Chapter 14

Expanded Collaborative Learning and Concept Mapping:
A Road to Empowering Students in Classrooms

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ABSTRACT

The synergic effects of knowledge accumulation, information technology development, and globalization have produced a new set of social paradigms. The transition towards a post-industrial society became evident at the beginning of the 21st century. New challenges are presented to the educational system, and a revision of methodological procedures is imperative to prepare citizens capable of dealing with complex contemporary issues. This chapter proposes 'expanded collaborative learning' for didactic activities involving peer review of any material produced by groups of students. We present a particular experience in which higher education students produced peer reviewed collaborative concept maps during an introductory course about natural sciences. Besides posing an unusual task for students, peer review changes the evaluation paradigm in traditional classrooms, reduces the power asymmetry between teacher and students, and promotes a truly collaborative atmosphere. This learning environment presents favorable conditions for empowering students, fostering them to act as autonomous citizens capable of transforming society.

NEW CHALLENGES FOR EDUCATION IN THE 21ST CENTURY

The beginning of the 3rd millennium was anticipated with some anxiety by humankind. This new era has brought a promise of changes based on the revision of our practices. The year 2000 software problem (Y2K bug), for instance, is a distant memory of the early 21st century. The millennium bug was a consequence of using two-digit dates in order to conserve computer memory, which was expensive and scarce in the 1960s. Media speculation as well as corporate and government reports at the end of

the 1990s caused widespread concern that critical industries and government would cease operating at the stroke of midnight between December 31, 1999 and January 1, 2000 (Murray & Murray, 1996). Despite these catastrophic expectations involving the millennium roll-over, the Y2K consequences were minimal because the majority of problems had been fixed correctly through a worldwide collaborative effort. Indian engineers were responsible for correcting a huge number of US computers, illustrating an example of international collaborative work through the Internet (Friedman, 2007).

This computational crisis embodied the changes that have impacted our society since the second half of the 20th century. The knowledge explosion, information technology development and globalization have dramatically affected our society (Friedman, 2007; Hobsbawn, 1996). New social paradigms have emerged since then, making the end of industrial society a certainty. Knowledge, post-modern and post-industrial are labels used to identify this new society that has shaped our contemporary way of life (Bell, 1999; De Masi, 2000; Touraine, 2007; UNESCO, 2005). While industrial society was based on work and goods manufacturing, post-industrial society is centered in free time, creative idleness, and service production in the form of symbols, information, values and esthetics (De Masi, 2000). The power in industrial society depended on the possession of manufacturing resources (e.g., factories). On the other hand, the power in post-industrial society depends on the possession of ideation resources, such as research labs, and information (e.g., mass media).

The new challenges posed by the post-industrial society are consequences of scientific-technological development and globalization. Machines and automated systems can carry out repetitive, routine and/or brute tasks more efficiently than humans. Therefore, the desired attributes of the 21st century workforce are quite different than those used by industrial society. A revision of the educational system is desirable in order to meet the new demands of the labor market and to prepare citizens capable of dealing with the complex scenarios posed by post-industrial society.

In contrast with the pronounced social changes involved in the transition to a post-industrial society, the majority of schools have not changed and the education designed for industrial society is still prevalent. They resemble an industrial factory in that their classrooms are equal, their teachers have a standardized discourse, and there is an expectation that all students answer the same questions in the same way (de Menezes, 2000). Such standardization, one of industrial society's main features, affected the educational system by allowing only one model to satisfy teachers' and students' diverse expectations.

Traditional schools were built up under industrial paradigms, and their methodological procedures must be revised to respond to the new demands of post-industrial society. Beyond transmitting disciplinary knowledge, education for the 21st century requires the development of skills related to lifelong learning, teamwork, creative thinking, and collaborative knowledge construction (Burnard, 2006; Fischer, Bruhn, Gräsel, & Mandl, 2002; Pintrich, 2004; Sawyer, 2006). The powerful combination of these cognitive and communicative skills with confidence, which is related to emotional behavior, can foster students' empowerment in classrooms. Any methodological change in classroom activities in order to fit the needs of post-industrial society must pursue a truly collaborative and empowering environment involving both teachers and students (Mintzes, Wandersee, & Novak, 1998). The ultimate lesson to be taught in post-industrial classrooms is to learn how to learn (Georghiades, 2004; Novak & Gowin, 1984).

A schematic representation of the key features of the new post-industrial classroom is presented in Figure 1. Self-evaluation, motivation, creativity, and metacognition are the pedagogical building blocks that compose the key features to pursue

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