

## Effect of Concept Mapping on Conceptual Understanding of Science of VIII<sup>th</sup> Class Students

### Abstract

The study was designed to assess the effectiveness of use of the concept mapping on conceptual understanding of science of Eighth class students in Government and Private schools of Delhi. Concept mapping is a schematic device for representing a set of concept meanings embedded in a framework of propositions. The study was conducted under natural settings and without disturbing the ratio of two sections- experimental and control, of eighth class from both the schools. In the control class, the teaching approach was primarily teacher orientated, that is the teacher used the lecturing method in sequencing the instructional activities. In the case of the experimental class, the concept mapping strategy of teaching was adopted to teach the same content. The results of this study indicated that the experimental class subjects achieved better conceptual understanding than those of the control class

**Keywords:** Concept, Concept Mapping, Conceptual Understanding.

### Introduction

Both Science and the learner are dynamic in nature. Keeping in view this very nature; there has always been the need of probing such a constructive approach which leads to conceptual understanding of science among the blooming minds. In this regard, concepts mapping works as wonder in assisting students in making conceptual connections so that his/her prior knowledge is taken into account and he/she actively constructs knowledge.

As we see today, the scientific revolution is changing not only the configuration of external world but also the trends of man's mind. Science helps to develop scientific attitude and scientific approach to the complicated problems of life. For a developing country, scientific and technological advancement is essential. For this, the whole system of education has the challenge to cater to the needs of science subject as this subject occupies an important place in curriculum; this is because it is central to many careers such as Engineering, Medicine, Pharmacy, Agriculture, Nursing, Dentistry, Laboratory Technology and all other related courses. Although Science is a prerequisite to these courses but poor understanding in science is alarming.

The principal goal of science education is teaching for conceptual understanding. But when the teacher use direct methods to teach concepts of science, most of the students find it hard to understand them and apply them in real world because they are unable to find the relationships between concepts. The major reasons for this lack of understanding are:

1. Students memorize the definitions and statements without understanding the meaning and logic.
2. They don't recognize the relationships needed to understand the different concepts.
3. Teachers' inability to clearly present connection between the concept areas.

### Conceptual Understanding and Concept Mapping

A concept is an abstract idea representing the fundamental characteristics letter represent. Concepts are mental categories used to group objects, events, information, etc. Concept arises from abstractions and generalizations from experiences or resulted transformations of existing ideas. The concept is fundamental category of existence. Concepts are building blocks of science. Understanding of the concepts of Science is often considered to be a critical component of this subject and is

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E: ISSN No. 2349-9443

necessary to make sense of scientific knowledge, the value of science to society, and how science can inform everyday life. To achieve this goal; adoption of constructivist approaches to teach this subject is highly emphasized. Concept mapping is one of the constructivist approaches that work wonder in achieving conceptual understanding of science.

Concept mapping was originally developed by Novak and the members of his research group as a means of representing frameworks for the interrelationships between concepts. Concept maps are based on the psychological theory propounded by Ausubel in 1968 which centers on individuals and how they integrate new learning into existing conceptual frameworks by making explicit, conscious connections between concepts as a way to integrate information into memory (Anderson 1992; Bruer 1993; Vosniadou 1996). The basic element of a concept map consists of concept words or phrases that are connected together with linking words or phrases to form complete thoughts called 'propositions'. Researchers have continued to develop and refine this technique for use in teaching, learning, research and assessment. Concept maps have been used for many instructional purposes, in many subjects, and with many levels of students.

There are several reasons for this. It addresses the individual differences among students as it is visual representation of the concepts and their relationships with other concepts and hence leads to better understanding of concepts. Concept mapping is student-centered, active teaching strategy. It encourages student-teacher interaction when they create a map together by discussing. Students make concept maps in their peer groups, hence, promotes cooperative learning. Students get habitual to establish links between concepts rather than recalling concepts separately. It proves effective in the revision of the topic during their exams and provides clarity of the concept.

#### Review of Related Literature

Evidence in the literature suggests that Concept Mapping is useful for better understanding of the subject, retaining information and improving students' performance. Gladys (1995), Schmid (1990), Gulati (2005), Jegede (2006), Trifone (2006), Conklin (2007), Brown (2009), Stanisavljevic (2012), Bakouli (2014) studied the efficacy of concept mapping on learning and achievement in Biology. Concept mapping is significantly more effective than the traditional/expository teaching strategy in enhancing learning in biology. Reynolds (1990), Egan (1999), Stoddard (2006), Khiabani (2010), Liu et al. (2010), Gardner (2015) investigated the use of concept mapping to find out its effectiveness in languages. Concept mapping is found out to be beneficial in enhancing learners' use of English reading strategies including listing, enforcing, and reviewing. Bar (1990), Marangos (2007), Stoddard (2006), Bharambe (2012), Pedrajas (2014) conducted studies to find the efficacy of using concept mapping in Social Sciences. It was concluded that the concept mapping strategy is more

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effective than conventional method. Akinsanya (2004), Gao (2007), Chie-Chang-Chiou (2008), Kwon (2008), Rai (2010), Moreira (2011), Ruff et al. (2012), Rosen (2014), Sellmann (2015) studied concept mapping as a tool/ strategy. In these studies concept mapping found to be facilitating students' achievement, meaningful learning, cognitive and affective gains. It helped the students in reducing errors.

#### Need and Importance of The Study

All aspects of the science have a deep impact on our lives. Science helps students to learn about how the natural phenomena occur and function, and how to make use of natural resources. It also teaches how the lack of these resources affects living things, and how you can conserve these resources.

We can say that everything around us is science. Our lives are part and parcel of discoveries and inventions of science. To have the benefits of science to make our life comfortable and easier, understanding of its concepts is necessary. Concept maps are found to be very helpful and effective in the establishment of organized structures of the concepts of science for better understanding. Thus, in the present study researcher wants to study the effectiveness of concept maps in better conceptual understanding of science of 8<sup>th</sup> class students.

#### Statement of The Problem

#### Effect of Concept Mapping on Conceptual Understanding of Science of 8<sup>th</sup> Class Students

#### Objectives of The Study

1. To compare the conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping and conventional method.
2. To examine the level of conceptual understanding of VIII<sup>th</sup> class students when taught through concept mapping.
3. To compare the conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping in context of gender.

#### Hypotheses

1. There is no significant effect of concept mapping on conceptual understanding of science of VIII<sup>th</sup> class students.
2. There is an average level of conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping.
3. There is no significant gender difference in conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping.

#### Design of The Study

Non-Equivalent Post-test Only Design research method is adopted for the present study. This type of design has two randomly assigned groups: an experimental group and a control group. Neither group is pretested before the implementation of the treatment. The treatment is applied to the experimental group and the post-test is carried out on both groups to assess the effect of the treatment or manipulation. This type of design is common when it is not possible or required to pretest the subjects.

**Sample**

**Table 1.1: School-wise distribution of the sample**

Sr. no.	Name of the School	Type	Experimental Group	Control Group	Total
1.	Sarvodaya Vidyalaya No. 3	Government	35	35	70
2.	MG Vidya Niketan	Private	35	35	70

**Tools Used**

1. Concept maps (developed by the investigator)
2. Conceptual Understanding Test (self – constructed)

1. Mean
2. Standard Deviation
4. t-test
5. Correlation (Karl Pearson)

**Statistical Techniques Employed**

The statistical techniques employed for interpreting the data are:

**Analysis and Interpretation of the Data**

**Hypothesis-I**

There is no significant effect of Concept Mapping on Conceptual Understanding of Science of VIII<sup>th</sup> class students.

**Table 1.2: T-ratio of Mean Scores of Conceptual Understanding of Experimental and Control Groups of Government and Private schools**

Government & Private School	N	Mean	SD	SE <sub>D</sub>	t-ratio
Experimental Group	70	61.57	10.92	1.69	13**
Control Group	70	39.6	9.06		

\*\* Significant at 0.01 level

(Critical Value 2.00 at 0.05 and 2.65 at 0.01 level, df138)

Table 1.2 indicates that the mean scores on conceptual understanding of science of experimental group i.e. group taught through concept mapping strategy is 61.57, which is higher than the corresponding mean scores of 39.6 for the control group i.e. group taught through conventional method of instruction in government school. t-value of mean score difference on conceptual understanding test of science of two groups is 13 which in comparison to

the table value was found to be highly significant at 0.01 level of significance. Thus, the hypothesis-“There is no significant effect of concept mapping on conceptual understanding in science of VIII<sup>th</sup> class students” is not accepted.

**Hypothesis-II**

There is an average level of conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping.

**Table 1.3 Level of Conceptual Understanding of Science of 8<sup>th</sup> Class Students in Private and Government school when taught through Concept Mapping**

Scores	Division	Number of Students		Total
		Private School	Government School	
0-39	III	0 (0%)	2 (6%)	2 (3%)
40-59	II	9 (26%)	16 (45%)	25 (36%)
60-74	I	21 (60%)	15 (43%)	36 (51%)
75-100	Distinction	5 (14%)	2 (6%)	7 (10%)

Table 1.3 shows that on the basis of performance on conceptual understanding test of Science four levels viz. Third Division, Second Division, First Division and Distinction were constituted. Only 3% students got third division, 25% students got second division, 51% students attained first division and 10% students secured distinction. It is resolved that 61% performed above average.

Hence the hypothesis “There is an average level of conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping” is not accepted.

**Hypothesis-III**

There is no significant gender difference in conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping.

**Table 1.4: t-ratio of Mean Scores of Conceptual Understanding of Experimental Groups of Government and Private schools**

Gender	N	Mean	SD	SE <sub>D</sub>	t-ratio
Girls	33	60.06	10.74	2.60	1.09**
Boys	37	62.91	11.04		

\*\* Not Significant at 0.05 level

(Critical Value 2.00 at 0.05 and 2.65 at 0.01 level, df 68)

Table 1.4 indicates that the mean score of boys on conceptual understanding of science of experimental group i.e. group taught through concept mapping strategy is 62.91, and the mean score of

girls is 60.06. The t-value of mean scores difference on conceptual understanding test of science of two groups is 1.09 which in comparison to the table value was found to be not significant at 0.05 and 0.01

E: ISSN No. 2349-9443

levels of significance. Hence, the hypothesis "There is no significant gender difference in conceptual understanding of science of VIII<sup>th</sup> class students when taught through concept mapping" is accepted.

### Findings

1. Imparting instructions through concept mapping strategy resulted in significant difference in scores of conceptual understanding test of science than those imparted through conventional method of teaching. The mean scores on conceptual understanding of science of experimental group i.e. group taught through concept mapping strategy comes out to be higher than the corresponding mean scores of the control group i.e. group taught through conventional method of instruction in government and private school.
2. On the basis of performance on conceptual understanding test of Science four levels viz. Third Division, Second Division, First Division and Distinction were constituted. Only 3% students got third division, 36% students got second division, 51% students attained first division and 10% students secured distinction. It is resolved that 61% students performed above average.
3. No significant difference in the mean score of boys and girls on conceptual understanding of science of experimental group i.e. group taught through concept mapping strategy and the mean score of girls is found. It is concluded that imparting instructions through concept mapping strategy resulted in similar conceptual understanding of science in boys and girls.

### Conclusion

The results revealed that the experimental group performed better than the control group on conceptual understanding test of science for eighth class. Hence, it can be concluded that concept mapping influenced learners in more positive ways. It makes them active learners in many ways. Firstly, it helped the students in developing higher levels of understanding. Secondly, this achievement found to be helpful in developing a "hunger" for learning in them. Here concept mapping strategy seems to break the stereotype notion that boys show better understanding and achievement in science and they can better understand the abstract ideas than the girls who find it more troubling to understand the abstract science concepts. Concept Mapping is found to be better mode of instruction than the conventional method i.e. the lecture method

### Educational Implications

The present study has the implications for the science teachers and teaching of science.

1. The students develop a novel understanding of the concepts if the teaching is supplemented with Concept maps.
2. Better understanding leads meaningful learning rather than mugging up the concepts.
3. Meaningful learning and better understanding are helpful in pushing concepts to long term memory of students. Thus, make it more likely to apply in real life practices of problem solving situations related to science.

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4. Concept mapping helps the students to perceive the concepts in their interrelatedness with other concepts. Hence, helpful in constructing a base for further knowledge.

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E: ISSN No. 2349-9443

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