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Research Article

EFFECTIVENESS OF CONCEPT MAPPING STRATEGY ON SELF REGULATION OF LEARNING AND ACADEMIC PERFORMANCE AMONG GOVERNMENT SCHOOL SCIENCE STUDENTS

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ABSTRACT

Efforts have been made over the last quarter century to improve science education in the schools. Unfortunately, schools are not able to meet the requisite standards of the teaching science. Ways and techniques employed for imparting science education don't cater to the needs of the students. The problem is observed largely in Government schools with minimum guidance. To overcome this situation Government schools need to transform their instructional strategies that help students to manage their own learning and inculcate the required skills. Concept mapping is one of the emerging instructional strategies that help learners to identify, graphically display, and link key concepts by organizing and analyzing information. Thus the present study aims to determine the effectiveness of Concept mapping strategy as a tool in pedagogy to enhance government school student's academic performance and self regulation of learning in science. The study has been carried out on 40 students of science from class ninth selected randomly from Government schools of Hoshiarpur in the state of Punjab. Randomized one group pre test post test research design was employed on the selected sample for data collection. The desired tools and techniques were framed with the support of standardized scales. The statistical techniques used were Mean, Standard deviation and t-test to achieve the opted objectives. The intervention positively indicates the relationships between concept mapping, academic performance and self regulation of learning among students.

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INTRODUCTION

Science is the pursuit and application of knowledge and understanding of the natural and social world following a systematic methodology based on evidence (Science Council, 2009). It deals with scientific principles, facts, fundamentals and ideas that contribute towards sustainable development of the individual as well as the society. Indian education system has emphasized the importance of science education at the school level. But the researchers conducted over the recent few decades have clearly witnessed the fact that there exists a gap in the student's learning. Student's performance was exceedingly good for rote based learning. But they fail in analysis and interpretation. This problem is largely viewed in the Government schools. The instructional techniques and strategies being used in the government schools by the science educators are outdated. They do not inculcate basic science process skills among students. So there is a growing demand for the transition in ways and strategies of teaching science in government schools. Scientific concepts can be derived mainly from child centered activities and experiments. In line with this

assertion, the National Curriculum Framework (2005) reiterates that the pedagogy should be child centered and constructivist based that engage students in the knowledge acquisition, construction of knowledge, analysis and interpretation of the concepts.

Concept mapping is one of the strategies that have emerged as a useful tool in leading science students towards meaningful and effective learning. This strategy has its roots in the Constructivist Cognitive Based Model that engage the learner in the active processing of information throughout the learning experience (Glatthorn & Coble, 1993). Concept mapping was first developed by J. D. Novak of Cornell University in the early 1980's. It is a two dimensional method of representing visual knowledge in the form of a hierarchical graphic network composed of nodes and links. It requires learner to identify, graphically display and link key concepts by organizing and analyzing information (Hsu, 2005) thus helping them to manage their own learning process. Most of the researches have been carried out to determine the effect of concept mapping on various cognitive and affective domains in private

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or public schools. The sector of government schools still needs attention of the researchers. Hence the present study is framed to figure out the impact of concept mapping on academic performance and self regulation of learning among science students of government schools.

REVIEW OF THE LITERATURE

The efficacy of Concept mapping has been supported in the literature by number of studies. It has evolved as a practicable method of instruction in the private schools. But the literature lacks the studies concerning the implementation of concept mapping strategies in government schools. For instance Mohamed (1997) studied the effectiveness of concept mapping in learning science subjects by Arab students in a preparatory school and indicated that experimental group subjects achieved better than control group. Pasana & Teresa (2003) investigated the effectiveness of concept mapping used as a learning strategy with students in English as Second Language classrooms at Major University in the Midwest. Jeng (2012) conducted a study on high school students of history class and revealed that concept mapping has a positive impact on their academic learning. Similarly, an experimental research carried out by Laxmi *et al* (2013) on 6th grade public school students to examine the effect of concept maps in science. Though studies have also been conducted on Government school students but they are less in number. So this study focuses on the Government schools of Hoshiarpur District of Punjab.

Justification of the Study

As concept mapping has emerged as an important instructional tool in the recent few decades. It is widely accepted by the foreign nations to impart quality education. Indian education system has also acknowledged its effectiveness. Steps have been taken to implement this strategy in the school system from the very early stage of education so that students can manage their learning. But the literature surveyed indicated that researches have been carried out taking public and private schools into consideration. Very few studies have been reported in the government school students. Therefore, it would be worthwhile to carry out a research on this strategy applied to government school students of Hoshiarpur district.

Objectives of the Study: Following objectives have been taken for the study.

1. To study the effect of Concept Mapping on Self Regulation of Learning among ninth class science students.
2. To study the effect of Concept Mapping on Academic Performance among ninth class science students.

Hypotheses: Following hypotheses have been framed for the study.

1. There will be no effect of Concept Mapping on Self Regulation of Learning on ninth class science students.
2. There will be no effect of Concept Mapping on Academic Performance on ninth class science students.

METHODOLOGY AND PROCEDURE

Design of the study: To study the effect of Concept Mapping on self regulated learning and academic performance among ninth class students, researcher has adopted the 'Randomized one group pretest-posttest experimental design'.

- **Preparation of Concept Maps:** The investigator prepared the concept maps from the selected units of ninth class science subject and organized as per the requirements of treatment. The Achievement test for science was designed by the investigator herself.
- **Pre-test administration:** Academic Self regulated learning skills (A-SRLS) scale by Magno (2010) and self prepared Science achievement test were administered on the students as a pre test. Instructions were given to the experimental group.
- **Intervention:** After administering pre-test, students were taught through Concept Maps prepared on the selected units in the given period of time.
- **Post-test Administration:** After intervention, post test was administered on the students.

Sample Size

In the present research 40 science students of class ninth from four government schools of Hoshiarpur district of Punjab were selected through simple randomization technique of sampling.

Tools: The following tools were employed.

1. Achievement test in Science was formulated and validated by the researcher.
2. Standardized Academic Self regulated learning skills scale by Magno (2010)

Data Collection

The primary data collected from the selected sample of 40 students in the experimental study in the form of self prepared tool and standardized test containing relevant questions. Achievement test in Science and Self regulated learning skills scale by Magno (2010) were administered on the students for pre-test and post-test scores. The scoring key of the self made questionnaires was prepared by the investigator for marking the answer of each (Pretest and Posttest) tests.

ANALYSIS AND INTERPRETATION OF DATA

Hypothesis I: "There will be no impact of Concept Mapping on Self regulation of learning on ninth class science students."

This hypothesis was tested by calculating mean and SD of Self regulated learning skills scale scores. The hypothesis was further examined by applying t-test on Self regulated learning skills scale scores for both pre test and post test.

Table 1 Showing Mean, SD, SEM, SE_D and t-ratio for Self regulated learning skills scores

Tests	N	Mean	SD	SEM	SE _D	t-ratio	Interpretation
Pre Test	40	13.75	4.63	0.73			
Post Test	40	21.93	4.53	0.72	1.025	7.9733	Extremely significant at 0.05 level

It can be seen from the table that the t-ratio of significance of difference of means in pre test and post test scores for self

regulation scale is $9.3411 > 1.96$ which is extremely significant at 0.05 level of significance. Therefore, hypothesis, “There will be no impact of Problem Based Learning on Self Regulation of ninth class science students” stands rejected. It is found that problem based learning enhances the self regulation. Student’s pre test and post test scores vary significantly.

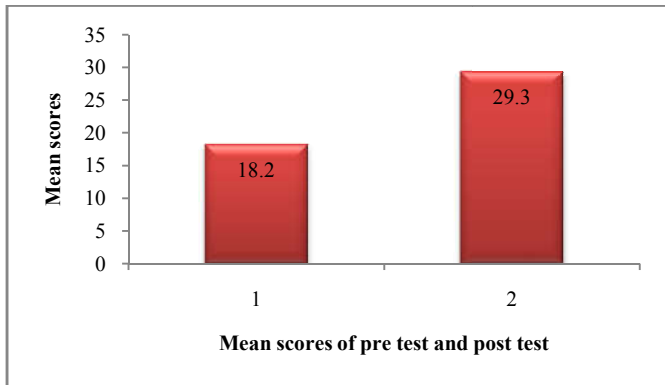


Fig 1 Showing schematic representation of mean scores of pre test and post test on self regulation

The above figure illustrates the mean scores of pre test and post test on self regulation among science students. The mean scores for both pre test and post test indicates that Problem based learning has a positive effect on self adapted learning skills among science students.

Hypothesis II: “There will be no impact of Problem Based Learning on Academic performance of ninth class science students.”

This hypothesis was tested by calculating mean and SD of academic performance test scores. The hypothesis was further examined by applying t-test on the achievement test scores for both pre test and post test.

Table 2 Showing Mean, SD, SEM, SE_D and t-ratio for achievement test scores

Tests	N	Mean	SD	SEM	SE _D	t-ratio	Interpretation
Pre Test	40	13.75	4.63	0.73			Extremely significant at 0.05 level
Post Test	40	21.93	4.53	0.72	1.025	7.9733	

It is evident from the table that t-ratio of significance difference of means in pre test and post test is $7.9733 > 1.96$ which is statistically significant at 0.05 level of significance.

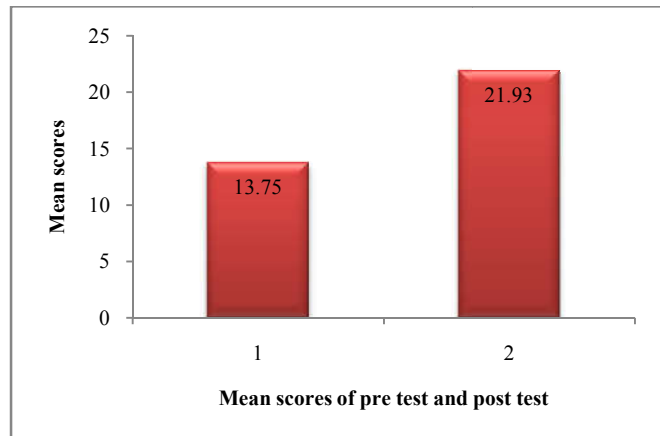


Fig 2 Showing schematic representation of mean scores of pre test and post test on academic achievement test

Therefore the hypothesis “There will be no impact of Problem Based Learning on Academic performance of ninth class science students” stands rejected. It is found that there exists a positive impact of problem based learning on achievement of science students. Implementation of PBL increases the achievement scores of students in science achievement test.

The figure depicts the mean scores of pre test and post test on achievement test. It is evident that the applications of Problem based learning as a teaching strategy in the science subject significantly enhance the scores of the students.

CONCLUSION AND DISCUSSION

This study has elucidated the effectiveness of the concept mapping approach both in terms of the students’ academic performance and self regulation of learning. A total of 40 students were selected randomly from four government schools of Hoshiarpur district for determining the effect of experimental variable on the dependent variables. Randomized single group pretest posttest design was employed. The results significantly showed that the t-ratio of significance difference of means in pre test and post test scores for academic achievement and self adapted learning skills were, $15.144 > 1.96$ and $13.612 > 1.96$ respectively, that were statistically significant at 0.05 level of significance. This demonstrated that concept mapping has significantly contributed to improve student’s achievement and self regulation of learning among students.

Further Implications

- The implementation of Concept Mapping as an experimental variable to study its effects on the academic performance and self regulated learning among students has clearly indicated that concept mapping should be administered at higher level in the educational sector.
- Future concept mapping studies should consider the learner’s level of knowledge and cognitive/social development.
- In addition to this, the study can be carried forward at primary, elementary, secondary as well as senior secondary level to improve the quality of teaching and learning.
- Study can be carried out on a larger sample.
- The study can also be conducted on other geographical areas.

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