the prepared learning situations on creative thinking of secondary school students.

METHOD ADOPTED

Experimental method was adopted for the study. Non-equivalent two group pretest-posttest design was the design selected for the study.

DESIGN OF THE EXPERIMENT

Population and Sample

The population was the secondary school students of Kerala. The sample selected for the study was 35 for the experimental group and 37 for the control group from a school selected randomly from Trivandrum district.

Tools Used

- Creative Thinking Test prepared and standardized by the investigator
- Learning situations based on creative thinking

The creative thinking test was prepared by taking fluency, flexibility and originality as the components of creative thinking. Imagination, curiosity and free association, creativity in multiple intelligences, fluency and flexibility were the categories of the components of creative thinking which were taken for the test construction. The item discrimination was calculated by means of t-ratio. The reliability of the test items was calculated by means of the test-retest method. The obtained correlation constant was 0.77, thus the tool ensured the reasonable reliability. The internal consistency of the creative thinking test was established by means of Cronbach’s Alpha, and its value was 0.76. The validity of the test was established by means of face validity.

For the preparation of learning situations, ten lessons were prepared with the brain based extrapolated learning strategies. The topics were selected from Physics part of secondary school syllabus. The content analysis was done and on the basis of that, the lessons to be taught were determined. Brain based extrapolated learning strategies were adopted and the corresponding activities were included. Research regarding the promotion of the creative thinking in the classroom has revealed that, teachers can incorporate creativity in the lesson by specific steps or by simply by fostering an atmosphere of open enquiry.

Analysis and Interpretations

The pretest and posttest scores of creative thinking test from the experimental and control groups were compared by means of paired t-test and critical ratio. The paired t-test was used within-subjects or matched-pairs designs, in which the observations in the groups are linked.

Table 1: Result of the Test of Significance of Difference in Mean Scores (Paired t-test) of Pretest and Posttest in Creative Thinking of Students in the Experimental Group

Test	Mean	SD	N	t	Significance
Creative thinking pretest	70.31	23.84	35	24.04	.000
Creative thinking posttest	88.23	26.41	35		

The obtained paired t-value is 24.04 and is significant at.01 level. The t-statistic ($p < .01$) shows that the pretest and posttest differ significantly at.01 level. Hence, it can be inferred that the learning situations prepared for enhancing creative thinking are effective in improving the creative thinking of the students in the experimental group.

Table 2: Result of the Test of Significance of Difference in Mean Scores (Paired t-test) of Pretest and Posttest in Creative Thinking of Students in the Control Group

Test	Mean	SD	N	t	Significance
Creative thinking pretest	70.95	23.52	37	0.48	0.635
Creative thinking posttest	71.08	24.39	37		

The significance of the obtained t-value is greater than .05, so the value is not significant at .05 level. This indicates that there exist no significant difference in the mean scores of creative thinking of students in the pretest and posttest. Hence, it can be concluded that students taught in the activity oriented method were not able to improve their creative thinking.

For the comparison of effectiveness of the learning situations on students gain in the creative thinking of experimental and control group, the mean and standard deviation of the gain in the scores of creative thinking of students in both the groups were calculated, and the difference between the mean gain scores were determined by the critical ratio. The result of the test of significance is given in Table 3

Table 3: Comparison of the Gain Scores of Creative Thinking of Students in the Experimental and Control Group

Groups	N	Mean	SD	CR	Significance
Experimental	35	17.92	2.57	38.90	.000
Control	37	0.13	0.87		

The critical ratio obtained is 38.41, which is significant at .01 level. This reveals that there is significant difference between the mean gain scores of the experimental and control groups.

Tenability of Hypothesis

The main objective of the study was the preparation of learning situations for enhancing creative thinking of students at secondary level. The investigator compared the effectiveness of the learning situations with the lessons taught, by the activity oriented method for enhancing creative thinking. The tenability of the hypothesis was tested by examining the authenticity of the findings obtained from the experiment conducted. The testing of hypothesis was done on the null hypothesis. The null hypothesis is: There is no significant difference in the effectiveness of the learning situations based on creative thinking skill of students.

- The mean pretest score in creative thinking of experimental group was 70.31 and that of posttest was 88.23. The mean posttest score of creative thinking of experimental group was significantly higher than that of the pretest score ($t=24.04$; $p<.01$)
- The mean pretest score in creative thinking of control group was 70.95 and that of posttest was 71.08. No significant difference was obtained between the pretest and posttest scores of creative thinking of control group ($t=0.48$, $p>.05$)
- When the means of the gain scores of creative thinking of experimental and control groups were subjected to the test of significance for their difference, it was found significant at .01 level (mean scores for experimental group=17.92 and control group=0.13: $t= 38.41$; $p<.01$)

The results showed the difference between the experimental and control groups. So, the null hypothesis formulated was rejected. Instead, the alternative hypothesis that the learning situations prepared on creative thinking is effective in enhancing creative thinking of secondary school students could be accepted.

DISCUSSION AND CONCLUSIONS

The results of the study showed that the learning situations developed were effective in enhancing creative thinking of students at secondary level. As the learning situations were prepared with the extrapolated brain based learning strategies, the students got the extended level of knowledge, in the sense that they were made capable of understanding not only the concepts involved in their textbook, also as per their syllabus. The investigator attempted to make conclusions by comparing the results obtained from the present study, with the results obtained from similar studies.

The study of Davida (2005) on creativity explored the possibility of developing an effective program for enhancing the creative ability of students, to think creatively as well as to evaluate the dynamics of this ability on their own. In the present study, the investigator developed learning situations for enhancing the creative thinking of students.

The study conducted by Krishna Kumari (1988) revealed that the creativity of primary school students was enhanced, when they were taught through brainstorming sessions. Shah (1992) showed that, the creative thinking abilities development program led to the development of fluency and originality of abilities in all groups. Murthy (1989) tried to develop the creative thinking abilities of eighth standard students through teaching of Physics, through synectic model developed fluency, flexibility and originality. These studies applied different strategies for improving creative thinking of students. The investigator developed learning situations based on the extrapolated brain based learning strategies, to improve the creative thinking of secondary school students.

Creative teaching strategies can help the students to generate new ideas and explore areas in greater depth, which in turn equip the children to generate their own knowledge rather than the rote learning process. In addition, with the appropriate techniques in developing creative ideas, students can develop the existing talent and always thinking about how best to develop the talents and abilities. Creative thinking is an important aspect in generating new knowledge, which is holistic and covers all aspects development. Thus, nurturing creativity is important in learning to ensure the quality of human capital. The principal aim of education should be to create individuals-who are capable of doing things (not simply by repeating what other generations have done) and also creative, inventive and discoverers.

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