

## Research Paper

**CONCEPT MAPPING AS AN EFFECTIVE WAY TO IMPROVE REASONING****Prof. Mrs. Kiran Dammani**Principal, S.G.S. B.Ed.College,  
1 Nasia Road, INDORE,  
(Madhya Pradesh).**ABSTRACT**

*In the present experimental study an attempt was made to study the effectiveness of Concept Mapping for improving Reasoning. Non Equivalent Control group design was employed for the experimentation. Sample of 75 students of class VIII studying in the academic year 2010-11 were selected for reasoning development programme. The intact groups as existed in the school were taken for experimentation. One of the groups was taught reasoning through Concept Mapping Strategy.*

The Concept Mapping is the strategy employed to develop a Concept Maps. It is a graphical tool for organizing and representing knowledge. The other group was Control group. The treatment continued for fifteen days at the rate of 35 minutes per day. Data were analyzed using ANCOVA. The result indicated that concept Mapping Strategy proved to be effective for Developing Reasoning.

**1.1.0 INTRODUCTION**

The concept mapping technique was developed by Prof. Joseph D. Novak at Cornell University in the 1960s. Concept maps have their origin in the learning movement called constructivism. In particular, constructivists hold that learners actively construct knowledge. Concept mapping is a technique for visualizing the relationships among different concepts. A concept map is a diagram showing the relationships among concepts. It is a graphical tool for organizing and representing knowledge. Concept Maps include concepts, usually enclosed in circles or boxes and relationships between concepts indicated by a connecting line linking two concepts. Words on the line referred to as linking words or linking phrases, specify the relationship between the two concepts. There are various types of concept map such as The "spider" concept map, The hierarchical concept map, The flowchart concept map which organizes information in a linear format and the systems concept map that organizes information in a format which is similar to a flowchart with the addition of 'INPUTS' and 'OUTPUTS'. In the present study all these types of concept maps were used for teaching selected topics of reasoning.

**1.2.0 SIGNIFICANCE OF THE PROBLEM**

The educational institutions have been created for updating the information as well for developing Reasoning and Thinking. It is the Reasoning and Thinking that is mostly used in life for solving the social problems and creating something new that will be useful to society. Reasoning is a hallmark of human thought, supporting the process of discovery that leads from what is known or hypothesized to what is unknown or hidden in one's thinking. Reasoning is highly conscious directed, controlled, active, and intentional, forward looking and goal directed thought. It starts with a definite problem and continues till a solution is found. There are various types reasoning like Analogical Reasoning, Cause-and-effect Reasoning, Effect to Cause-Reasoning, Comparative reasoning, Conditional Reasoning, Criteria Reasoning, Decomposition Reasoning, Reasoning from Signs, Logic, The Syllogism, Inductive Reasoning, Deductive Reasoning and Moral reasoning. Normally, it appears that anything and everything can be taught to the learner by suitable process of conditioning which can be designed according to the goals and views. This idea had been reinforced by Watson (1930) who said that everything can be taught. It is however sometimes argued that there is a valid distinction between knowledge and reasoning; whereas knowledge and facts can be taught but reasoning cannot be taught (according to Hereditarian). But when one examines this view more closely, one finds that methods

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which are valid and appropriate for teaching knowledge or facts are not useful to teach reasoning. Thus effectiveness of teaching and learning reasoning depends upon an ever vigilant discovery and appropriate method. It is a known fact that the explosion of information is because of the reasoning and thinking abilities of human beings. The technological developments are also the result of these abilities. These abilities are mostly used in daily life. One may not be able to solve daily life related problems only on the basis of information. The information is getting obsolete day by day. So efforts should be made to update the information. The basic need of this age is how to apply or use this knowledge or information in day-to-day life. So students should be taught how to obtain relevant information and how to use or apply this information in solving problems. Students should be able to construct new knowledge by using their past experience or knowledge. Most of our students are not able to think rationally or reason properly. It shows that the present methods of teaching cannot help in the development of reasoning. In such situation one finds the need of educational programme that prove useful for developing reasoning and thinking ability of the students. Concept mapping is a teaching technique that has been used in a variety of educational settings to promote meaningful, integrative learning, critical thinking and can be utilized with students of different learning styles. We find the need of educational programme that proves useful for developing Reasoning. Concept Mapping had proven to be an effective learning strategy. Jegede, Alaiyemola and Okebukola (1990); Esiobu and Soyibo (1995); Czerniak and Haney (1998); Hall, Hall and Saling (1999); Nicoll, Francisco and Nakhleh (2001); Wheeler (2004); Pranita (2004); Hsu (2004); Mauri and Ahoranta (2004) and Fred Nyabuti Keraro Samuel W. Wachanga and William Orora (2007) developed the Concept Maps and studied its effectiveness in comparison with Conventional Method. Hall and O'Donnell (1996) experimentally reported that the Concept Mapping group showed better recall memory of material presented through Concept Map for both for super and subordinate concepts than material presented in text. Manjula (2001) investigated the use of concept mapping as a strategy to enhance meaningful learning and to improve upon the process skills of students in science. All these researches proved that concept mapping proved to be an effective instructional as well as study tool. A good number of researches have been conducted concerning various subjects taught at school level. Investigation found a few researches related to reasoning. Out of these, researchers, namely, Banga (1980), Sharma (1981), Malhotra (1982,) Francis (1983), Deshpande (1984) Bhattacharya (1986) Pandey (1986), Mohan (1988), Sing (1988), Mishra (1989), and Kumar (1991) studied the correlates of reasoning. While Pande (1985), Garg (1988), and Suri (1989) investigated into structure of reasoning. Patel (1981) enquired into different predictors of reasoning ability while Sonia (2002) had developed instructional material for enhancing reasoning ability of school students. Wheeler (2004) evaluated the effectiveness of concept mapping in developing critical thinking skills in baccalaureate nursing students. But all these studies are not sufficient and enough to arrive at any conclusion. The present study is an attempt to develop reasoning of students through concept mapping.

The Reasoning can be developed. Keeping this in mind it was decided to undertake a research for facilitating Reasoning. It is the need of the age that learning must develop Reasoning and Thinking ability of the students. The abstract and highly conceptual nature of Reasoning seems to be particularly difficult for the students and teaching methods and techniques do not seem to make the learning process sufficiently easy for students. While reviewing literature it was also realized that a very few researches have been conducted on Concept Mapping and Reasoning in India. In the present study Concept Maps were used for developing Reasoning of the students of class VIII.

### **1.3.0 STATEMENT OF THE PROBLEM**

Effectiveness of Concept Mapping in Terms of development of Reasoning of class VIII Students of Madhya Pradesh.

### **1.4.0 OBJECTIVES**

1. To study the effect of Concept Mapping in terms of development of the Reasoning of the students of class VIII by considering Intelligence as covariate.
2. To study the effect Concept Maps, Intelligence and their Interaction in terms of development of the Reasoning of the students of class VIII by considering Pre-reasoning scores as covariate.

### **1.5.0 DELIMITATIONS OF THE STUDY**

1. The study was conducted in Indore city only.
2. The study was restricted to only the English medium schools affiliated to M.P. Board only.
3. The treatment continued for only 15 days at the rate of 35 minutes per day.

### **1.6.0 SAMPLE**

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From the population two schools were selected using Random Sampling technique. The randomly selected schools were Shri Devi Ahilya Higher Secondary School and Shri Bal Vinay Mandir. From the selected schools, class VIII students were taken up for this study. The selected schools were assigned randomly to the two levels of Treatment. Shri Devi Ahilya Higher Secondary School formed the Experimental Group while Shri Bal Vinay Mandir formed the Control Treatment-wise, Gender-wise and School-wise distribution of sample of students belonging to class VIII is given in

**Table 1.1 . Table 1.1: Treatment-wise, Gender-wise and School-wise distribution of Sample**

S.No	Schools	Treatment	Males	Females	Total
1.	Shri Devi Ahilya Higher Secondary School.	Concept Mapping Strategy	14	26	40
2.	Shri Bal Vinay Mandir	Conventional Method	26	09	35
<b>TOTAL</b>			<b>40</b>	<b>35</b>	<b>75</b>

It can be observed from the Table 1.1, that the sample consisted of 75 students. Of these there were 35 females and 40 males. The age of students ranged between 13 to 15 years. Both the schools were affiliated to Madhya Pradesh Board of Secondary Education, Bhopal.

#### 1.7.0 DESIGN

The study employed Non-equivalent Control Group Design. According to Campbell and Stenley (1963), the layout of this design is as given under.

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#### 1.8.0 TOOLS

**Reasoning Test :** The Reasoning test was developed by the Investigator. Test comprised of seventy two multiple choice questions. One mark was allotted to each correct answer. The maximum marks of the test were seventy two.

**Intelligence Test:** Raven's Progressive Matrices was used for assessing intelligence of the students. There were sixty problems in the test divided into five sets as A, B, C, D and E. The problems are arranged from simple to difficult level. Scoring was done using the instruction given in manual.

#### 1.9.0 PROCEDURE FOR DATA COLLECTION

The permission from the head of the institution was obtained. After administering the test of Reasoning, experimenter gave the orientation about Concept Mapping and Reasoning. Importance of reasoning in all walks of life was explained. Various types of Concept Maps were also presented and explained in the class. Experimenter had prepared concept maps of all the three selected units of reasoning i.e. Series, Coding -Decoding and Analogy in the class room with help of children. While explaining, the selected unit, Concept Map was also prepared and discussed in the class. Doubts of students were cleared. They were also allowed to discuss among themselves and with also the Investigator to clarify their doubts. The treatment was continuing for fifteen days at the rate of 35 minutes per day. At the end of the treatment the same Reasoning test was administered in both the groups, During the process of experimentation Intelligence was also assessed in both the groups. The instructions given in the manual were followed. The scoring was done as per instructions given in the manual. The obtained data were analyzed using the appropriate Statistical techniques.

#### 1.10.0 DATA ANALYSIS AND INTERPRETATION

The first objective was to study the effect of concept mapping in terms of development of the reasoning of the students of class VIII by considering Intelligence as covariate. The data related to this objective were analyzed with the help of Analysis of Covariance. The results are given in Table 1.2

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**Table 1.2: Summary of ANCOVA by considering Intelligence as as Covariate**

Source of Variance	df	SSy.x	MSSy.x	Fy.x
Treatment	1	1280.74	1280.74	14.08**
Error	72	6549.83	90.97	
Total	74			

\*\* Significant at 0.01 level

The second objective was to study the effect Concept Maps, Intelligence and their interaction in terms of development of the reasoning of the students of class VIII by considering Pre-reasoning scores as covariate. There were two levels of Treatment, namely, Concept Mapping and Conventional Method. High Intelligence and Low Intelligence were the two levels of Intelligence. Thus, the data were analyzed with the help of 2 X 2 Factorial Design Analysis of Covariance and the results are given in Table 1.3.

**Table 1.3: Summary of 2 X 2 Factorial Design of ANCOVA by considering Pre-Achievement scores as covariate.**

Source of Variance	df	SSy.x	MSSy.x	Fy.x
Treatment (A)	1	1065.64	1065.64	11.92**
Intelligence (B)	1	115.63	115.63	1.29
A X B	1	11.423	11.423	2.26
Error	70	6256.59	89.38	.128
Total	74			

\*\* Significant at 0.01 level

From Table 1.2 and 1.3 , it can be stated that Concept Mapping Strategy proved to effective for developing reasoning.

#### 1.11.0 CONCLUSIONS

1. Concept Mapping was found to be effective in developing reasoning when Intelligence was taken as covariate.
2. Concept Mapping was found to be effective in developing reasoning when Pre-reasoning scores were taken as covariate.
3. Reasoning was found to be independent of Intelligence when Pre-reasoning scores were taken as covariate. Thus it can be said that Concept Mapping was found to be effective for both high and low intelligent students.
4. Reasoning was found to be independent of Interaction between Intelligence and Treatment when Pre-reasoning scores were taken as covariate.

#### 1.12.0 IMPLICATIONS

As concept maps have the ability to reveal a complex structure of ideas or multiple links between concepts the visual nature of concept maps thus allow the learner to figure out the links among key ideas and makes it easier to see information in different ways and from different viewpoints. Concept mapping therefore structures the learning process more effectively with the result that higher-quality learning takes place.

This study has wide implications for persons working in the field of education. It provides guidelines to parents, teachers, curriculum planner, students, teacher educators, nurse educators, textbook writers, corporate and government organization, military and researchers.

It can be used by teacher as a tool for teaching difficult and complex concepts, as an evaluation tool, as a diagnostic test and as a tool to test students' prior knowledge. Teachers can examine how well students understand topic and concept by observing the Concept Maps of students. Concept map can also be used by teacher for the purpose of assignments. This type of assignments will be fun for the students.

Students play the role of nation builders in our society. In the present scenario there is a lot of awareness among the students. Students should be well-acquainted with the critical and analytical thinking, scientific attitude, problem solving approach and inductive reasoning. In the present study, it has

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been found that students taught with Concept Mapping technique achieved better than traditional method. Students should construct their own concepts maps to generate knowledge own their and to conceptualize a lot of things in memory. Teaching and Learning through Concept Maps has large number implications for students. Concept Mapping is useful to presents abstract concepts and large information in a graphical form or visual form, as it presents all the basic information on one page and clearly defines the central idea, by positioning it in the center of the page the difficult, complex, lengthy topic can be easily understood by students. Concept Mapping can be used as an effective tool to study for the examinations, for taking notes of lectures, Seminars or Workshops.

The textbook writers should present and organise the content thoughtfully to children. The Kothari Commission(1964-1966) stated, "A good text book written by a qualified and competent specialist in the subject, and produced with due regard to quality of printing, illustrations and general get up, stimulates the pupils interest and helps the teacher, considerably in his work".

There is need to acquaint teacher educator with latest techniques, methods and innovation of education. The most important aspects of educational system is teaching and learning process. Now a day more emphasis is given on meaningful learning. There is need to update and upgrade the knowledge of teacher educators, in order to implement proper teachers training programmes. Keeping this in view the present study has tried to give a new approach to learning process and thus gave a new urge to educate teacher educators also. So they can train pre-service and in-service teachers in Concept Mapping Strategy.

#### 5.12.0 SUGGESTION FOR FURTHER RESEARCH

1. Research studies can be carried out to develop and study the effectiveness of Digitalized and Print Concept Mapping in various subjects of high school and college level.
2. Comparison can be made in Concept Mapping and Mind Mapping strategy.
3. Concept Mapping can be used as a diagnostic tool for various subjects at high school and college level.
4. Effectiveness of Concept Mapping can be studied for Educational Psychology and Research Methodology.
5. Effectiveness of Concept Mapping can be studied for Mathematics and Geography.
6. Concept Mapping can be used as an evaluation tool for various subjects

#### References

1. **Bascones, J. and Novak, J. D.:** Alternative Instructional Systems and the Development of Problem Solving Skills in Physics: European for Exploring Course Content. *Journal of Higher Education*, Vol. 54, No.1, 1983, pp.31-41.
2. **Chang, K., Sung, Y., and Chen, I.:** The Effect of Concept Mapping to Enhance Text Comprehension and Summarization. *The Journal of Experimental Education*, Vol. 71, No1, 2002, pp. 5- 23.
3. **Dammani, K. and Agnihotri, K.:** Effectiveness of Concept Mapping. *Psycholingua*, Vol. 39, No.2, 2009, pp.128-130.
4. **Esiobu, G. O., and Soyibo, K.:** Effects of Concept and Vee Mapping Under Three Learning Modes on Students' Cognitive Achievement in Ecology and Genetics. *Journal of Research in Science Teaching* Vol.32, No.9, 1995, pp. 971-995.
5. **Fred Nyabuti Keraro, Samuel W.Wachanga, and William Orora:** Effects of Cooperative Concept Mapping Teaching Approach on Secondary School Students' Motivation in Biology in Gucha District, Kenya. *International Journal of Science and Mathematics Education*, Springer, Netherlands Vol.5, No.1, 2007, pp. 1573-1774.
6. **Gardner, H.:** *Frames of mind: The theory of multiple intelligences*, New York: Basic Books. (1983).
7. **Hall, R.:** *Knowledge Maps and the Presentation of Related Information Domains*. Unpublished Doctoral Dissertation Texas Christian University, USA, 1988.
8. **Horton, P. B., McConney A. A., Gallo M., Woods A.L., Senn G. J., and Hamelin D.:** An Investigation of the Effectiveness of Concept Mapping as an Instructional Tool. *Science Education*, Vol.77, No.1, 1993, pp 95-111.
9. **Jegade, O., Alaiyemola, F., and Okebukola, P.:** The Effect of Concept Mapping on Students' Anxiety and Achievement in Biology. *Journal of Research in Science Teaching*, Vol. 27, No.10, 1990, pp. 951-960.
10. **Lambiotte, J., and Dansereau, D.:** Effects of Knowledge Maps and Prior Knowledge on Recall of Science Lecture Content. *Journal of Experimental Education*, Vol. 60, No.3, 1992, pp.189-201.

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- 11. Lehman, J., Carter C., and Kahle J.:** Concept Mapping, Vee Mapping and Achievement: Results of a Field Study with Black High School Students. *Journal of Research in Science Teaching*, Vol. 22, No.7, 1985, pp.663-673.
- 12. McClure, J., Sonak B., and Suen H.:** Concept Map Assessment of Classroom Learning: Reliability, Validity and Logistical Practicality. *Journal of Research in Science Teaching*, Vol.36 No.4, 1999, pp 475-492. <http://www.acei.org>(Moore, 1989).
- 13. Nicoll, G., Francisco, J., and Nakhleh, M.B.:** An Investigation of the Value of Using Concept Maps in General Chemistry. *Journal of Chemical Education*, Vol.78, No. 8, 2001 pp.1111- 1117.
- 14. Novak, J. D., and Gowin D.B.:** *Learning How to Learn*. Cambridge University Press, New York, 1984.
- 15. Novak, J., and Wandersee, J. (Eds.).** Concept Mapping [Special issue]. *Journal of Research in Science Teaching*, Vol. 27, No10, 1990.
- 16. Novak, J., and Cañas, A.:** The Theory underlying Concept Maps and How to construct them. Technical Report IHMC Cmap Tools, Florida Institute for Human and Machine Cognition, 2006. :<<http://cmap.ihmc.us/Publications/>> 1may 2010
- 17. Pankratius, W. J.:** Building an Organized Knowledge Base: Concept Mapping and Achievement in Secondary School Physics. *Journal of Research in Science Teaching*, Vol.27, No.4, 1990, pp. 315-333
- 18. Plotnik, E.:** Concept mapping: a graphical system for understanding the relationship between Concepts. ERIC Clearinghouse on Information and Technology Syracuse NY, 1997.<[www.ericdigests.org/1998-1/concept.htm](http://www.ericdigests.org/1998-1/concept.htm)>
- 19. Rao, M.P.:** Effect of Concept Mapping in Science on Science Achievement, Cognitive Skills and Attitude of Students. *Indian Educational Abstracts*, Vol. 4, No.1, 2004.
- 20. Ryan, J., Rice, D., and Samson, S.:** Achievement and Demographic Correlates of Students' Performance on Concept Maps. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Atlanta, GA, 1993.
- 21. Shawn, J. P.:** A Case Study of Metacognitive Strategy Relative to the use of the Visual Image Concept Mapping Software, 'Inspiration' by College Students with Learning Disabilities. Unpublished Doctoral Dissertation, The Pennsylvania State University, Pennsylvania, 2000.
- 22. Snead, Donald and Snead Wadnal L.:** Concept Mapping and Science Achievement of Middle Grade Students. *Journal of Research in Childhood Education*, Vol. 18, No.4, 2004, pp. 306.
- 23. Spaulding, D. T.:** Concept Mapping and Achievement in High School Biology and Chemistry. Unpublished Dissertation, Florida Institute of Technology: 1989.
- 24. Sternberg, R. J. Beyond IQ: A Triarchic Theory of Intelligence.** Cambridge: Cambridge University Press. (1985).
- 25. Yadav, R.S., Factors affecting intelligence, Indian Educational Review; vol 26(1); page no 95-106, (1991).**
- 26. Wikaramasinghe:** A Study of Change in Sri Lankans Per Service Teachers' Knowledge about Teaching During their Students Teaching Period. PhD. Edu. Wollongong University, 2004.
- 27. Zittle, F. J.:** The Effect of Web-based Concept Mapping on Analogical Transfer. Dissertation Abstracts International, Section A- Humanities and Social Sciences, Vol.62, No.11, 2002.