

ESTABLISHING MEANINGFUL CONNECTIONS: THE USE OF CONCEPT MAPS AS A LEARNING TOOL

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ABSTRACT

The constant changes in health professions, and the need for future practitioners to remain competent means that students should be taught using meaningful and integrated learning strategies. Among the different strategies that help students retain information, develop critical thinking and reason to solve several difficulties; concept maps have been addressed as one such relevant approach. They are described as an organised hierarchical representation of mental understandings, linking a set of relevant concepts using verbs or phrases that give sense to the map. In this short communication the authors intend to discuss the current use and benefits of concept maps within health professions education, along with what constitutes an effective concept map and how it should be introduced to students.

KEY WORDS Concept Maps, Health Professions Education, Learning Technologies, Meaningful Learning.

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In recent years, there has been an increasing interest from researchers in health professions education towards the establishment of teaching strategies centred on active learning situations which provide students with in-depth knowledge and skills, and critical and creative ways of thinking.¹ Developing Problem solving skills and critical thinking competencies play an important role in the integration of theory and practice. However, traditional teaching strategies have been focused on unidirectional styles of thinking, which may not be compatible with today's continuing changing contexts.² The constant changes in health professions, and the need for future practitioners to remain competent

in these environments, means that students should be taught using meaningful and integrated learning strategies.¹ Active learning strategies have the potential to encourage life long learning, and also to reduce rote learning.³ Among the different strategies that help students retain information, develop critical thinking and reason to solve several difficulties (e.g. PBL, CBL, role playing, collaborative learning, case studies, simulation), concept maps have been addressed as one such relevant strategy.¹

Concept maps, originally introduced by Novak and Gowin,⁴ are based on Ausubel's theory of learning.⁵ They are described as an organised hierarchical representation

of mental understandings, linking a set of relevant new concepts to ones the student already knows.¹ In other words, more general concepts are located at the top of the map, while more detailed concepts follow them. A key component is linking concepts that are near from each other, using verbs or phrases that give sense to the map, and finally cross-linking concepts that are farther away (Figure 1).¹ In order to produce a comprehensive concept map, a student should understand, relate, and integrate the background concepts and information that the map will finally reflect. These interactions between different concepts replace unidirectional with multi directional organisation of thinking, improving awareness of the studied information for upcoming problem solving situations.³ Promoting meaningful and self-directed learning are recognised as major goals in health professions education. Likewise, learning with concept maps reflects the intention of the learner to discriminate and connect concepts, therefore supporting meaning and learning.¹

Concept Maps support visualisation of learning, integration of concepts, manipulation of information,⁷

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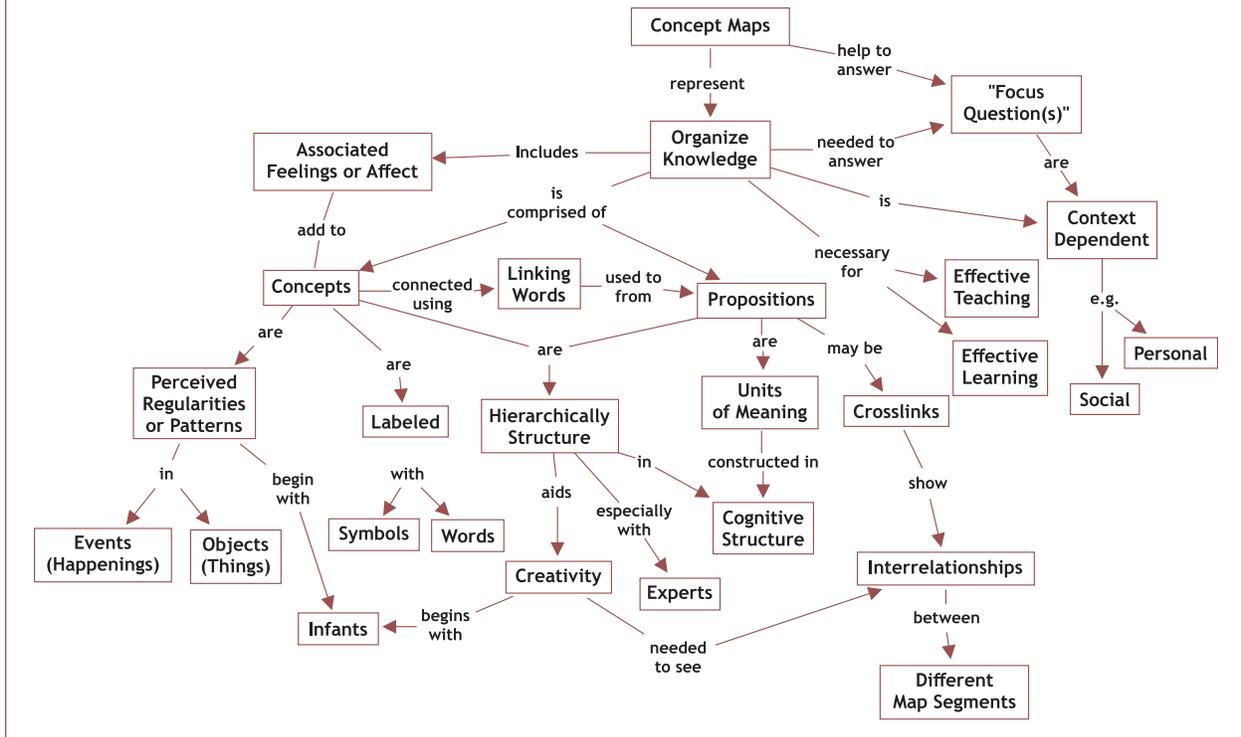
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FIGURE 2: A CONCEPT MAP SHOWING THE KEY FEATURES OF CONCEPT MAPS. (NOVAK JD, CAÑAS AJ. THE THEORY UNDERLYING CONCEPT MAPS AND HOW TO CONSTRUCT THEM. TECHNICAL REPORT, FLORIDA INSTITUTE FOR HUMAN AND MACHINE COGNITION 2006.)⁶



and linking clinical practice and theoretical knowledge.⁸ This may lead to higher levels of critical thinking and proper decision making abilities.² Moreover, several investigations report that concept maps have in fact helped students improve their critical thinking abilities.^{2,9-14} Additionally, they have been related to anxiety reduction and to increased motivation and success.¹⁵ In the literature, the use of concept mapping as a learning strategy, has been reported for more than 25 years.¹⁶

A recent literature review suggested a growing interest among health professions education,¹ specifically in medical, dental, and nursing education. Probably, because concept maps facilitate retention of information, leading to long-term memory. Moreover, the retained information is coded in a meaningful way, and it is also easy to retrieve.¹² After reviewing 35 studies the authors concluded, four main features of concept maps.¹ Firstly, (a) it promotes meaningful learning; secondly, (b) it serves as an addi-

tional teaching resource; thirdly, (c) it facilitates teachers' feedback, and finally (d) it can be used as an assessment tool. In the reviewed articles authors indicated its usefulness to support the development of critical thinking, to promote collaborative learning and problem solving, to stimulate meaningful learning within problem based learning courses, and that it effectively worked across groups with different learning styles. As a learning resource, students can show creativity and mastery of concepts within certain knowledge. When giving feedback, it allows students to clarify topics and teachers to easily identify students' misunderstandings. Additionally, no reviewed article reported detrimental effects when using concept maps in health professions education.

The ability to create concept maps is an acquired skill; therefore it is imperative that teachers and students take the time to learn it. When introducing concept maps, a three stage protocol has been suggested.³ In the first place (a) an introductory

workshop is crucial for students to understand what meaningful learning and concept maps are, here students should familiarise themselves with relevant examples and it is also important to provide a guide on how to create concept maps. Secondly, (b) a series of follow up activities are intended for students to practice and receive feedback. Finally, (c) and only after going through the previous stages, students can apply this new skill in many ways and in a wide variety of topics throughout the curriculum.

As an active learning strategy, concept mapping allows students to 'discover' learning, instead of being part of a 'receptive' passive process. Therefore, it can be of great use in relating theoretical basis to clinical problem solving situations, increasing students' skills of analysis, evaluation, and reasoning. Additionally, traditional learning strategies have been reported to suppress critical thinking abilities of students, since most is copied from textbooks and lectures in a 'passive way'. Thus,

concepts are informed and not discovered. When developing concept maps, the content is actively discovered and it's internalised in a meaningful way (i.e. new knowledge is processed into long term memory, being linked into prior knowledge) instead of being internalised in a rote way (i.e. memorising the material without processing it and easily losing it if there is no frequent repetition).⁵ This is also founded in that students' ability to organise, relate, and process information determines their reasoning competencies in different work settings.¹⁷ In the case of concept maps, 'the concepts' reflect students' awareness, whereas 'the links' reflect the depth of meaning.⁷

Some individuals found that the experience of the conventional technique of creating a concept map, using large sheets of paper, or creating patterns with small index cards, was slow and time consuming. Recording and cataloguing the maps, linking or transferring concepts from one map to another was not easy. However, recent developments in Learning Technology have removed all such limitations. Modern "touch-screen" tablets and freely available software, for example IHMC Cmap tools® (<http://cmap.ihmc.us>), allows most students the opportunity to build their own concept maps quickly and easily.¹ These have the added advantage of being easily modified, integrated with maps on new topics, stored and shared easily with fellow students, and tutors. Examples of concept maps are easily found. A recent Google search, for example, generated 18 million hits in less than half a second (ref: Google-search for "Concept Maps" undertaken on 02/18/14). Therefore the benefits are available for very little cost.

Health professions education students are expected to exhibit competencies for critical thinking, reasoning, and decision-making in diverse circumstances, enabling them to deliver better-quality health care. Thus, benefiting patients, peers and their institutions.¹²

Therefore, teachers are challenged to develop learning strategies that foster those characteristics. Initially, concept maps may represent another typical graphic representation of knowledge. However, when understanding its basics and using it in the appropriate way, a good concept map starts to represent a quite simple instrument for learning, but at the same time it is a sophisticatedly complex tool with can promote deep meaning.⁶

NOTES ON CONTRIBUTORS

Both CO and PE were involved in every part of the analysis, idea's development, write-up, and editing the final draft.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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