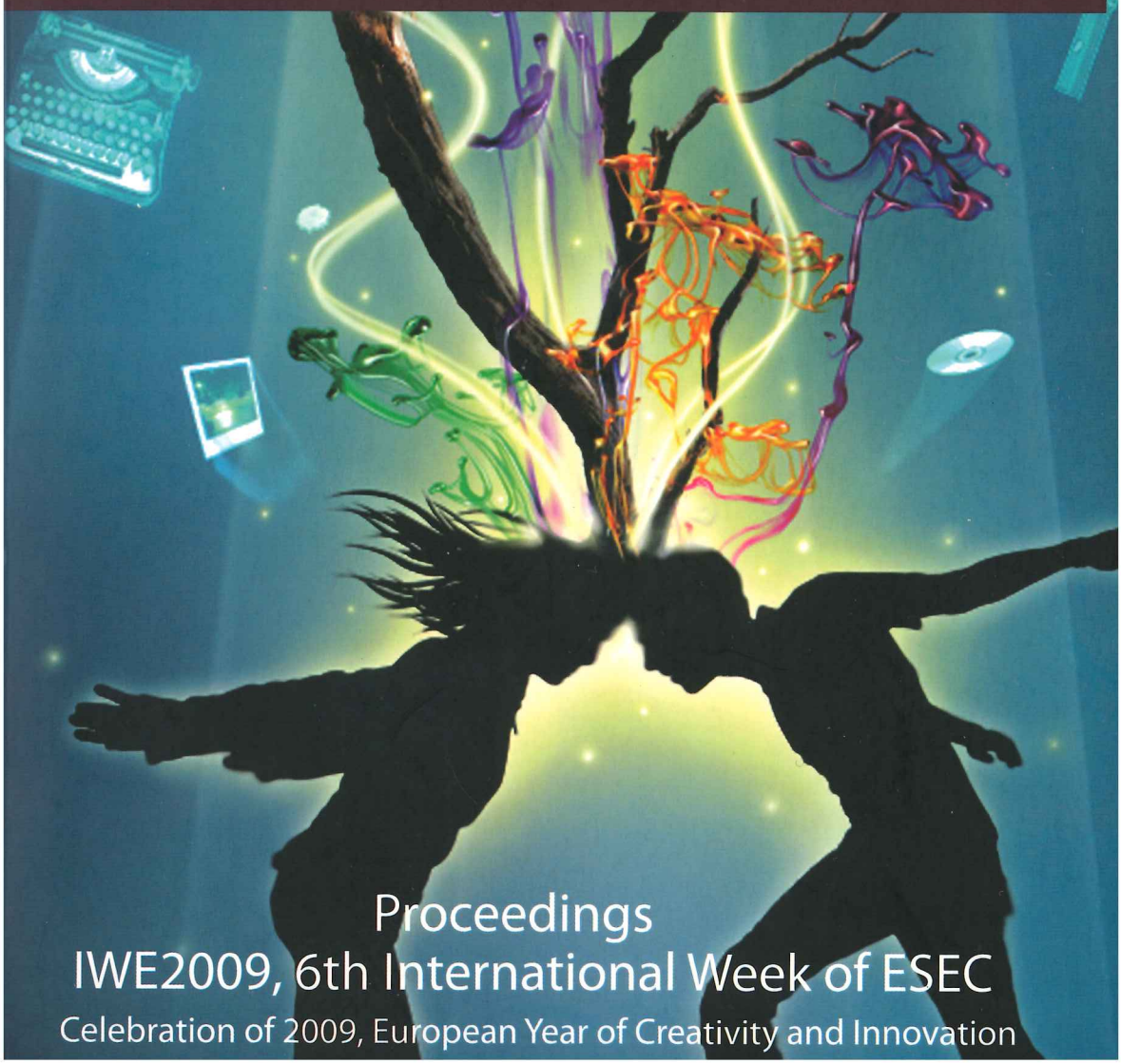
Instituto Politécnico de Coimbra
Escola Superior de Educação (ESEC)

CREATIVITY AND INNOVATION

edited by Susana Gonçalves



Proceedings
IWE2009, 6th International Week of ESEC
Celebration of 2009, European Year of Creativity and Innovation

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Proceedings of the 6th International Week of ESEC,
Coimbra, July 2009

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Cover photography by Nefasto/ NDSIM

ISBN: 978-972-95072-8-1
© ESEC, 2009
Escola Superior de Educação de Coimbra (ESEC)
Praça Heróis do Ultramar, s/n, Solum
3030-329 Coimbra, Portugal

Graphic print: Edilliber, LDA
Graphic Design: NDSIM/José Pacheco

Published with the support of:

FCT Fundação para a Ciência e a Tecnologia
COIMBRA
CÂMARA MUNICIPAL DE COIMBRA
Caixa Geral de Depositos

This book is a collection of papers given at the IWE2009_ 6th International Week of ESEC, Coimbra (23rd-27th March, 2009). ESEC and the editor would like to thank all those who contributed to the 6th International Week and the proceedings edition.
The online version of this book edition to be found at www.esec.pt/iwe2009/proceedings

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Chapter 9

BRAIN, LEARNING AND THE CONCEPT MAPS AS A TOOL FOR CREATIVE LEARNING

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Abstract

Concept mapping is a technique that exposes the concepts and assertions hidden within the cognitive structure of each student and it is of great importance since it shows the changes occurring in the cognitive structure, clarifies misconceptions and superficial interpretation in the teaching/learning process, and allows the teacher and student to exchange points of view on the validity or absence of a link between two concepts.

In this study concept mapping discussed in terms of learning process, different concept mapping tools have been discussed and usage of concept mapping effect on the teaching learning process discussed.

Keywords: Concept Map, Concept Map Tools, Concept Map Usage in Learning-Teaching

Introduction

Learning defined as changing of behaviours in general. Learning requires a hard working process in which learner should be more active.

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Mainly there are two factors affecting learning. These are individual factors as age, learning styles, attitudes and environmental factors as family, social environment, socio-economic level, and culture.

Recently, individualized learning has gained more interest and very important studies have been done on learning styles. Some of the learning style studies claim that the learning styles are inborn characteristics of individuals (Kolb 1984, Riding & Rayner 1998) while others say learning styles could be learned and influenced from the environment (Dunn & Dunn, 1992). However, the general tendency is toward being an inborn characteristic. Generally learning style and learning strategy are mixed together. The main difference between learning style and learning strategy is the later one could be learned in the education process.

Sprenger (2008) underlines the importance of the learning environment and needs of differentiation in the learning environment according to learning style and memory. She mentions physical, emotional and cognitive environment, which can enable or disable the learning process. She underlines six characteristics of a strong cognitive environment as; predictability, feedback, novelty, choice, challenge, and reflection. Therefore one of the most important factors in the learning process is cognitive factor. In the literature there are a number of studies interesting with the human brain and its working structure in the learning process (White, 1993; National Research Council, 2000; OECD, 2001). Figure 1 shows the key memory systems of the brain and their working structures.

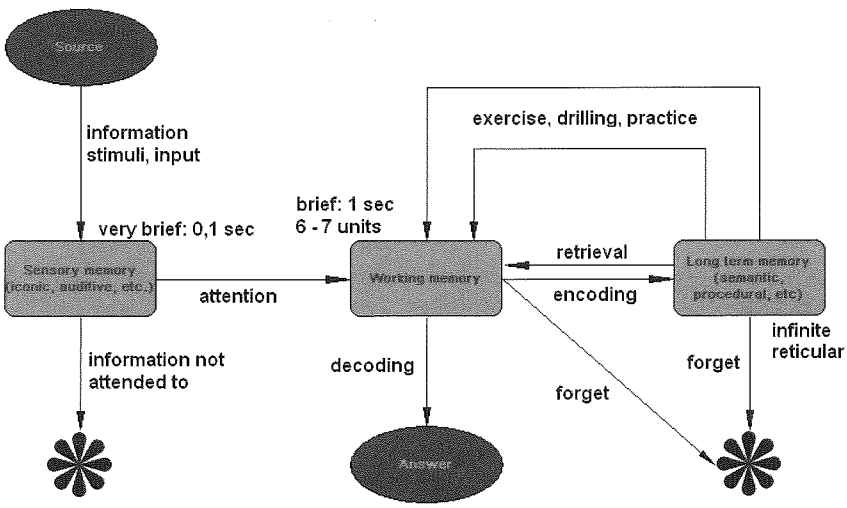


Figure 1. *Key Memory Systems of the Brain*

In the learning process it is important how individuals organize knowledge. Most of the time people don't use any tool to organize their knowledge but there are some effective tools to do this.

In this study the use of concept mapping in the teaching-learning process have

been discussed. Before discussing about the concept mapping tools I will discuss about the concept mapping and its relation with the learning process and some studies on concept mapping.

What is Concept Mapping and how it is Relate with Learning Process?

A concept is a set of specific objects, symbols or events which are grouped together on the basis of shared characteristics and which can be references by a particular name or symbol (Merrill, Tennyson & Posey, 1997, p. 6)

Concept mapping is a technique that exposes the concepts and assertions hidden within the cognitive structure of each student and it is of great importance since it shows the changes occurring in this cognitive structure, clarifies misconceptions and superficial interpretation in the teaching/learning process, and allows the teacher and student to exchange points of view on the validity or absence of a link between two concepts (Novak, 1990). In addition, the process of creating concept maps may also contribute to the development of a cooperation between the student and teacher in the sharing of meaning, where "making and remaking concept maps, and sharing it with others may be considered a team effort in the sport of thinking"

Concept maps were born out of the constructivist theory of learning, which holds that the learner constructs or builds his/her own knowledge, as opposed to the previous notion of knowledge as something that was acquired through direct transfer from books or experts. In the constructivist theory of learning, information can be acquired, but knowledge is pieced together only through the incorporation of new information or ideas into the framework of the learner's existing knowledge (Cheek, 1992).

Formally, a concept map is a graph consisting of nodes and labelled lines. The nodes correspond to important terms (representing concepts) in a domain. The connecting lines denote a directional relationship between a pair of concepts (nodes). The label on the line (explanation) conveys how the two concepts are related. The combination of two nodes and a labelled line is called a proposition. A proposition is the basic unit of meaning in a concept map and the smallest unit used to judge the validity of the relationship drawn between two concepts. Concept maps, then, purport to represent some important aspects of a student's declarative knowledge in a content domain (e.g., physics) (Ruiz-Primo, 2004) .

Novak's concept maps were first developed in 1972 by Novak and his collaborators at Cornell University (Novak, 1990). They are directly related to Ausubel's original theory and have been proven useful in facilitating meaningful learning (Novak, 1990; Novak & Gowin, 1998). The fundamental idea in Ausubel's cognitive psychology is that learning takes place by the assimilation of new concepts and propositions into existing concept and propositional frameworks held by the learner. This knowledge structure as held by a learner is also referred to as the individual's cognitive structure. (Novak & Cañas, 2008)

Concept maps consist of hierarchic diagrams that represent concepts and how these concepts interrelate, focusing on showing the concept's organization within

the cognitive structure of an individual on a given subject (Novak & Gowin, 1998). Although usually hierarchically organized, concept maps should not be confused with organigrams or flow diagrams because they do not imply a sequence, time frame, or a sense of direction, nor do they set organizational or power hierarchies.

The label for most concepts is a word, although sometimes symbols such as + or % used, and sometimes more than one word is used. Propositions are statements about some object or event in the universe, either naturally occurring or constructed. Propositions contain two or more concepts connected using linking words or phrases to form a meaningful statement. Sometimes these are called semantic units, or units of meaning. Some characteristics of the concept maps are (Novak & Cañas, 2008);

They 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. It is best to construct concept maps with reference to some particular question we seek to answer, which is called a *focus question*

They include *cross-links*. 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

Sometimes specific examples of events or objects needed 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.

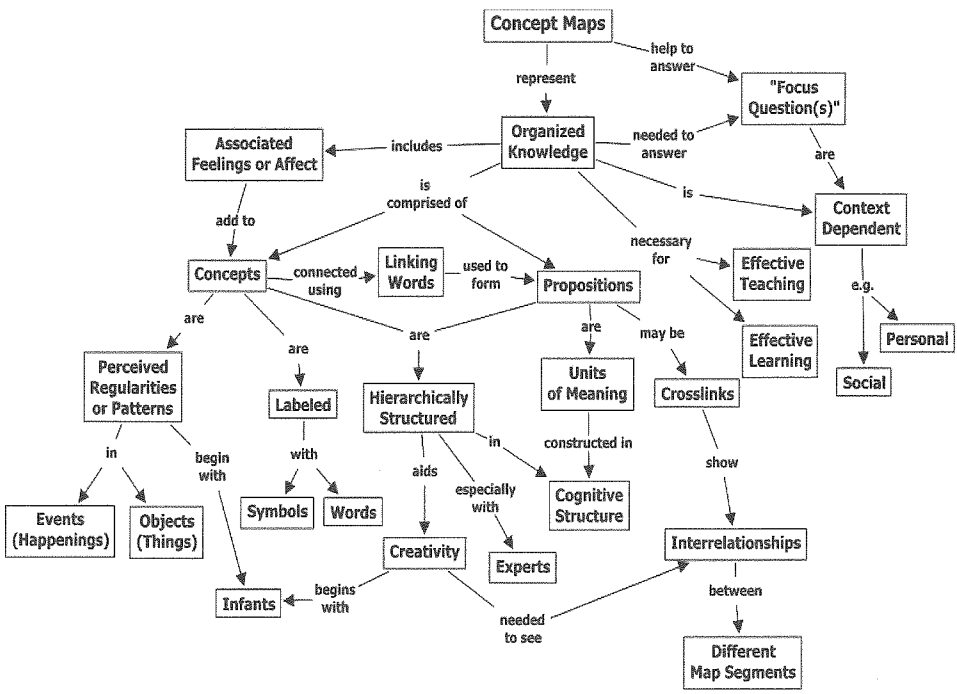


Figure 2. *Example of Concept Map*

There are many researchers (e.g., Slotte & Lonka, 1999, pp. 522 – 523) who refer to Novak and Gowin (1998), but clearly mix concept maps with Buzan's (1974, 2000) mind maps, which are much simpler association maps.

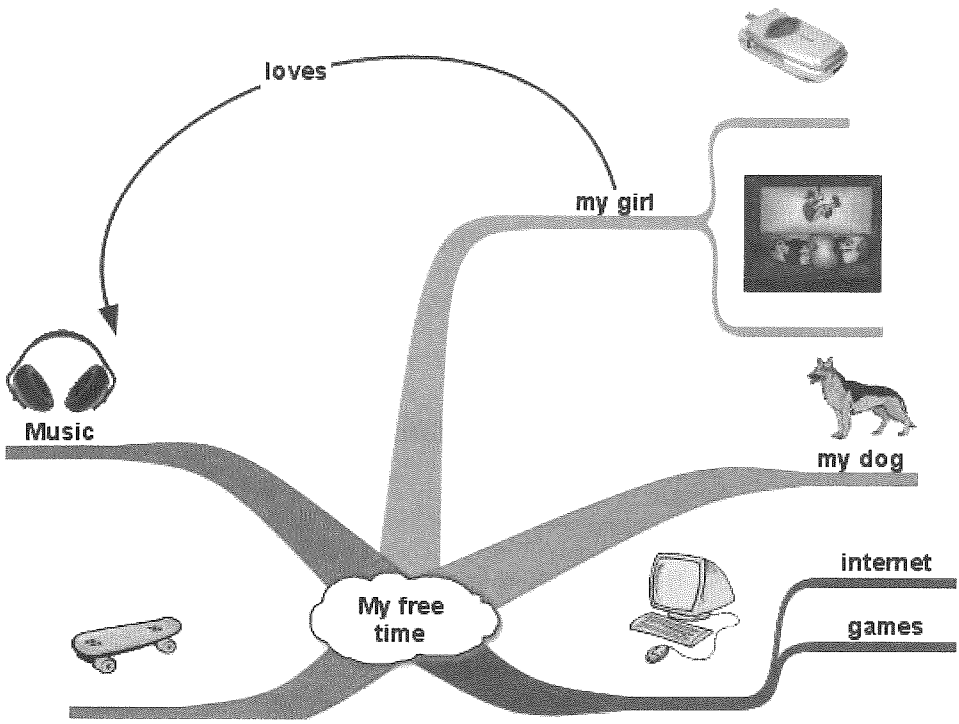


Figure 3. *Example of Mind Map*

Some Studies on Concept Mapping

Luckie, Harrison & Ebert-May (2004) assessed the 1000 freshman and sophomore students' concept maps who have enrolled in each of the six introductory science-major courses: Biology I & II, Chemistry I & II, and Physics I & II, as well as two non-major science courses: Introductory Biology and Geology. They used a program called Concept Connector, which is developed in their project at the Michigan State University. Concept Connector, consisting of a web-based, concept mapping Java applet with automatic scoring and feedback functionality. The Concept Connector tool is being designed to enable students in large introductory science classes to visualize their thinking online and receive immediate formative feedback. In their study students complete the concept maps as an integral part of the course. They submitted the concept map into the system and each new concept map submitted received a new feedback and a new (frequently improved) score. As a result a student gained continues feedback about his/ her conceptualization.

Engel, C. A & Ebron, P.A. (2004) used two different ways to teach concepts in the cultural anthropology course. First of all they created a collaborative online hyperglossary, which allows users to simply edit and upload definitions and

comments on key terms. They also used Cmap tool to organize concepts. They concluded that Cmap allowed for a genuinely different way of re-presenting and interacting with the textual material, while the Hyperglossary, even though built around the notion of keywords and potentially more collaborative, stil might come closer to a conventional approach of writing.

Paykoç et all. (2004) used the Mind Mapper Professional tool to organize their brainstorming activity about major curricular issues in Turkey. They concluded that both the quality and the quantity of the issues improved through the use of the mind mapping process.

Kaohsiung & Kaohsiung (2004) focused upon the effects of implementing the concept-map learning method among math educators. They found out that a concept map was a good tool for teachers to prepare and design the learning activity systematically, and to reflect for further modification of teaching. It's a good guideline to clarify confusion of concepts and integrate teachers' experiences in the discussion or group working. Learning concept-map methods is helpful for teachers to improve teachers' knowledge of practice.

Kaohsiung & Liu (2004) studied on experienced junior high school teachers who used the concept map as a new teaching and learning tool for teaching mathematic. They collected data using interviews, classroom observations, the subjects' teacher discussion sessions, videotaping, and students' learning material analysis. As a resut they found that subject teacher's beliefs had gradually changed through the research. The teacher's role had also changed from a knowledge deliverer into a communicator and distributor. Through the discussion and sharing session with the professional growth community, the level of self-confidence within subject had increased regarding her mathematics teaching as well as her teaching effectiveness. The concept maps approach allows the subject to move away from the rote memorization of information toward the facilitation of meaningful learning.

Concept Mapping Tools

Many educators point to the need to increase our use of technology. Linn and Hsi (1999, in Novak 2002) describe the use of computers as "learning partners," and illustrate the kind of learning successes that can accrue when students, teachers, and computers are integrated into collaborative efforts to learn better.

The use of learning technologies could

- Contribute to improve education considering its massiveness;
- Improve and accelerate learning;
- Enable a best use of the educator's time;
- Tend to integrate and equilibrate the differences between students;
- Have a beneficial effect in learning "disabilities / impairments".

Concept mapping would be easily formed with the help of different concept mapping tools. There is numereous concept mapping tools. They help us to make concept mapping more colourful, interesting and detailed. Also with the help this tools different concept maps made by students can be shared and improved.Some of the well-known concept mapping tools are (http://users.edte.utwente.nl/lanzing/cm_home.htm):

Cmap : CMap, provides for a highly explicit concept and prepositional framework, arranged hierarchicaly. This allows a kind of "auto-coaching" as students work with CMap to build their own knowledge structures. It offers capability to integrate any digitally-generated images into a clear conceptual structure.

Inspiration: It is a flexible concept mapping software. The use of concept mapping software, particularly *Inspiration* in small-group contexts increase diffusion of innovations and preferred strategies (Heinze-Fry, 2004)

Kidspiration: Version of Inspiration for children.

Axon Idea Processor: Makes concept maps; it has many tools and features.

CoCo Systems: A software that can graphically records, structures and clarifies the ideas.

There are many other softwares to organize concept maps. Some other softwares as "TextVision / TekstNet" could help concept mapping from text.

Concept Mapping Implications in Classroom

In their book Novak & Govin (1998) introduced different concept mapping activities for different grades. The following two examples show how concept mapping would be implemented into the classroom settings.

Example 1:

Strategies for Introducing Concept Mapping in Grade Seven through College

(Nowak & Gowin, 1998, p. 32)

Activities to prepare for concept mapping

1- **Make two lists of words** on the blackboard or overhead projector using a list of familiar words **objects** and another list for **events**.

Object words might be: car, dog, chair, tree, cloud, book.

Event words could be: raining, playing, washing, thinking, birthday party etc.

Ask the students if they can describe how the two lists differ. Try to help them recognize that the first list is things or objects and the second list is happenings or events and label the two lists.

2- Ask the students what they think of when they hear the word car, dog, etc. help them recognize that even though we use the same words, each of us may think of something little different. These mental images we have for words are our ***concepts***: introduce the word concept.

3- Repeat the activities in step 2, using event words. Again, point out the differences in our mental images, or concepts, or events. You may want to suggest at this point that one reason we have trouble understanding each other sometimes is that our concepts are never quite identical even though we know the same words. Words are labels for concepts, but each of us must acquire our own meanings for words.

4- Now list words such as are, where, the, is, then, with. Ask students what comes to their minds when they hear each of these words. These are not *concept* words; we

call them ***linking*** words and we use them in speaking and writing. Linking words are used together with concept words to construct sentences that have meaning.

5- Two concept words and linking word(s), construct a few sentences on the board to illustrate how concept words plus linking words are used by humans to convey meanings. E.g.: The dog is running or there are clouds under thunder.

6- Have students construct a few short sentences of their own, identify the concept words and tell whether each is an object or event, and also identify the linking words.

7- If you have bilingual students in the class, have them present some foreign words that label the same events or object. Help the students recognize that language does not make the concept, but also serves as the label we use for the concept.

8- Introduce some short but unfamiliar words to the class such as dire (terrible), terse (using few words, concise). These are words that stand for concepts they already know, but have somewhat special meaning. Help students see that meanings of concepts are not rigid and fixed, but can grow and change as we learn more.

9- Chose a section of textbook (one page is sufficient) and duplicate copies for the students. Choose a passage that conveys a definitive message. As a class, ask them to read the passage and identify key concepts. (Usually 10 to 20 relevant concepts can be found in a single page or text material.) Also have the students note some linking words and concept words that are less important to the story line.

Example 2:

Concept Mapping Activities (Nowak & Gowin, 1998, p. 34)

1- Select a particular meaningful paragraph. Have the students read the text and select the key concepts. List these concepts on the board.

2- Put the most inclusive concept at the head of a new list of rank-ordered concepts. List the next most general, most inclusive concepts, working through the first list until all concepts are rank ordered.

3- Now begin constructing a concept map, using the rank-ordered list as a guide in building the concept hierarchy. Have students help in choosing good linking words to form the propositions shown by the lines on the map.

4- Reconstruct the map if it needed. Point out the students that at least one and sometimes two or three reconstruction is needed to show a good representation of meaning.

5- Score the map according to the criteria suggested by Novak. Point out possible structural changes that might improve the meaning.

6- Student-constructed maps can be presented to the classroom the blackboard.

After creating the concept maps it is important to assess it. Concept maps would be graded based on the following criteria (Novak & Gowin, 1998):

Proposition: Is the meaning relationship between two concepts indicated by the connecting line and linking word(s)? Is the relationship valid?

Hierarchy: Does the map show hierarchy? Is each subordinate concept more specific and less general than the concept drawn above it (in the context of the material being mapped)?

Cross links: Does the map show meaningful connections between one segment of the concept hierarchy and another segment? Is the relationship shown significant and valid?

Result

Learning could be an addition, a subtraction or a modification. It takes place more readily in some circumstances. To facilitate learning a teacher needs to understand the various factors which bear upon the learning process as motivation, feedback or knowledge of results, participation and practice, transfer or application of knowledge, and perception (our ability to recognise, discriminate, relate, select). Concept mapping would be useful to motivate students. Furthermore, it would help them translate their knowledge into application. Sometimes teachers have to spend much time to know if their students are in the right way or not. Concept mapping could be used to assess whether students' conceptualisation is true or false.

References

Buzan, T. (1989). *Use your Head.* England:BBC Books

Cheek, D. (1992). *Thinking Constructively About Science, Technology and Society Education.* Albany, NY:State University of New York Press.

Dunn, R. & Dunn, K. (1992). *Teaching elementary students through their individual styles: Practical approaches for grades 3-6.* Boston: Allyn and Bacon.

Engel, C. A & Ebron, P.A. (2004). Mapping key concepts in cultural anthropology. *Concept Maps: Theory, Methodology, Technology Proceeding of the First International Conference on Concept Mapping. A. J. Cañas, J. D. Novak, F. M. González, Eds. Pamplona, Spain*

Heinze-Fry, J. (2004). Applications of Concept Mapping to Undergraduate General Education Science Curses. In A. J. Cañas, J. D. Novak & F. M. González (Eds.), *Concept Maps: Theory, Methodology, Technology, Proceedings of the 1st International Conference on Concept Mapping.* Pamplona, Spain: Universidad Pública de Navarra.

Kaohsiung, S.L. N. & Kaohsiung, H.C. N.(2004). The effect improving teachers' knowledge of practice: concept-map implementation in the mathematical teacher professional development community. *Concept Maps: Theory, Methodology, Technology Proceeding of the First International Conference on Concept Mapping. A. J. Cañas, J. D. Novak, F. M. González, Eds. Pamplona, Spain.*

Kaohsiung, S.L.N.& Liu, J. C. (2004). The study of concept map implementation for enhancing professional knowledge of a high school mathematics teacher. *Concept Maps: Theory, Methodology, Technology Proceeding of the First International Conference on Concept Mapping. A. J. Cañas, J. D. Novak, F. M. González, Eds. Pamplona, Spain.*

Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development.* New Jersey: Prentice-Hall.

Luckie D. B., Harrison, S. H. 2 & Ebert-May, D. (2004). Introduction to C-tools: Concept mapping tools for online learning. *Concept Maps: Theory,*

Methodology, Technology Proceeding of the First International Conference on Concept Mapping. A. J. Cañas, J. D. Novak, F. M. González, Eds. Pamplona, Spain

Merrill, M.D., Tennyson, R.D. & Posey, L. O. (1997). *Teaching Concepts: An Instructional Design Guide.* Second Ed. USA: Educational Technology Publications.

National Research Council (2000). Editors: Bransford, J. D., Brown, A. L., Cocking, R.R. *How People Learn: Brain, Mind, Experience and School.* National Research Council

Novak, J. (1981). Applying learning psychology and philosophy to biology teaching. *The American Biology Teacher, 43(1),* 12 – 20.

Novak, J. D. & Cañas, A. J. (2008), The Theory Underlying Concept Maps and How to Construct and Use Them, Technical Report IHMC CmapTools 2006-01 Rev 01-2008, Florida Institute for Human and Machine Cognition, available at: http://cmap.ihmc.us/Publications/ResearchPapers/TheoryUnderlyingConceptMaps.pdf

NOVAK, J. D. (1990). "Concept Mapping: a Useful Tool for Science Education" in *Journal of Research in Science Teaching,* 27(10), 937-949.

Novak, J. D. (2002). Meaningful learning: the essential factor for conceptual change in limited or inappropriate propositional hierarchies leading to empowerment of learners. *Science Education, vol. 86,* Issue 4, pp.548-571

Novak, J.D. & Gowin, D.B. (1998). *Learning How to Learn.* USA: Cambridge University Press.

OECD (CERI).(2001) *Preliminary Synthesis of the Second High Level Forum on Learning Sciences and Brain Research: Potential Implications for Education Policies and Practices.* Brain mechanism and youth learning. Granada, Spain (1-2-3- February).

Paykoç,F., Mengi, B., Olgun, P., Önkol, P., Özgür, B., Pilli, O & Yıldırım, H. (2004). What are the major curriculum issues?: The use of mindmapping as a brainstorming exercise. *Concept Maps: Theory, Methodology, Technology Proceeding of the First International Conference on Concept Mapping. A. J. Cañas, J. D. Novak, F. M. González, Eds. Pamplona, Spain.*

Riding, R. & Rayner,S. (1998). *Cognitive styles and learning strategies: Understanding style differences in learning and behaviour.* London: David Fulton Publishers.

Ruiz-Primo, M.A. (2004). Examining concept maps as an assessment tool. Concept Maps: Theory, Methodology, Technology Proceeding of the First International Conference on Concept Mapping. A. J. Cañas, J. D. Novak, F. M. González, Eds. Pamplona, Spain

Slotte, V., & Lonka, K. (1999). Spontaneous concept maps aiding the understanding of scientific concepts. *International Journal of Science Education, 21(5),* 515-531.

Sprenger, M. (2008). *Differentiation through Learning Styles and Memory.* Second

edition. USA: Corwin Pres.

White (1993). *What every teacher should know about the functions of learning in the human brain.* On-Line: http://www.brainfriendlylearning.org/tfs-sample.pdf