Chapter 18

Using Concept Maps to Assess Individuals and Teams in Collaborative Learning Environments

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ABSTRACT

The main focus of this chapter is the use of concept mapping, broadly defined to include both graphical and textual representations, for assessment in collaborative learning contexts. Several tools developed by the authors integrate concept mapping as the primary means of assessing progress of learning in complex and problem-solving domains. This chapter presents an overview of the theoretical and empirical foundation for these assessment tools, and discusses their applicability to collaborative learning environments (CLE).

INTRODUCTION

Collaborations are formed in learning settings to meet instructional needs as well as to exploit the benefits (pedagogical, learning, and pragmatic) associated with collaborative learning (Stahl, 2006).

This rationale is similar to that of organizations that rely on working collaborations to address difficult and challenging tasks (Salas & Fiore, 2004). In educational settings, collaborative learning environments (CLEs) have been used to promote participation and enhance learning. One of the main reasons for creating CLEs is to facilitate the devel-

opment of professional skills that are promoted from group learning, such as communication, teamwork, decision making, leadership, valuing others, problem solving, negotiation, thinking creatively, and working as a member of a team (Carnevale, Gainer, & Meltzer, 1989).

Collaborative learning involves the interaction of two or more individuals and their environment with the goal of developing knowledge, skills, or attitudes. There is a need to assess the learning and interactions in order to provide feedback to the learners to improve collaborative interactions, thereby improving overall performance, and in order to evaluate the general efficacy of collaborative learning given a specific context. Studies of collaboration processes have led to improved understanding about what teams do, and how and why they do what they do (Salas & Cannon-Bowers, 2000). Another benefit in assessing collaborative learning processes is to understand the differences between highly successful collaboration process behaviors and unsuccessful process behaviors. From this understanding, a better collaboration framework can be used to inform the design, development, and deployment of collaborative learning strategies in contexts such as educational and workplace settings.

There is evidence that teams whose thinking is similar are likely to work more effectively together than teams whose thinking is not (Cannon-Bowers & Salas, 1998; Guzzo & Salas, 1995; Hackman, 1990). The degree to which a team shares similar conceptualizations is seen as a key indicator of successful overall performance (Salas & Cannon-Bowers, 2000). Developing learning activities that enhance a team's development of shared understanding has the potential to improve a team's learning and ultimately that of the individuals on the team. Methodologies that focus on a team cognition framework can provide an important view on collaborative processes and help guide the design of effective collaborative learning activities (interaction strategies) (Fiore & Salas, 2004; Langan-Fox, Anglim, & Wilson, 2004).

Several research studies have tried to establish the link between collaborative knowledge and collaborative processes. Research has shown that specific interactions, such as communication and coordination, mediate the development of team knowledge and thus mediate team performance (Mathieu, et al., 2000). Interactions among teammates coupled with shared knowledge are a predominate force in the construct of shared cognition. As teammates interact, they begin to share knowledge, thereby enabling them to create cues in a similar manner that in turn helps them make compatible decisions and take proper actions (Klimoski & Mohammed, 1994). Shared knowledge can help team members in CLE by increasing understanding about what is occurring with the learning task, develop accurate expectations about collaborative actions, and communicate efficiently in the learning environment.

Collaborative learning environments are becoming more common in educational and workplace settings in order to meet the challenges created by technological and scientific progress. Technological advances impact how we do things as well as how we think. Knowledge used to be measured by the ability to repeat or recall information in many contexts. However, knowledge is increasingly being measured by the ability to efficiently find and make effective use of information (Simon, 1996). The former approach to knowledge and assessment is appropriate for declarative knowledge – knowing facts and the definitions of concepts. However, with regard to the ability to solve problems, especially complex, dynamic and ill-structured problems, the latter kind of knowledge is also required. The challenge addressed in this paper is to develop assessment methodologies appropriate for this latter type of knowledge.

Learners not only need to gain a basic understanding of foundational topics: they also need to acquire skills associated with asking meaningful questions that will help them develop general skills and attitudes. To be successful, educational

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