USAGE OF CONCEPT MAP FOR ORGANIZING AND COMPREHENDING LEARNING AND TEACHING

By

Judith Dorothy Sujeetha T

Ph.D Scholar, Department of Education, Mother Teresa University, Kodaikanal, Tamil Nadu, India.

Abstract

Concept maps are graphic representations of topics, ideas, and their relationship. The usage of concept maps as a teaching strategy was first developed by J.D. Novak of Cornell University in the early 1980's. It was derived from Ausubel's learning theory which places central emphasis on the influence of student's prior knowledge on subsequent meaningful learning. Teaching has been considered the act of transferring information from the teacher to the learner which was seen as an empty vessel to be filled with knowledge. The art of teaching became the art of presenting information. Teachers can use concept maps as a pre-reading strategy by inviting students to share what they already know about a particular concept. Concept map promotes conceptualization from the standpoint of meaningful learning points up that the meaning of new knowledge is constructed through its interaction with specifically relevant prior knowledge. This paper highlights the benefits of concept map in organising the ideas for teaching, learning and described its use as a tool to improve meaningful learning.

Keywords: concept map, meaningful learning, concepts, ideas, graphic representation.

Introduction

Cognitive scientists view learners as processors of information who use a variety of strategies to store and retrieve knowledge. They emphasised the study of how information is stored and processed in memory. Thus, the learner is a person who can engage in activities help people to acquire, organise, and remember incoming knowledge more efficiently. Strategies devised to support a constructivist approach to learning rely upon connecting prior knowledge to new concepts. For effective teaching and learning we need to develop innovative teaching practises. Research indicates that concept mapping is an example of such a strategy (Novak and Gowin, 1984; White and
Gunstone, 1992). Concept maps are two or three dimensional spatial or graphic displays that make use of labelled nodes to represent concepts and lines or arcs to represent relationships between pairs of concepts. The philosophy of new thinking is based on David Ausubel’s theory of meaningful learning (Ausubel, 1968). Ausubel initiated the constructivist theory, which holds that students are not “vessels to fill” with ideas, but that they produce and develop their own knowledge with an active process. This knowledge is then structured and stored in “semantic maps” that are constructed and restructured every time student learn new knowledge. Individuals are encouraged to relate new knowledge to relevant concepts and propositions they already know. Concept mapping is a teaching and learning strategy that establishes a bridge between how people learn knowledge and sensible learning. Concept Mappings was originally developed by Novak and his research group as a means of representing frameworks for the interrelationships between concepts (Novak & Gowin, 1984). It is arranged in hierarchical organisation in which the more general and inclusive concepts at the top of the map and the more concrete and specific ones at the bottom. Meaningful learning relates the new knowledge to existing concept and ideas. Concept mapping visually illustrates the relationships between concepts and ideas. When you learn a new concept, you add it to the appropriate place in the Concept Mapping. By interrelating concept in network of concept and labelling relationship between the concepts, the concept map integrates different concept together. This promote better memorization and recall as well as the ability to apply knowledge in new situation. To engage in meaningful learning student must identify specifically relevant concepts and recognise non-
arbitrary relationships between the concepts. Prior studies have shown concept maps are a meaningful learning tool and an alternative to rote learning when students work cooperatively in small groups.

**Meaning of Concept Map**

A concept map is a graphical display of concept names connected by directed arcs encoding prepositions in the form of simplified sentences.

**Definitions**

**Concept map**

A concept map is a type of graphic organiser used to help students organize and represent knowledge of a subject. Concept maps are tools for organising and representing knowledge. They include concepts, usually enclosed in circles or boxes of some type, and relationships between concepts or prepositions, indicated by a connecting line between two concepts. Words on these lines can be used to specify the nature of the relationships between different concepts.

**Preposition**

A preposition is made when two or more concepts combined to form a statement about something: a basic unit of meaning or expression: e.g., living things are composed of cells.

**Role of Concept Mapping**

The role of Concept mapping is currently shifted from individual learners to collaborative learning promoting (Funaoi, Yamaguchi and Inagaki, 2002). The former aims to support the personal learning, thereby helping the instructor or student to find errors in knowledge acquisition or to merge acquired and old concepts on the other hand, the latter improve contract between learners and teachers and indeed the problem understanding. Some studies have found that collaborative concept mapping enhances student’s interaction and helps them in learning the particular parts of
curricula (Lorenzo, Rodriguez-Artacho, and Blanco, 2011).

**Concept Mapping Methods**

Concept maps provide an elegant, easily understood representation of an expert’s domain knowledge. They are more like webs, showing links between concepts in a more complex way, and they can allow for a range of complexity, from very simple to very complex. Maps can be drawn by hand or created with computer software whether undertaken individually or collaboratively.

**Types of Concept Maps**

- **Spider**: Organised by placing the central theme or unifying factor in the centre of the map. Outwardly radiating sub-themes surround the centre of the map.
- **Hierarchical**: Presents information in a descending order of importance. The most important information is placed on the top. Distinguishing factors determine the placement of the information.
- **Systems**: Organizes information in a format which is similar to a flowchart with the addition of ‘INPUTS’ and ‘OUTPUTS’.
- **Flowchart**: Organizes information in a linear format.
- **Cross-linked**: Cross-linked maps use a descriptive word or phrase and identify the relationship with a labelled arrow. Cross-linked maps use a descriptive word or phrase and identify the relationship with a labelled arrow.

**Components of Concept Map**

Links: Identify the type of relationship.

Type of Links: Inclusion Characteristics, Actions, Process, Temporal, Similarity.

**Construction of Concept Map**

Concept maps are typically hierarchical in nature, with the subordinate concepts stemming from the main concept or idea. This
type of graphic organizer always allows change and new concepts to be added. The Rubber Sheet Analogy states that concept positions on a map can continuously change, while always maintaining the same relationship with the other ideas on the map.

1. Start with a main idea, topic, or issue to focus on

A helpful way to determine the context of your concept map is to choose a focus question something that needs to be solved or a conclusion that needs to be reached. Once a topic or question is decided on, that will help with the hierarchical structure of the concept map.

2. Then determine the key concepts

Find the key concepts that connect and relate to your main idea and rank them in to most general, inclusive concepts come first, then link to smaller and more specific concepts.

3. Finish by connecting concepts; creating linking phrases and words

Once the basic links between the concepts are created, add cross-links, which connect concepts in different areas of the map, to further illustrate the relationships and strengthen students understanding and knowledge on the topic.

There are several ways to construct concept maps. It includes following steps

- Identify the major ideas or concepts to be presented.
- Organize the ideas into categories.
- Remind students that your structure may be change as you continue to read and add more information.
- Use lines or arrows on the map to represent how ideas are connected to one another.
- Limit the amount of information on the map to avoid frustration.
• After students have finished the map, encourage them to share and reflect on how they each made the connections between concepts.
• Encourage students to use the concept map to summarize what was read.

A Concept Map about Concept Mapping

Application of Concept Mapping Activities

Teaching and Learning

The act of integrating new knowledge into the context of an existing knowledge structure represented by a concept map indeed aids in meaningful learning.

The use of concept mapping in teaching allows for the illustration of subject matter, promotes active and meaningful learning, and equips learners with a tool they can use throughout the research process (Novak, Joseph, 1991). Maps can provide a common framework for understanding and a starting point for discussion. Active learning exercises may incorporate concept mapping to identify the main points of an article, to map out the steps to be followed in the research process, or to brainstorm keywords and develop a search strategy based on a topic. Concept mapping activities can be done in pairs or small groups to offer peer-learning opportunities. Concept maps can be drawn on whiteboards or on paper, as well as with computer software.

Designing

Concept mapping stimulates discussion as groups devoted to designing an activity or program reflect on the relationships between
the concepts that represent the content. Learning is emphasized in the literature of concept mapping, but the technique is also effective for planning, evaluating, and creating knowledge collaboratively in library settings. One benefit of concept maps is that they offer a reference point for aligning learning objectives, strategies for teaching, and assessment methods. Maps can give structure to disparate levels of objectives, allowing them to be visually and conceptually ties to potential instructional methods. The map becomes a common framework for planning. It also integrates the planning and evaluation process, as the same map can represent both the goals of the project and the means by which it will be evaluated.

**Organizing**

Concept mapping is fundamentally a tool for organizing knowledge. It has applications for individuals and groups alike. Concept maps are also effective for collaboratively organizing team projects, as they can provide a common visual landscape and shared vocabulary form which different individuals can work. Maps make the connection between concepts explicit, allowing information to be transmitted from one person to another in a mixed format that incorporates both verbal and extra-verbal (i.e., visual) social group behaviours. (Trochim and Trochim, 2007).

**Benefits of Using and Making Concept Maps for Both Teachers, Students and as an Assessment Tool**

**Students**

The aim is to interpret learners’ personal understanding and their possibilities to draw individual examples against the existing theoretical and practical tasks. Concept maps allow students

- Helping students to brainstorm and generate new ideas.
• Encouraging students to discover new concepts and the propositions that connect them.
• Allowing students to communicate ideas, thoughts and information.
• Helping students to integrate new concepts with older concepts.
• Enabling students to gain enhanced knowledge of any topic and evaluate the information.
• It helps children to organize new information.
• It helps students to make meaningful connections between the main idea and other information.
• They are easy to construct and can be used within any content area.
• To track the personal progress in various areas and aspects.
• To evaluate the outcome of the program.

• Concept maps are commonly used for learning using one of the two following ways:
• Students are asked to develop their own concept maps following a topic in focus.
• Students are asked to analyse some preliminary designed concept maps built by instructors or other learners.
• Both approaches look to be effective tools in improvement of the learning outcomes.

Teachers

Concept maps of different instructors are subjective, because every concept map represents the authors’ individual knowledge and skills. With regard to the curriculum concept map can help in the following ways:

• Map out the points within the course at which the teacher wants or need to assess your students and how the assessment links to what you
are teaching and they are learning.

- Map out the key concepts you want to teach and the links and relationships between them.
- To find out the gaps in learning process
- Look at a glance how the different parts of the course fit together
- Suitable tool in promoting student’s comprehension of the learning material and improving their understanding of new material.
- Check learning and identify misconceptions. The use of concept maps can also assist teachers in evaluating the process of teaching. They can assess the students' achievement by identifying misconceptions and missing concepts.

Assessment Tool

Concept maps are a valuable tool of assessment procedures because they evidently represent learner's knowledge through multiple feedbacks tailored to student’s personal characteristics and requests. It considers two issues:

- How the maps are designed.
- How they are interpreted.

Students' achievement can be tested or examined by concept mapping (Ross, 1991). The research team around Joseph Novak at Cornell found that an important by product of concept mapping is its ability to detect or illustrate the "misconceptions" learners may have as explanations of content matter. The conceptions students may have been often incomplete and deficient, leading to misunderstanding of instruction. Concept maps drawn by students express their conceptions (or their misconceptions) and can help the instructor diagnose the misconceptions that make the instruction ineffective.
Disadvantages of Using Concept Map

Teachers often use concept map to promote learning, these visuals have potential disadvantages if they middle relationships and discourage critical thinking.

- Sometimes relationships on concept map become difficult to interpret (E.g. Spider map)
- A hierarchical map may discourage critical thinking, imposing a general to a specific order, discouraging reasoning skills and offering incomplete data.
- Teachers need to focus their time effectively and use concept map when they are most effective.

Teachers must evaluate the potential disadvantages of concept map when planning instruction.

Implications of Concept Maps on Knowledge

Students draw concept maps to get insight into what they already know and how they represent their knowledge. Concept maps helps the students to brainstorm and generate new ideas, encourage students to discover new concepts, allow students to communicate ideas, thought and information, integrate new concepts with older concepts, thus enable the students to gain enhanced knowledge of any topic and evaluate the information (Shinde Anand, 2014). A Concept map based on the content of a course, for example is valuable when selecting learning outcomes and strategies for teaching and assessment.

Conclusion

In the realm of teaching and learning concept mapping facilitates meaningful learning and active engagement in knowledge acquisition. Concept should be at the very centre of all teaching and learning activities. It is true that now a day’s concept maps are quite used in teaching and learning situation.
Concept Mapping is a useful strategy for teachers and students to employ but like any other strategy it can be overused. Concept mapping is essential to increase meaningful learning in students and for representing the knowledge, experience of individual. Concept Maps make the key ideas clear to both Students and Teachers. It is a kind of visual road map. However, in spite of this concept does not receive the attention they deserve. Most of the concept maps are conceptual diagram for storage of information. Attempts have to be made to rescue concept map as an instructional resource to deal with concepts that is for the facilitation of the meaningful learning of concepts. Thus, Concept mapping is proposed as a strategy to promote conceptualization from the stand point of meaningful learning theory.

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ABOUT THE AUTHOR

Judith Dorothy Sujeetha T is a Research Scholar in Department of Education at Mother Teresa Women’s University, Kodaikanal, Tamil Nadu, India. She holds M.Sc. and M.Phil degrees in Microbiology and M.Ed. degree. She has participated in many seminars and conferences at national and international levels. She has also published a few articles in the field of education in various reputed peer reviewed Journals.

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