

Effect of Concept Mapping on the Academic Achievement of Rural Secondary School Students in Mathematics

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Abstract: Concept mapping is a technique for representing knowledge in graphs. Concept mapping is a meta-learning strategy that can be used to develop student's capacity to learn independently. The present study is experimental in nature and conducted 200 rural secondary school students of Kapurthala district of Punjab. Result showed that concept mapping has a noticeable impact on achievement of student in mathematics.

Keywords: Concept mapping, Graphical representation, Rural secondary school students

INTRODUCTION

The technique of concept mapping was developed by Joseph D. Novak and his research team at Cornell University in the 1970s as a means of representing the emerging science knowledge of students [1]. It has subsequently been used as a tool to increase meaningful learning in the sciences and other subjects as well as to represent the expert knowledge of individuals and teams in education, government and business. Concept maps have their origin in the learning movement called constructivism [2-3]. In particular, constructivists hold that learner actively construct knowledge. A concept map is a kind of visualization, a graphical representation of some domain knowledge. More precisely, concept mapping is a technique to visualize relationships between different concepts. The concepts are represented in a hierarchical fashion with the most inclusive, most general concepts at the top of the map and the more specific, less general concepts arranged hierarchically below [4]. The hierarchical structure for a particular domain of knowledge also depends on the context in which that knowledge is being applied or considered. Therefore, it is best to construct concept maps with reference to some particular question we seek to answer, which we have called a focus question. The concept map may pertain to some situation or event that we are trying to understand through the organization of knowledge in the form of a concept map, thus providing the context for the concept map [5].

- A concept map is graphical representation of a person's knowledge of a domain.
- Concept maps are tools for organizing and representing knowledge. They include concepts, usually enclosed in circles or boxes of some type, and relationships between concepts or propositions, (indicated by a connecting line and linking word) between two

concepts. Linking words on the line specify the relationship between the two concepts.

- The arrangement of major concepts from a text or lecture into a visual arrangement [2]. Lines are drawn between associated concepts, and relationships between the connected concepts are named. These concept maps reveal the structural pattern in the material and provide the big picture.
- Concept mapping is a technique for visualizing the relationships between different concepts. A concept map is a diagram showing the relationships in between concepts. Concepts are connected with labelled arrows, in a downward-branching hierarchical structure. The relationship between concepts is articulated in linking phrases [2].

Concept mapping can be done for several purposes:

- To create ideas (brain storming, etc); [8]
- To communicate complex ideas;[9].
- To design a complex structure (long texts, hypermedia, etc);
- To aid learning by openly integrating new and old knowledge;
- To assess understanding or diagnose misunderstanding.

Steps involved in the concept mapping process:

- Preparation ;
- Generation of Statements;
- Structuring of Statements;
- Representation of Statements;
- Interpretation of Maps;
- Utilization of Maps.

Concept maps are the inclusion of cross-links [7]. These are relationships or links between concepts in

different segments or domains of the concept map. Cross-links help us see how a concept in one domain of knowledge represented on the map is related to a concept in another domain shown on the map. In the creation of new knowledge, cross-links often represent creative leaps on the part of the knowledge producer. There are two features of concept maps that are important in the facilitation of creative thinking: the hierarchical structure that is represented in a good map and the ability to search for and characterize new cross-links. A final feature that may be added to concept maps is specific examples of events or objects that help to clarify the meaning of a given concept. Normally these are not included in ovals or boxes, since they are specific events or objects and do not represent concepts.

Purpose of the Study

The purpose of this study was to find out the impact of concept mapping on academic achievement rural secondary school students. The following research questions were designed to address the problem:

- Is there any impact on the academic achievement of rural secondary school students in mathematics who imparted and who did not impart instructions through

concept mapping according to their pre test result?

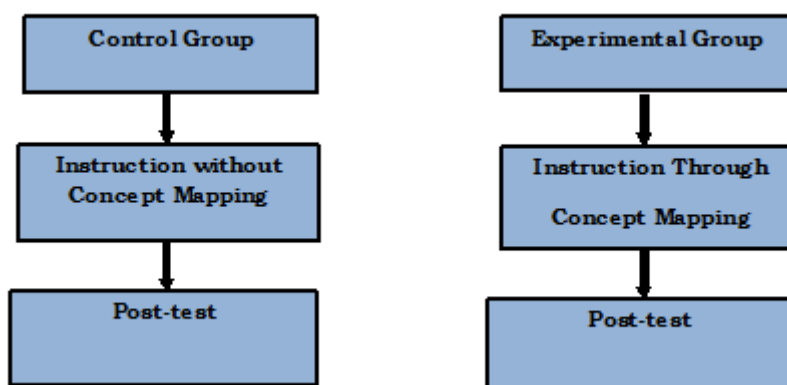
- Is there any impact on the academic achievement of rural secondary school students in mathematics who imparted and who did not impart instructions through concept mapping according to their post test results?

METHOD

The present study was experimental in nature. All secondary school rural students of Kapurthala district of Punjab constitute the population for the present study. The investigator has taken 200 rural secondary school students studying class-X and the age group of the students ranged between 13 to 15 years and they had completed the prescribed syllabus of their mathematics textbook (measures of central tendency and use of graphical representation) by using simple random sampling technique as the sample.

Design of the Study

After studying the review of related literature and considering the objectives of the study, one group pre test and post test experimental method was used.



Design of Experimental Research

Tool used

In order to measure the impact of concept mapping on achievement in mathematics of rural secondary students the investigator has used an achievement test constructed by himself.

Description of the test

The test comprises of 30 items of statistics. It includes 5 of mean, 5 of median, 8 graphs, 3 of mode and other 9 items are from statistics. Every item has four alternatives. Each correct answer is given 1 mark. Students are supposed to mark correct response among the four alternatives. Only 1 hour was allotted to complete the test.

Validity of the test

To determine the validity of the questionnaire views of senior mathematics teachers were given due

importance. Views of these experts were incorporated to improve the quality and content of the test and to determine face and content validity. The test has contained content validity and it has been checked by the experts.

Statistical Technique used

For analysis and interpretation of data t-test was used

RESULTS AND DISCUSSIONS

To find out the impact of concept mapping on academic achievement of rural secondary school students in mathematics pre-test was conducted and the result is presented in table 1.

Table .1 Comparison of experimental group and control group on pre-test

Group	N	Mean	S.D	df	t-ratio
Control group	100	20.7	5.23	98	0.112
Experimental group	100	20.79	5.64	98	

Table I. depicts that the calculated value of $t = 0.112$ is less than the table value at both levels. It can be interpreted that there exists no significant difference between the achievements of Experimental group and Control group at the time of pre-test. Hence, the null hypothesis is supported.

To find out the impact of concept mapping on academic achievement of secondary school rural students in mathematics pre-test was conducted and the result is presented in table 2.

Table .2 Comparison of experimental group and control group on post-test

Group	N	Mean	S.D	df	t-ratio
Control group	100	15.69	5.67	98	6.60
Experimental group	100	20.70	5.04	98	

Table 2. shows that the calculated value of $t = 6.60$ is greater than the table value at both levels. It explains that there is a significant difference between the achievements of Experimental group and Control group on post test. Hence, the null hypothesis is not supported.

Recommendations

- The result of this study may be helpful in providing training to students to achieve mastery over contents.
- This study may prove beneficial in suggesting teachers the use of concept mapping in improving performance of the students.
- It is also evident from the study that the effectiveness of concept mapping can improve if we entertain students belonging to varied cultures in the classrooms.
- Although, students generally work together in small groups in hands-on science classes, there are times when all-class discussions are valuable. Summarizing, comparing, and interpreting often involves the whole class. Teachers can use both small-group and whole-class approaches to teaching mathematics, and discuss when each may be appropriate.

CONCLUSION

- In view of the result of this study, following conclusion has been drawn.
- On the basis of results it is concluded that if teacher would utilize concept mapping in teaching mathematics the academic achievement of rural secondary school students in mathematics might be improved.
- Hence it may be interpreted that there is positive impact of concept maps on academic achievement of rural secondary school students in mathematics. It means if the teacher would utilize concept mapping in mathematics teaching, the academic achievement of rural secondary school students would be improved certainly.

Suggestions for further research

- Similar study can be conducted at primary, college and university levels students and students of other district of Punjab and other states in India as well.
- Comparison can be made between achievement levels of students who belong to urban and rural areas also.
- The teacher can use different strategies to teach for mastery over subject.
- The same study can also be conducted on other subjects.

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