

# CONCEPT MAPPING: AN INVITATION TO CREATIVE THOUGHT

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## Abstract

*Concept maps, when used to improve factual recall from written material or verbal communication, have the potential to enhance effective learning. The use of concept mapping allow higher education learners to create an understanding of information by making associations and by creating and exploring links, skills that establish the basic process of problem solving and creative thinking during problem based- and reflective-learning. The mind map as learning facilitation method offer educators several advantages, for example to stimulate interest, to enhance concentration and to increase understanding. It facilitates improved memory in learners since mind mapping serves as a method to help learners learn, record, and recall information. To explore mind mapping as an approach to optimise learning holds potential since it is an invitation to creative thought.*

## 1. INTRODUCTION

It is expected from educators to explore new trends in higher education such as problem-, resource-based-, learner-centred-, co-operative-, reflection- and articulating learning. All these educational approaches focus on the active involvement of learners in the learning process. Although various authors reported on the advantages of learners' active participation in enhancing academic success, the specific method in reaching this involvement is not always stated.

The process of concept mapping puts knowledge into a visual image; an effort put forward by learners which force them to be actively involved in the learning process. In addition concept maps as an educational strategy visually portrays a relationship of concepts or ideas and can be used to strengthen learners' capacity to learn and facilitators' capacity to support learners to be active rather than passive learners (Peterson & Snyder 1998:7).

## 2. CONCEPT MAPPING

Concept mapping is a central idea or concept that radiates outward in related ideas. Concept maps are also called mental maps, mind maps, clusters, mapping, word webbing, think-links or idea branches (Lim, Cheng, Lam, & Ngan 2003:55; Peterson & Snyder 1998:6). For the purpose of this article, the term concept maps will be used.

There are basically two parts to a concept map, namely the visual and the theoretical part. Visually a concept map is a display of shapes, e.g. boxes, triangles and circles, which are connected by lines and/or arrows drawn between the figures. In theoretical terms, a concept map includes verbal

information within and between the shapes which creates an outline of ideas (Lim *et al.* 2003:55).

A map can effectively reveal very quickly a complex structure of ideas about difficult concepts or can show multiple links between the concepts. The visual nature of concept maps therefore holds the potential to promote memory (Peterson & Snyder 1998:10), review and recall of knowledge (Russel 2004:2; Lim *et al.* 2003:55). Concept maps operate as adaptable scaffolds that can be shaped around the learning situation and the learning outcomes (De Simone, Schmid & McEwen 2001:279).

### **3. THE ROLE OF CONCEPT MAPS**

Concept mapping is described as a process that promotes active learning because learners are engaged in active search of knowledge rather than the passive reception thereof (Edelson in De Simone *et al.* 2001:264). However, concept maps are also useful in other areas of higher education, for example; in reaching the overall goal of a learning programme, optimising curriculum planning, undertaking qualitative and quantitative research, enhancing teaching or learning and to aid in assessment.

Since concept mapping clearly defines a central idea or theme and indicates the relative importance thereof the concept map allows integrated thinking and portrays information holistically (Peterson & Snyder 1998:13). Bearing this in mind the role of concept maps in each of the aforementioned areas will briefly be touched on.

Concept maps create a platform for brainstorming because the structure of a concept map provides opportunity for convergent thinking, an integral part of planning processes in higher education. It aids in the pre-arrangements of ideas within specific planning process like curriculum planning, the planning of a learning programme, a module, a learning activity, an assignment or a research project (Poldma 2004:141; Russel 2004:2).

Concept mapping assists in meeting and adhering to the general educational goals of learning programs, which is to support learners to be academically successful (Peterson & Snyder 1998:27). Concept maps can also be used to reflect on the effectiveness of learning programmes. The condense form of a map can limit the time-imposed constraints of comprehensive documenting and reporting when conducting quality control on academic programmes. In addition, academic programme content or learning area content portrayed in the form of a map, can also indicate gaps or overlaps which is helpful in curriculum planning.

To progress towards a resolution during quantitative and qualitative research, concept mapping strategies may also be useful to analyse thinking processes. A concept map emphasises and reveals the interaction and contradiction between different concepts, including cause-effect, part-whole relationships, hierarchies and cross-links in a logically scientific way (Poldma 2004:141).

#### 4. ADVANTAGES OF CONCEPT MAPS

A major advantage of concept maps is that it is a visual way of communication. It encourages learners to reflect on the key elements of their prior knowledge or experience. In asking learners to create concept maps, facilitators are inviting learners to display and communicate to others their knowledge of a learning area or -domain (Alpert & Grueneberg 2001:36). If used correctly mind mapping encourages high-level and critical thinking which facilitates problem solving (Russel 2004:1; Farrand, Hussain & Hennessy 2002:427; Peterson & Snyder 1998:27).

Learners and facilitators appear to be satisfied with the usefulness, ease of use and effectiveness of concept mapping as learning strategy (Freeman & Jessup 2004:166) over and above the fact that many advantages exist for both facilitator and learner.

##### 4.1 Advantages of concept mapping for facilitators

Concept mapping can serve as an instructional tool for facilitators (Peterson & Snyder 1998:27). Pre-constructed concept maps presented as a teaching/learning activity are valuable as a strategy to facilitate learning (Alpert & Grueneberg 2001:36). In addition concept mapping accommodates a variety of preferred learning styles (Peterson & Snyder 1998:7). In honouring different learning styles, concept mapping result in 'teaching to all types' by accommodating the cognitive learning styles often neglected by traditional instruction, that is sensing, visual, active and global learning dimensions (Felder in Laight 2004:232).

Concept maps further allow facilitators to cover topics in greater depth since a map "...provides a framework that can be viewed, elaborated on, adapted and developed over a period of time" (Fisher in Lim *et al.* 2003:56). Mapping also stimulates the sharing of ideas, since mapping is a visual means to build concepts from data (individually and collectively), which makes it a useful educational strategy to facilitate group-work activities (Chularut & Debacker 2004: 248).

##### 4.2 Advantages of concept mapping for higher education learners

Concept mapping as a study technique is useful to learners in higher education because the more advanced the study material, the greater the need to condense and simplify information in a form that is easy to learn. Concept mapping can thus be used to help learners learn how to learn (Novak 2004:23; Peterson & Snyder 1998:11). The use of ineffective learning strategies during problem based learning (PBL) can obstruct learner's ability to define and solve problems in a purposeful way (De Simone, *et al.* 2001:264). Concept maps smooth the progress of learning since concept mapping helps learners to acquire knowledge from various sources of information by using key words and images.

As concept maps have the ability to reveal a complex structure of ideas or multiple links between concepts (Lim *et al.* 2003:57), the visual nature of concept maps thus allow the learner to figure out the links among key ideas and makes it easier to see information in different ways and from different viewpoints. Concept mapping therefore structures the learning process more effectively (Laight 2004:232) with the result that higher-quality learning takes place.

Concept mapping as an instrument to demonstrate knowledge stimulate learners to become thinkers. Learners find themselves in a position to explore their conception of key ideas and mapping assists them in making significant patterns of their knowledge (Lim *et al.* 2003:55), it further promotes creative thinking by helping learners to generate ideas, to see logical association and view issues from a holistic perspective (Peterson & Snyder 1998:13).

Additional advantages put forward in the literature are that concept mapping can serve as a model to replace or support note-taking and note-making which are time consuming tasks. As a study technique, concept maps provide a revision aid and its unique pattern make memory and recall easier (Russel 2004:2; Farrand *et al.* 2002:427).

During the process of learning mind maps provide a framework from which to structure information that enhances learning and provides opportunities to encourage self-regulation and self-efficacy (Chularut & DeBacker 2004:248). Self-regulation (Leung, Lam & Hedley 2001:1072; Kitsantas 2002:109; Gettinger & Seibert 2002:350; Ruban, McCoach, McGuire & Reis 2003:270; Sanz de Acedo Lizarraga, Ugarte, Iriarte, & Sanz de Acedo Baquedano 2003:65) and self-efficacy (Zimmerman 1998:81; Davis & Harden 1999:130; Kitsantas 2002:103; Linnenbrink & Pintrich 2002:315), among others are factors associated with academic achievement. Academic success can therefore be placed within reach of higher education learners by nurturing these factors through concept mapping.

## **5. CONCEPT MAPS AS ASSESSMENT TOOL**

A regular mode of assessing learners is by means of essays. The main difficulty of essays is that they are time-consuming to write, to read and to assess and it is also difficult to assess learners' ability to see relations between ideas. A map on the other hand can reveal very quickly a complex structure of ideas about sophisticated concepts or can show multiple links between concepts. Facilitators can therefore use concept mapping as an assessment tool (Peterson & Snyder 1998:15) or as a vehicle to record conceptual learning in reflection models to improve quality learning and aid in assessment.

Nicoll and Nakleh (2001:868) presented a three-level model to assess concept maps which are combined with the standards/criteria for assessing concept maps as defined by Lim *et al.* (2003:62). The following rubric incorporates these elements and standards (see Table 1).

**Table 1: Rubric to assess concept maps**

<b>ELEMENTS</b>	<b>Standards</b>	<b>Needs revision</b>	<b>Adheres to standard</b>
<b>Accuracy</b>	Content is factually correct and supported with evidence.		
<b>Utility</b>	Links are correct, complete or useful.		
<b>Clarity</b>	The clarity of the structure and the content knowledge expressed on the map.		
<b>Integration and complexity</b>	The overall quality of the map in reflecting the complexity of relationships among the concepts portrayed in the map i.e. the predictive ability of a link.		
<b>Organisation</b>	Effectively reflects the logic flow and relationship of concepts or ideas graphically and visually.		
<b>Creativity and stability</b>	The extent to which creative ideas and creative structures to represent content are used.		

The above rubric can also be used as a guideline for learners when constructing mind maps for the first time. Concept maps, as a form of assessment, reveal not only what learners understand, but also the gaps in their knowledge or their misunderstandings (Lim *et al.* 2003:70).

## **6. DISCUSSION**

This article touched on elementary principles that consider effective communication between teacher and learner along with the active involvement of learners, essential for promoting meaningful learning in higher education. Effective exchange of ideas enables teachers and learners to be active in the structuring of shared understanding which also reveals overlap between perspectives held by novice (learner) and expert (facilitator/teacher). Concept maps provide a visual tool that illustrates such overlap in understanding and create something tangible to promote collaborative conversation and active involvement that can transpire in meaningful learning.

It is commonly assumed that higher education learners are experienced in how to learn. However, learners experience difficulty extracting important information, identifying associations between ideas and integrating information with their former knowledge to form logical understandings (Bransford in De Simone *et al.* 2001:263). The mere fact that concept mapping, over that of traditional instructional methods or learning strategies can improve comprehension and recall of information in low-achieving learners, confirm that concept mapping has a viable place in higher education.

In the literature the following authors from various disciplines in education stated that incomplete traditional pedagogic learning strategies can be improved by putting into practice concept mapping;

- in the health sciences (Li-Lung 2004:9; Xiaoxue 2004:371),
- the humanities (Chularut & Debacker 2004:248),
- nature sciences (Quin, Mintzea & Laws 2004:12) or
- young children (Novak 2004:39; Riley 2004:244).

Although several authors reported on the advantages and positive rewards from concept mapping experienced by learners (Li-Lung 2004:9; Xiaoxue 2004:371; Chularut & Debacker 2004:248; Quin *et al* 2004:12 Novak 2004:39; Riley 2004:244; Freeman & Jessup 2004:166), learners in higher education are sometimes fixed on traditional teaching methods and experience an unfamiliarity with novel teaching/learning activities and could lack the ability to construct their own maps.

Although easy to use, learners should be guided and instructed in the process of using concept mapping as a study strategy (De Simone *et al.* 2001:282; Farrand *et al.* 2002:430). Furthermore, all types of concept mapping strategies are not equally effective for different educational outcomes (Xiaoxue 2004:371; Lee 2004:112). The possibility that not all learners will gain the same benefit by using concept mapping should thus be considered when implementing concept mapping as a learning facilitation strategy.

## **7. SUMMATIVE PERSPECTIVES**

Although concept mapping is a very old form of putting forward information the application thereof holds the potential to uphold innovation practices in teaching and learning. In view of the fact that a wider learner engagement occurs during concept mapping (Laight 2004:232), the intent of learner-centred learning can be reached. Furthermore, articulating-, reflective- and problem based learning focus on self-direction and tends to be mainly unstructured. The use of concept mapping can be used to structure the information/knowledge acquired during these educational approaches (Russel 2004:1; Farrand *et al.* 2002:427). Concept maps as a learning strategy thus support and foster new trends in higher education since it allow learners to externalise their thinking in a visual/verbal outline that allow them to review, reflect and revise their thinking.

Even if concept mapping is considered an innovative and viable educational strategy, the implementation thereof should not be considered an alternative educational approach but rather implemented as an additional instructional or learning scaffold. Concept mapping should function in collaboration with other traditional educational working practices that supports learners to capture their developing ideas, organise them, make new associations and become more creative (Marchinko 2004:1).

Teaching and learning are complex actions that play an essential role in learners' academic achievement. Buzan and Buzan (2000) argued that: "When the brain develops its ability to image, so it develops its thinking capacity, its perceptual abilities, its memory, its creativity, and its confidence." When a learner experiences academic success it cultivates a positive attitude to learning. Concept mapping as a visual learning tool can thus be used as a workable means to increase learners' capacity to learn and facilitators' capacity to support their learners in the learning process so as to enhance active involvement during problem-, resource-based-, learner-centred-, co-operative-, reflection- and articulating learning.

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