

Chapter 5

Concept Maps as a Tool for Promoting Online Collaborative Learning in Virtual Teams with Pre-Service Teachers

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ABSTRACT

The chapter provides an overview of concept mapping and a description of a theoretical framework that adopts concept maps as a tool to enhance collaborative learning in virtual teams in an online learning environment. It was developed by drawing on the relevant literature and on research in online collaborative learning in the pre-service teacher education programs at an Australian university. The framework is underpinned by socio-constructivist learning theories for collaborative learning with online technologies. The use of a concept map to illustrate the framework is presented and the pedagogical benefits are highlighted. The framework is applicable to all higher education courses in promoting collaborative virtual team learning.

INTRODUCTION

The primary aim of this chapter is to provide readers with an overview of concept mapping and a theoretical framework for working collaboratively with concept maps in small virtual teams in online learning environments. The framework is targeted at students in teacher education courses although it is also applicable across all higher education courses.

The chapter begins with a clarification of the relationships between mind maps and concept maps, terms that frequently appear to be used interchangeably, before discussing concept maps and their pedagogical benefits. It is followed by an exploration of the hierarchical versus cyclical nature of concept maps and how they can be used to elicit different types of understanding (Ruiz-Primo & Shavelson, 1996; Hibberd, Jones & Morris, 2002; Safayeni, Derbentseva & Cañas, 2005). Various concept mapping tools are presented, including

DOI: 10.4018/978-1-59904-992-2.ch005

Cmap Tools (<http://cmap.ihmc.us/>), which are online collaborative concept mapping tools used to capture staged developmental thinking and/or learning. Their practical applications are situated in socio-constructivist learning theories that underpin the theoretical framework for collaborative learning within online technologies (Hung & Nichani, 2001). Based on socio-constructivist learning theories, the use of concept maps as a tool to promote collaborative online learning with pre-service teachers in teacher education courses will be discussed. The case in point illustrates one practical application, supporting collaborative learning using online technologies to enhance virtual teamwork.

CONCEPT MAPPING

The two closely related and rather similar terms of concept maps and mind maps are often used interchangeably. It is therefore necessary to clarify the differences between them to avoid further misunderstandings.

A Definition of Concept Maps

Concept maps are graphical tools for organizing and representing knowledge. They include concepts, usually enclosed in circles or boxes of some type, and relationships between concepts indicated by a connecting line linking two concepts. Words on the line, referred to as linking words or linking phrases, specify the relationship between the two concepts. (Novak & Cañas, 2006, p. 1)

The two most distinguishing attributes of concept maps are the hierarchical structure in which concepts are represented and the use of cross-links, which indicate the relationships between the knowledge components. The hierarchical organisation of concept maps usually depicts the most general concept at the top and more specific concepts underneath. The cross-links show how concepts in the knowledge area are connected to

each other. Both of these features are central in aiding creative thinking.

A Definition of Mind Maps

Mind maps use a central word, idea or other item arranged intuitively around the central word. A mind map starts with a key notion that radiates out into branches. This free flow of ideas promotes brainstorming. These tree structures generate and chart elements without the immediacy of having to establish an intrinsic conceptual framework.

Concept Maps and their Different Structures

Concept maps are visual, ‘at-a-glance’ representations of key concepts or ideas and the inter-relationships between them. It is a technique first developed in the 1970s by Joseph Novak (born 1932) for representing understanding in multimodal forms. The concepts can be linear and hierarchial or networked consisting of nodes (concepts) and links (relations between concepts). Nodes are displayed as circles, ovals or rectangles, with the links being either uni-or bi-directional and usually labelled.

Concept maps are—at their most basic—graphic organisers of information. There are several types such as chain (or sequential), spider, hierarchical and cyclical concept maps. Each type is suitable for a particular kind of knowledge or content.

Sequential maps are also called chain maps and are typically used for time lines or for a sequence of events or a succession of steps. (see Figure 1)

Hierarchical concept maps are typically used for heredity (i.e. family trees) or food chains (i.e. the feeding relationship between species within an ecosystem), which are classical tree structures. The more general concept is at the top of the hierarchy, with more specific concepts in the lower part; hence they are read from the top to the bottom. However, most hierarchical concept

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