Concept Mapping Activities Using CmapTools

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Abstract. The technique of conceptual mapping is a tool that facilitates new knowledge construction. It engages the cognitive processes involved in analysis, critical attitude, organization and representation of knowledge, taking into account the social and cultural environment. Concept mapping is involved in various areas of human activities and is used in all levels of education, research, activities, design and programs.

Keywords. Concept mapping, Concept maps, CmapTools.

1. Introduction

Concept mapping is a 20th century phenomenon. Typically, roots of this technique were created with materials such as paper-andpencil or sticky notes on a surface, for example a cardboard, blackboard, or a wall. Maps generated with the concept mapping (CM) technique are based on words linked together in a hierarchical structure, like a network. An important feature is cross-links, which are usually propositional links between concepts in different areas and clusters of a concept map, that reveal more complex relations between those concepts.

2. Conceptual Mapping Technique

Current literature suggests that concept maps are used in research, analysis, design, assessment and creative approach. Using learning and teaching tools which focus on the representation of knowledge and the understanding of the trainees contributes to their self-investigation and development. Concept maps are such tools, designed to facilitate meaningful learning [1] as a graphical representation of concepts [3].

3. Concept mapping software

CmapTools [2] is a concept mapping software developed by J. Novak (Novak & Gowin, 1984), based on the meaningful learning theory of Ausubel (Ausubel et al. 1984). It is one of the teaching techniques and learning strategies designed to enhance the constructive and meaningful learning. New knowledge interacts and interrelates with representations, concepts and propositions of the cognitive structure of the trainees in such a way to help them acquire essential meaning.

4. Construction of a Concept Map

A concept map which corresponds to a cognitive field, a problem or a project to be mapped integrates the following stages:

- specify the key question
- brainstorm relative concepts
- main concept selection
- classification
- branching
- cross links between concepts
- redefining relations
- examples
- integration of the map

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5. How to use Concept Mapping

Concept maps are a hands-on activity and as such they can uncover students' misconceptions as well as understanding. It may help students follow what comes after and it can be used as a review tool as well. During a session a concept map can be used as (i) an organizer of the course, (ii) a brief presentation of the course-concepts, (iii) an advance organizer, like a bridge to link new concepts with them already have been discussed and (iv) a review tool to have a chance to see what was done, as well.

6. Sample Activity: A concept map about "water" with CmapTools

6.1 After a short training exercise with CmapTools, participants in the workshop are kindly requested to create their concept map in the graphical format of the application. There will be an assignment of creating a concept map of their conceptual understanding of the field of Environmental Education about key concept of "water".

6.2 Discussion about what students already know and "how" do they understand the concept. The difficulties students meet in their way to construct their Cmap.

6.3 Which is the 'key question" to construct a map? Pieces of advice that can help discover it.

6.4 The ways to discover relative concepts. Brainstorm but keep in mind the rules. Share ideas and bring them all out for discussion.

6.5 Proposed solutions to single main concepts from others less value in meaning.

6.6 Branch concepts in first taxonomy.

6.7 Place cross-links between concepts to provide understanding words with action.

6.8 Redefine relations between concepts and change if necessary the initial map.

6.9 Add resources in any format of media and examples in the bottom-down concepts to present features abilities.

6.10 Keep in mind the purpose of this map construction.

6.11 Give examples for assessment with Cmaps. What is the critical question? Pre and Post Assessments.

7. Resources

[1] Ausubel, D. Educational Psychology: A cognitive view. Holt, Rinehart & Winston, New York; 1998

[2] CmapTools. Available at

http://cmap.ihmc.us/conceptmap.html [1/6/2010] [3] Novak Cañas. The theory underlying concept maps and how to construct them. Available at http://cmap.ihmc.us/Publications/ResearchPapers /TheoryUnderlyingConceptMaps.pdf [1/6/2010]