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THE EFFECTIVENESS OF CONCEPT MAPPING TECHNIQUE ON ACADEMIC ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN PHYSICS.

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Abstract

The success in the study of the animal behavior has led to the extension of same concepts, theories and methods to the study of human behavior. The most significant human behavior is the ability to form concepts, to label concepts with language symbols and manipulate these symbols. So a new teaching strategy which can be adopted directly into classroom situation for effective teaching of concepts is needed at present. Concept mapping refers to a visual representation of key ideas or thoughts in a graphic or pictorial form. Concept mapping allows the learner to identify relationships between seemingly isolated concepts while developing a cohesive knowledge structure. The Concept mapping is a teaching strategy which help in visualizing the relationship between the concepts and in turn proved to be effective in increasing the achievement among students (V.Vijayathilakan-1992.) Concept mapping can help teachers to teach and students to learn more meaningfully.

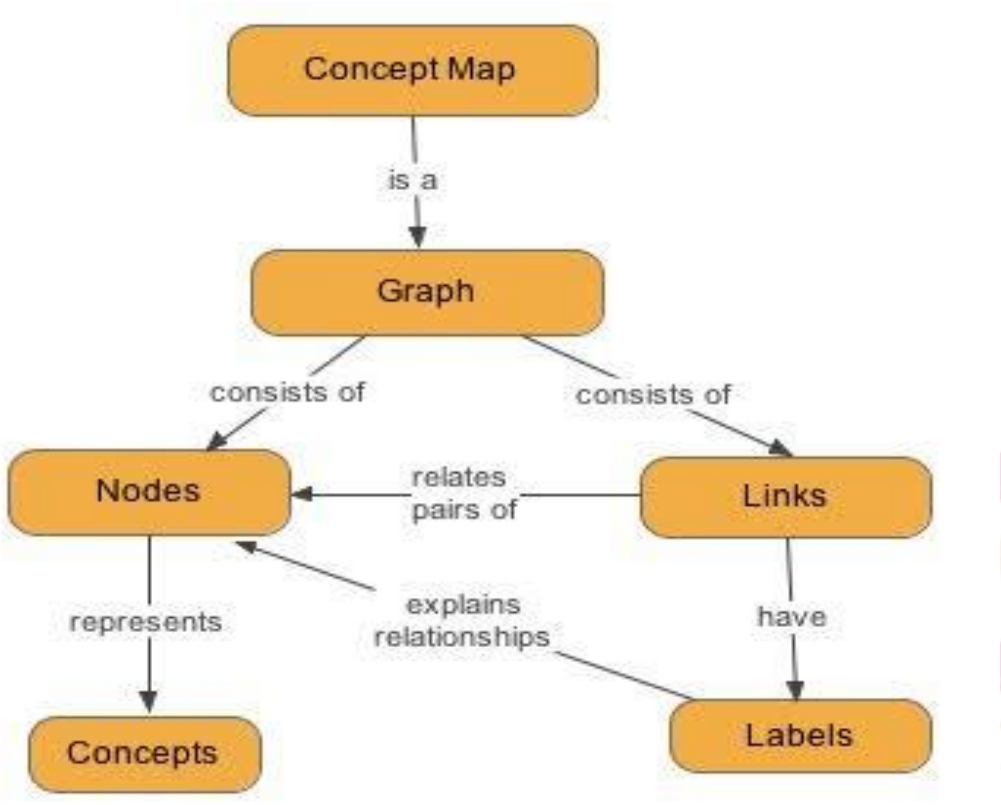
The readymade knowledge gained by a wrong strategy never takes deep root in the cognitive structures of the learner. This can be remedied to a large extent by the technique of concept mapping which helps the learner to give permanency to the ideas.

Meaning of Concept mapping

Concept maps are diagrammatic representation which show meaningful relationships between the concepts in the form of preposition which are linked together. Concept mapping is a technique for representing knowledge in graphs. Knowledge graphs are networks of concepts. Networks consist of nodes (points/vertices) and links (arcs/edges). Nodes represent concepts and links represent the relations between concepts.

Concepts and sometimes links are labeled. Links can be non-, uni- or bi-directional. Concepts and links may be categorized; they can be simply associative, specified or divided in categories such as causal or temporal relations.

The diagrammatic representation of concept map is as follows,



The concept mapping technique was developed by **Prof. Joseph D. Novak** at Cornell University in the 1960s. This work was based on the theories of David Ausubel, who stressed the importance of prior knowledge in being able to learn about new concepts. Novak concluded that ***"Meaningful learning involves the assimilation of new concepts and propositions into existing cognitive structures".***

Finally **Prof. Joseph D. Novak** defined **'Concept mapping'** as ***"Concept maps are intended to represent meaningful relationship between concepts in the form of propositions"***

This "**Concept mapping**" is a recent development and widely used as constructivist teaching and learning model. It has been used as an advanced organizer to focus students' attention and guide them to organize their mental thoughts and discoveries. Ex.: Circuit cycles, organizing charts, semantic networks, story maps, cluster maps, cluster maps, spider maps, fish bone maps, etc., .

- Cluster map: It is used for Concept mapping and summarizing a topic.
- Spider map: It is used to describe a central idea or provide overview of a chapter.
- Fish bone map: It is used for cause and effect studies.
- Story map: It is used to write a story or analyze a story by identifying theme, elements in a story or a moral.

- Circuit cycle: it is used to represent the organs or elements of a machine with their functions diagrammatically.
- Organizational chart: It is used to show the flow of the function of the organization or organ.

NEED AND IMPORTANCE OF CONCEPT MAPPING:

The Concept mapping is a teaching strategy which help in visualizing the relationship between the concepts and in turn proved to be effective in increasing the achievement among students (V.Vijayathilakan-1992.) Concept mapping can help teachers to teach and students to learn more meaningfully.

Concept mapping can be done for several purposes:

- To generate ideas (brain storming, etc.);
- To design a complex structure (long texts, hypermedia, large web sites, etc.);
- To communicate complex ideas;
- To aid learning by explicitly integrating new and old knowledge;
- To assess understanding or diagnose misunderstanding.

HOW TO BUILD A CONCEPT MAP:

- Identify the key and associated concepts from a particular topic of the subject.
- Create groups and sub groups of related items according to hierarchy.
- Think in terms of connecting the items in a simple sentence or a visual symbol that shows the relationship.
- Make sure that important concepts are highlighted, relationships are appropriate.
- Check the neatness and order of the connectivity.
- To create the interest and to be creative, use different shapes, colors and fonts etc.

OBJECTIVES:

The Objectives of the study are as follows,

- To study the scientific attitude of the students towards concept mapping in Physics.
- To develop the scientific skills of the students belonging to different groups of intelligence.
- To study the differences in science achievement process skills and attitude towards concept mapping among students.
- To find out the effectiveness of concept mapping on academic achievement of class VIII students in Physics.

HYPOTHESES FORMULATED FOR THE STUDY:

- The concept mapping strategy does have a positive effect on concept attainment in Physics of VIII grade students.
- There is no significant difference in concept attainment between boys and girls as a result of concept mapping as a teaching strategy.
- The concept mapping does have a positive effect on attitude towards Physics of VIII grade students.
- There is no significant difference in attitude towards Physics between boys and girls as a result of concept mapping as a teaching strategy.

REVIEW OF RELATED LITERATURE:

Leman.J.D and Kahle.J.D(1985) found that concept mapping enhances achievement by using concept mapping as a teaching strategy in order to teach science concepts. Melon.J and et.al (1984) made a study which revealed that concept mapping significantly enhances achievement in the analysis of Fraser and Edwards (1986) the data discovered that over 50% of the students who achieved a high level of concept mapping mastery showed achievement.

Beyer Back and Barbara Ann (1985) conducted a study on the use of concept mapping as an approach to the assessment of student's representation of structural knowledge. It was reported that more advanced students adopted concept mapping as a strategy in learning.

A study conducted by Novak, Gowin and Johansen (1983) on the use of concept mapping found that the strategy is effective in bringing about changes in scientific knowledge and problem solving skills. In a study, Franklin Carl Edward (1991) conducted an experiment testing the effects of concept mapping on science anxiety and acquisition of scientific knowledge among VIII grade students low in integration, complexity revealed through multiviate analysis that concept mapping makes a significant difference in science achievement but not in science anxiety. In a longitudinal study Novak and Musanda (1991) demonstrated that concept maps can be used effectively in analyzing conceptual change. Thus there is a gain in achievement. Hanna Barenholz and Pinchas (1992) found that concept mapping helped in assessing students understanding the concepts in science.

In a study, Marvin Willerman (1991) the results indicated that concept mapping used as an advance organization significantly improved VIII grade science achievement. NCERT (Eric) in RIJ (2002) revealed that concept mapping is effective in improving the achievement and process skills in science. The study also extended to attitude of student's efforts in concept mapping.

METHODOLOGY

a] Design of the study:

The present study is experimental in nature. Pretest, post test, control group and experiment group was employed for the study. Non verbal intelligence test developed by Raven (Raven's progressive matrices) was used for equating the groups.

b] Sampling:

In this study, Simple Random sampling technique was used to draw the sample which consists of 160 children, among the 160 children 80 were boys and 80 were girls from four secondary schools of Mysore city.

TOOLS USED FOR THE STUDY

i) Raven's progressive matrices

ii) Attitude scale developed by Dr.Sridevi (2004)

PROCEDURE

The present study is experimental in nature, with pretest-posttest design. Students were divided into experimental and control group by matching cases based on the scores of intelligence which was found to have correlation with the dependent variable of the study.

The investigator established a good rapport with students and administered the tests. Firstly, pretest was conducted then treatment was given later on posttest was given. The data collected was tabulated, analyzed using suitable statistical techniques.

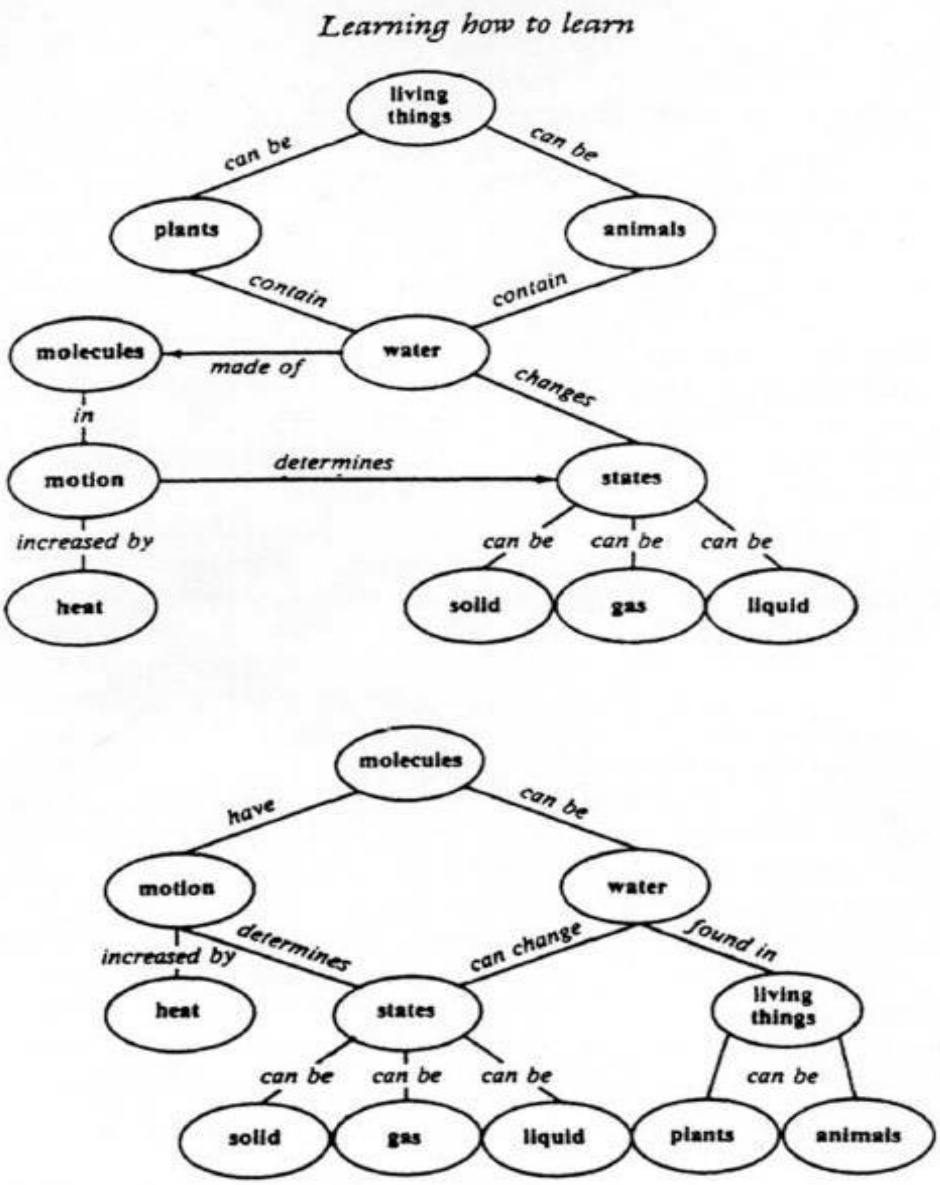


Figure 2.2 Two "rubber map" configurations showing eleven of the concepts in Figure 2.1 in new hierarchical arrangements.

STATISTICAL TECHNIQUES:

The pre-test and post-test answer sheets of both the experimental and control groups were scored as per the guidelines and scoring keys of each test. These gain scores were computed and considered as raw scores for further statistical analysis. The following statistical techniques were used to analyze the collected data with the view to test the hypotheses.

- ✓ Mean
- ✓ Standard Deviation
- ✓ 't' test

RESULT AND FINDINGS OF THE STUDY

The scores obtained by both the groups of students in the pretest and posttest were analyzed using appropriate quantitative statistical techniques. The marked hypotheses were tested through "t" test.

Table-1: Academic achievement score of the experimental group in Physics.

Group	No. of students	Treatment	Mean score	S D
Experimental	30	Concept mapping	17.97	4.69

Table-1 shows the achievement test scores of experimental group of students in Physics. By referring the norm of the achievement test, it was found that the group's mean score falls in the high category. This indicates that the group of students taught through "Concept mapping have high achievement.

Table-2: Academic achievement score of the control group in Physics.

Group	No. of students	Treatment	Mean score	S D
Control Group	30	Traditional method	16.00	4.10

Table-2 shows the achievement test scores of control group of students in Physics who are taught through Traditional method. By referring the norm of the achievement test, it was found that the group's mean score falls in average category. This indicates that the group of students taught traditional method has average academic achievement in Physics.

Table-3: Academic achievement score of the both the groups based on gender

Group	Gender	Mean	Standard Deviation	N
Experimental	Male	16.80	4.87	15
	Female	19.13	4.34	15
	Total	17.97	4.69	30
Control	Male	14.27	4.92	15
	Female	15.00	3.21	15
	Total	14.63	4.10	30
Total	Male	15.53	4.98	30
	Female	17.07	4.30	30
	Total	16.30	4.68	60

Table-3 shows that the there is no significant difference in concept attainment between boys and girls as a result of concept mapping as a teaching strategy. There is no significant interaction of 'group' and 'gender' on concept attainment as a result of concept mapping.

CONCLUSION

In the study an attempt was made to explore the effectiveness of concept mapping technique on academic achievement of secondary school students in Physics. This study provided opportunities for

generating ideas to design the innovative strategies; it also throws light on the emerging trends and applications of new technique in teaching learning process.

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