

## Learning With Computer-Based Learning Environments: A Literature Review of Computer Self-Efficacy

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*Although computer-based learning environments (CBLEs) are becoming more prevalent in the classroom, empirical research has demonstrated that some students have difficulty learning with these environments. The motivation construct of computer-self efficacy plays an integral role in learning with CBLEs. This literature review synthesizes research that has empirically examined factors related to computer self-efficacy and the relationship between computer self-efficacy, learning outcomes, and psychological factors are positively related to computer self-efficacy. Students who receive behavioral modeling report significantly higher computer self-efficacy than do students who receive the more traditional instruction-based method when learning with CBLEs. Computer self-efficacy is related both to learning outcomes and to learning processes with CBLEs. This review also offers theoretical and methodological issues for future research in the area of computer self-efficacy.*

**KEYWORDS:** self-efficacy, motivation, computer-based learning environments, literature review.

Computer-based learning environments (CBLEs) are becoming more prevalent in the classroom and have been used to help students learn about challenging topics (Azevedo, 2005; Graesser, McNamara, & VanLehn, 2005; Mandinach & Cline, 1996). CBLEs can serve a variety of functions in the classroom, ranging from increasing the productivity of students' class work to acting as intellectual partners to foster learning (Jacobson & Kozma, 2000; Lajoie, 2000; Lajoie & Derry, 1993; Linn & Hsi, 2000; Salomon, Perkins, & Globerson, 1991). Furthermore, most CBLEs provide a learning environment with multiple forms of representations (e.g., text, audio, and video) and allow students to pursue personal goals by presenting information in a nonlinear format (Dillon & Jobson, 2005; Jonassen & Reeves, 1996). Although these characteristics should foster active participation in the construction of knowledge (White & Frederiksen, 2005; Williams, 1996), empirical

research has produced mixed results on the effectiveness of using these environments as learning tools in the classroom (for meta-analyses, see Bangert-Drowns, Kulik, & Kulik, 1985; C. C. Kulik & Kulik, 1991; J. A. Kulik, 1994). Research suggests that although CBLEs foster knowledge development in some students (e.g., Jacobson & Archodidou, 2000), other students have difficulty using these learning environments to develop knowledge (e.g., Azevedo, Guthrie, & Sebirt, 2004).

To examine why some students have difficulty learning in these environments, research has focused on the cognitive and metacognitive processes students use during learning (Azevedo, Cromley, Winters, Moos, & Greene, 2005). For example, research has found that students who activate prior knowledge and monitor their emerging understanding tend to develop deeper understanding of challenging topics when compared to students who do not use these processes during learning with CBLEs (Azevedo et al., 2004; Quintana, Zhang, & Krajcik, 2005). However, it is important to consider cognitive and motivational processes related to learning with CBLEs. Motivational challenges may arise because some CBLEs allow students to make their own decisions about which information to access (Vuorela & Nummenmaa, 2004). As such, learning in these environments is dependent on students' active participation in the learning process, and the extent to which students actively participate in the learning process is related to motivational constructs (Moos & Azevedo, 2006, 2008). In particular, students' participation in the learning process with CBLEs is associated with the perception of their capabilities related to specific computer skills and knowledge (Debowski, Wood, & Bandura, 2001; C. A. Murphy, Coover, & Owen, 1989). This perception, referred to as *computer self-efficacy* (C. A. Murphy et al., 1989), plays an integral role in learning with CBLEs. As suggested by Shapka and Ferrari (2003), higher computer self-efficacy is strongly associated with specific activities during learning with CBLEs (i.e., searching and navigation patterns).

The goal of this review is to synthesize literature that has examined the relationship between a theoretically driven construct of motivation, computer self-efficacy, and learning with CBLEs. We first define the theoretical framework of self-efficacy and describe how self-efficacy is a motivational construct that warrants examination in the field of learning with CBLEs. Then, we follow with a description of computer self-efficacy and how it relates to the original conceptualization of self-efficacy. Next, we explain our method for choosing the studies in this literature review. To determine which studies to review, we used research questions that have been prevalent in the rich history of self-efficacy in academic learning: (a) What are the sources of self-efficacy? (b) What is the relationship between self-efficacy and learning outcomes? and (c) What is the relationship between self-efficacy and learning processes? These three research questions guided our decisions regarding which studies should be included in this literature review. After reviewing the included studies, we discuss the theoretical and methodological issues of the reviewed studies and provide suggestions on how these issues could be addressed in future research.

### *Conceptual Framework of Self-Efficacy*

Self-efficacy is derived from the social cognitive theory (SCT; Wood & Bandura, 1989) originated by Bandura (1986). SCT accounts for the role of self-regulatory, self-reflective, cognitive, and vicarious processes in human behavioral adaptation.

According to this theoretical framework, individuals are proactive and self-regulating. Central to this underlying assumption is Bandura's conception of *reciprocal determinism*, which suggests that human functioning is a dynamic interplay between environmental, behavioral, and personal influences. This dynamic interplay, termed *triadic reciprocity*, helps explain how individuals acquire and maintain certain behavioral patterns. For example, a student's behavior is based on the interaction between personal factors and the learning environment. As the environment presents new experiences, the student may evaluate current behavior with the new experiences in the learning environment.

Self-efficacy is of central importance to SCT and is conceptualized as the self-perception of one's capabilities to meet situational demands based on current states of motivation, course of actions needed, and cognitive resources (Wood & Bandura, 1989). As identified by a number of reviews on motivational constructs (for extensive reviews, see Greene & Ackerman, 1995; K. P. Murphy & Alexander, 2000), *self-efficacy* is a fundamental term in the motivational literature. Motivation has been described as "physiological processes involved in the direction, vigor, and persistence of behavior" (Bergin, Ford, & Hess, 1993, p. 437). Based on this conceptualization, constructs that are related to persistence, effort expenditure, and behavioral activities are considered motivational constructs. Research has demonstrated that students with higher self-efficacy tend to persist more in the face of difficulty (Torkzadeh & Van Dyke, 2002), whereas those with lower self-efficacy tend to engage in fewer challenging activities (Bandura, 1977, 1982). Furthermore, studies have shown that self-efficacy influences choice of behavioral activities, which include cognitive activities such as strategy use (Multon, Brown, & Lent, 1991). Based on extensive previous research, it is clear that students' perceptions of their capabilities to meet situational demands are related to their performance, persistence, and choice.

A vast body of research has focused on the relationship between self-efficacy and performance in various academic activities. It is not surprising that this vast array of research has found a strong, positive relationship (e.g., Bandura & Schunk, 1981; Betz & Hackett, 1981; Pajares, 1996; Pajares & Miller, 1994; Pintrich & De Groot, 1990; Schunk, 1982, 1983, 1984, 1989, 1991; Wigfield, Guthrie, & Tonks, 2004; Zimmermann, Bandura, & Martinez-Pons, 1992). Results from this line of research indicate that self-efficacy is strongly related to performance across a variety of subject areas (Multon, 1991). For example, research has found that children's mathematical self-efficacy is predictive of their mathematical test scores (Collins, 1982) and that children who felt more efficacious for problem solving demonstrated higher performance levels when compared with peers with lower self-efficacy, despite the fact that all of the children had equal ability (Bouffard-Bouchard, 1990). Similarly, Pintrich and De Groot (1990) found that academic self-efficacy was positively related to other academic domains, such as quality of writing. Furthermore, Wigfield and Guthrie (1997) found that efficacy has a significant positive correlation with fourth and fifth graders' breadth of reading and the time that they took to read outside of school (for an overview of the relationship between motivation, including self-efficacy and reading, see Guthrie & Wigfield, 1999).

### Self-Efficacy and CBLs

Research has found that there is substantial variability in how individuals use CBLs. Whereas some students use CBLs sequentially (i.e., they read from top to bottom), others learn by cross-linking nodes of information in these environments (MacGregor, 1999). Students that use features of CBLs, such as cross-linking nodes of information, tend to demonstrate higher learning gains (Brospan, 1998). However, although research has indicated that learning with CBLs is facilitated when students actively participate in the learning process by using the embedded features, many students may lack the confidence in their ability to effectively learn with CBLs, possibly because experiences in traditional environments, such as the classroom, do not prepare students for learning with CBLs (Whipp & Chiarelli, 2004). Thus, self-efficacy is a particularly important construct to study when examining learning with CBLs, and research has shown that self-efficacy is related to performance even when controlling for other variables (Mentro, Cartledge, & Locke, 1980). To address this line of research, researchers have extended original conceptualizations of self-efficacy to examine the relationship between computer self-efficacy and learning with CBLs. Computer self-efficacy has been conceptualized as an individual's perception of his or her capability related to computer skills and knowledge (C. A. Murphy et al., 1989).

Computer self-efficacy is grounded in the rich history of research examining self-efficacy in traditional classroom contexts. This line of research has been driven by three themes: (a) individual and contextual factors related to self-efficacy (e.g., Bandura, 1994), (b) the relationship between self-efficacy and learning outcomes (e.g., Bouffard-Bouchard, 1990), and (c) the relationship between self-efficacy and learning processes (e.g., Pintrich & De Groot, 1990). These three themes were used to develop the three guiding research questions for this literature review: (a) What factors are related to computer self-efficacy? (b) What is the relationship between computer self-efficacy and learning outcomes with CBLs? and (c) What is the relationship between computer self-efficacy and learning processes?

### Method

#### Criteria for Inclusion

Studies that examined the relationship between computer self-efficacy and learning with CBLs in a variety of domains were selected for this literature review. For this review, a CBLE was defined as any technology-based environment that was used as an instructional tool (e.g., databases, hypermedia, multimedia, and Web-based learning environments) in an educational setting (e.g., classroom) and/or research setting (e.g., laboratory). After the initial selection of articles, inclusion criteria were used to identify which studies would be included in this literature review. These criteria focused on three main areas: (a) research questions, (b) theoretical framework, and (c) methodology.

First, studies were included only if they examined one of the three questions in this literature review: (a) What factors are related to computer self-efficacy? (b) What is the relationship between computer self-efficacy and learning outcomes with CBLs? and (c) What is the relationship between computer self-efficacy and learning processes with CBLs? The rationale for focusing on these three questions

is based on several factors, including previous research on self-efficacy in traditional classroom settings and the educational implications that arise from examining these three research questions. In terms of previous research examining self-efficacy, much of the research has used Bandura's (1986) conceptualization of self-efficacy and has focused on various factors related to self-efficacy (Bandura, 1994). In addition, educational implications for CBLEs is best understood when research also accounts for variables that are related to *what* students learn and *how* they learn with CBLEs (Azevedo et al., 2005; Moos & Azevedo, 2006, 2008; Winne, 2005). Thus, studies identifying the relationship between computer self-efficacy, learning processes, and learning outcomes with CBLEs were included in this literature review. Studies that addressed research questions outside these themes were excluded (e.g., the interaction between gender and computer self-efficacy and/or development of computer self-efficacy scales; see Busch, 1995; Cassidy & Eachus, 2002).

Second, inclusion criteria also included an examination of the theoretical foundation of the study. To be included in this literature review, a study needed to clearly articulate the theoretical framework of its measure of computer self-efficacy. For example, many studies included in this literature review used Bandura's theoretical framework of self-efficacy as the underlying theory (Bandura, 1977, 1986, 1997). Studies that did not clearly articulate a well-grounded theoretical framework were excluded from this review. Third, the methodology of each study was examined to determine if sound statistical analyses were used. Flawed methodology was grounds for exclusion, which included inappropriate statistical techniques (e.g., ecological fallacy due to unit analyses, inadequate control of confounding variables, and/or methodological designs that did not allow the researchers to test stated hypotheses). In addition, the sample needed to be appropriately described, and there needed to be an adequate sample size (e.g., power analysis revealed a sufficient sample size). In addition, research with samples of grade-level students were the focus of this literature review (i.e., learning disabled and/or gifted populations were outside the scope of this literature review and were not included). Although research on the relationship between computer self-efficacy and learning with CBLEs for samples of learning disabled and/or gifted students certainly warrants examination, the scope of this literature review is limited to grade-level students.

#### Search Procedures

Based on suggested frameworks for developing literature reviews (see Hart, 1999), the search included two phases: (a) gather all relevant articles in the initial search, and (b) based on the inclusion and exclusion criteria for this literature review, choose articles from the initial search that align with the focus of this literature review. In the first phase of the search, PsycINFO and ERIC databases were searched for literature published after 1987 because the use of CBLEs in educational settings was limited before 1987. The literature search was terminated in April 2007. When searching for this initial set of studies, limiters were applied so that the most relevant research would be identified. The following keywords were used in the search: "self-efficacy and computer\*", "self-efficacy and computer-based learning environments", "self-efficacy and multimedia", "self-efficacy and hypertext", "self-efficacy and computer-assisted instruction", "self-efficacy and hypermedia", and "self-efficacy and intelligent-tutoring system." As previously

stated, this literature review is not focused on specific types of CBLEs (i.e., hypermedia vs. intelligent-tutoring systems), and thus, the keywords in the search procedures were aimed at collecting studies that examined the relationship between computer self-efficacy and a variety of CBLEs. The first phase of the search yielded 331 articles. Next, dissertations, chapters, and technical reports were excluded, and only peer-reviewed studies were included. With the remaining articles, the previously identified inclusion and exclusion criteria were used to finalize which studies would be included in this literature review. Out of the total of 331 articles found in the first phase of the search, 33 articles met these criteria and were used for this literature review.

These 33 articles were grouped based on the three research questions (see Table 1 for a complete list of articles, by research question). Twenty-five articles examined factors related to computer self-efficacy (Bandura & Wood, 1989; Chou, 2001; Chu, 2003; Coffin & MacIntyre, 1999; Debowski et al., 2001; Deng, Doll, & Truong, 2004; Dunlap, 2005; Ertmer, Evenbeck, Cennamo, & Lehman, 1994; Gallini & Zhang, 1997; Gist, Schwoerer, & Rosen, 1989; Hasan, 2003; Houle, 1996; Hsu & Huang, 2006; Johnson, 2005; Martocchio & Dulebohn, 1994; Meyer, Middlemiss, & Theodorou, 2002; Potosky, 2002; Russon, Josefowitz, & Edmonds, 1994; Salanova, Grau, & Cifre, 2000; Schunk & Ertmer, 1999; Thompson & Lynch, 2003; Torkzadeh & Van Dyke, 2002; Vuorela & Nummenmaa, 2004; Wang & Newlin, 2002; Whipp & Chiarelli, 2004). Second, five studies focused on the relationship between self-efficacy and learning outcomes with CBLEs (Hill, Smith, & Mann, 1987; Holladay & Quiñones, 2003; Mitchell, Hopper, & Daniels, 1994; Shapka & Ferrati, 2003; Thompson, Meriac, & Cope, 2002). Finally, three studies examined the relationship between students' self-efficacy and learning processes with CBLEs (Brozman, 1998; Emturian, 2004; MacGregor, 1999). These three themes represent the three research questions of this literature and serve as the organizational structure. Each research question raises different theoretical and methodological issues. These issues are addressed in the following section.

#### Results

##### What Factors Are Related to the Development of Computer Self-Efficacy?

This section presents findings from studies that examined factors related to computer self-efficacy. Studies examining this research question can be divided into two subcategories: (a) nonexperimental studies and (b) experimental studies. Chu, (2003), Coffin and MacIntyre (1999), Deng et al. (2004), Dunlap (2005), Gallini and Zhang (1997), Hasan (2003), Houle (1996), Hsu and Huang (2006), Johnson (2005), Potosky (2002), Salanova et al. (2000), Thompson and Lynch (2003), Torkzadeh and Van Dyke, (2002), Vuorela and Nummenmaa (2004), Wang and Newlin (2002), and Whipp and Chiarelli (2004) used nonexperimental designs to examine what factors are associated with computer self-efficacy. Bandura and Wood (1989), Chou (2001), Debowski et al. (2001), Ertmer et al. (1994), Gist et al. (1994), Martocchio and Dulebohn (1994), Meyer et al. (2002), Russon et al. (1994), and Schunk and Ertmer (1999) used experimental designs to examine what factors are related to computer self-efficacy. This section first synthesizes the findings from studies in the first subcategory and then presents findings from studies

**Table 1**  
Complete list of reviewed studies, by research question

Research Question 1a: What factors are related to computer self-efficacy? (noneperimental; n = 16)
Chu, L.-L. (2003). The effects of Web page design instruction on computer self-efficacy of preservice teachers and correlates. <i>Journal of Educational Computing Research</i> , 28(2), 127-142.
Coffin, R. J., & MacIntyre, P. D. (1999). Motivational influences on computer-related affective states. <i>Computers in Human Behavior</i> , 15(5), 549-569.
Deng, X., Doll, W. J., & Truong, D. (2004). Computer self-efficacy in an ongoing use context. <i>Behaviour and Information Technology</i> , 23(6), 395-412.
Dunlap, J. C. (2005). Problem-based learning and self-efficacy: How a capstone course prepares students for a profession. <i>Educational Technology Research and Design</i> , 53(1), 65-85.
Gallini, J. K., & Zhang, Y. L. (1997). Socio-cognitive constructs and characteristics of classroom communities: An exploration of relationships. <i>Journal of Educational Computing Research</i> , 17(4), 321-339.
Hasan, B. (2003). The influence of specific computer experiences on computer self-efficacy beliefs. <i>Computers in Human Behavior</i> , 19(4), 443-450.
Houle, P. A. (1996). Toward understanding student differences in a computer skills course. <i>Journal of Educational Computing Research</i> , 14(1), 25-48.
Hsu, W. K., & Hwang, S. S. (2006). Determinants of computer self-efficacy: An examination of learning motivation and learning environments. <i>Journal of Educational Computing Research</i> , 35(3), 245-265.
Johnson, R. D. (2005). An empirical investigation of sources of application-specific computer self-efficacy and mediators of the efficacy-performance relationship. <i>International Journal of Human-Computer Studies</i> , 62(6), 737-758.
Potosky, D. (2002). A field study of computer efficacy beliefs as an outcome of training: The role of computer playfulness, computer knowledge, and performance during training. <i>Computers in Human Behavior</i> , 18(3), 241-256.
Sahanova, M., Grau, R. M., & Cifre, E. (2000). Computer training, frequency of usage and burnout: The moderating role of computer self-efficacy. <i>Computers in Human Behavior</i> , 16(6), 575-590.
Thompson, L. F., & Lynch, B. (2003). Web-based instruction: Who is inclined to resist and why? <i>Journal of Educational Computing Research</i> , 29(3), 375-385.
Torkzadeh, G., & Van Dyke, T. (2002). Effects of training on Internet self-efficacy and computer user attitudes. <i>Computers in Human Behavior</i> , 18(5), 479-494.
Vuorela, M., & Nummenmaa, L. (2004). How undergraduate students meet a new learning environment? <i>Computers in Human Behavior</i> , 20(6), 763-777.
Wang, A. Y., & Newlin, M. H. (2002). Predictors of Web-student performance: The role of self-efficacy and reasons for taking an on-line class. <i>Computers in Human Behavior</i> , 18(2), 151-163.
Whipp, J. L., & Charelli, S. (2004). Self-regulation in a web-based course: A case study. <i>Educational Technology and Development</i> , 52(4), 5-22.
<i>Research Question 1b: What factors are related to computer self-efficacy? (experimental; n = 9)</i>
Bandura, A., & Wood, R. (1989). Effect of perceived controllability and performance standards on self-regulation of complex decision making. <i>Journal of Personality and Social Psychology</i> , 56(5), 805-814.
Chou, H. W. (2001). Effects of training method and computer anxiety on learning performance and self-efficacy. <i>Computers in Human Behavior</i> , 17(1), 51-69.

**Table 1** (continued)

Debowksi, S., Wood, R. E., & Bandura, A. (2001). Impact of guided exploration and enactive exploration on self-regulatory mechanisms and information acquisition through electronic search. <i>Journal of Applied Psychology</i> , 86(6), 1129-1141.
Ertmer, P. A., Evenbeck, E., Cennamo, K. S., & Lehman, J. D. (1994). Enhancing self-efficacy for computer technologies through the use of positive classroom experiences. <i>Educational Technology Research and Development</i> , 42(3), 45-62.
Gist, M. E., Schworer, C., & Rosen, B. (1989). Effects of alternative training methods on self-efficacy and performance in computer software training. <i>Journal of Applied Psychology</i> , 74(6), 884-891.
Martocchio, J., & Dulebohn, J. (1994). Performance feedback effects in training: The role of perceived controllability. <i>Personnel Psychology</i> , 47(2), 25-39.
Meyer, B., Middlemiss, W., & Theodorou, E. (2002). Effects of structure strategy instruction delivered to fifth-grade children using the Internet with and without the aid of older adult tutors. <i>Journal of Educational Psychology</i> , 94(3), 486-519.
Russon, A. E., Josefowitz, N., & Edmonds, C. V. (1994). Making computer instruction accessible: Familiar analogies for female novices. <i>Computers in Human Behavior</i> , 10(2), 175-187.
Schunk, D. H., & Ertmer, P. A. (1999). Self-regulatory processes during skill acquisition: Goal and self-evaluative influences. <i>Journal of Educational Psychology</i> , 91(2), 251-260.
<i>Research Question 2: What is the relationship between self-efficacy and learning outcomes with CBLEs? (n = 5)</i>
Hill, T., Smith, N. D., & Mann, M. F. (1987). The role of efficacy expectations in predicting the decision to use advanced technologies: The case of computers. <i>Journal of Applied Psychology</i> , 72(2), 307-313.
Holladay, C. L., & Quinones, M. A. (2003). Practice variability and transfer of training: The role of self-efficacy generality. <i>Journal of Applied Psychology</i> , 88(6), 1094-1103.
Mitchell, T. R., Hopper, H., & Daniels, D. (1994). Predicting self-efficacy and performance during skill acquisition. <i>Journal of Applied Psychology</i> , 79(4), 506-517.
Shapka, J. D., & Ferrari, M. (2003). Computer-related attitudes and actions of teacher candidates. <i>Computers in Human Behavior</i> , 19(3), 319-334.
Thompson, L. F., Meriac, J. P., & Cope, J. G. (2002). Motivating online performance: The influence of goal setting and Internet self-efficacy. <i>Social Science Computer Review</i> , 20(2), 149-160.
<i>Research Question 3: What is the relationship between self-efficacy and learning processes with CBLEs? (n = 3)</i>
Brosnan, M. J. (1998). The impact of computer anxiety and self-efficacy upon performance. <i>Journal of Computer Assisted Learning</i> , 14(3), 223-234.
Emurian, H. H. (2004). A programmed instruction tutoring system for Java-super™: Consideration of learning performance and software self-efficacy. <i>Computers in Human Behavior</i> , 20(3), 423-459.
MacGregor, S. K. (1999). Hypertext navigation profiles: Cognitive characteristics and information processing strategies. <i>Journal of Educational Computing Research</i> , 20(2), 189-206.

in the second subcategory. Finally, this section ends with a summary of the studies in this section, which includes a critique and implications for future research.

*Nonexperimental studies.* Studies using nonexperimental designs have primarily suggested that psychological and behavioral factors are related to computer self-efficacy. In terms of psychological factors, some studies have found that students' attitudes toward CBLEs are significantly related to their computer self-efficacy. Attitudes toward CBLEs are broadly defined as a psychological tendency that is expressed through positive, negative, or neutral views of CBLEs (Torkzadeh & Van Dyke, 2002). This operational definition suggests that attitudes toward computers include four interpretable factors: (a) positive reactions to computers, (b) negative reactions to computers, (c) attitudes to computer-related mechanisms, and (d) computer and children education (Torkzadeh & Van Dyke, 2002). Using data from a sample of 189 undergraduates, Torkzadeh and Van Dyke found that positive attitudes toward CBLEs were positively correlated with higher computer self-efficacy, whereas negative attitudes were positively correlated with lower computer self-efficacy. Negative attitudes toward CBLEs included such assumptions as "I feel that using computers is too time consuming," whereas positive attitudes toward CBLEs included such assumptions as "I feel like I have control over what I do when I use a computer" (Torkzadeh & Van Dyke, 2002). Previous findings have also suggested that attitudes toward CBLEs are formed at an early age (Wildier, Mackie, & Cooper, 1985) and that attitudes are relatively stable by the time students reach higher education (Torkzadeh & Van Dyke, 2002). However, Torkzadeh and Koufteros (1993) also found that training programs can modify attitudes toward CBLEs and thus indirectly affect computer self-efficacy.

In addition to these three interpretable factors of attitude, curiosity and enjoyment in using CBLEs to learn are related to computer self-efficacy. For example, Wang and Newlin (2002) investigated the relationship between college students' personal choices for taking Web-based courses and their self-efficacy. They found that students who enrolled because they enjoyed Web-based learning environments and/or were curious about Web courses had higher self-efficacy toward CBLEs. Studies focusing on psychological factors related to computer self-efficacy have also examined students' preferences for working alone or in collaboration with peers. Gallini and Zhang (1997), for example, examined the relationship among sociocognitive factors with computer self-efficacy for 88 fourth and fifth graders. Students with a preference to work alone showed significantly higher self-efficacy when learning with a CBLE. Other studies have explored how different aspects of motivation relate to computer self-efficacy. For example, Deng et al. (2004) found that for 153 engineers the effect of self-efficacy on computer use is mediated by intrinsic motivation.

In addition to examining psychological factors, nonexperimental studies have also examined the relationship between behavioral factors and computer self-efficacy. The majority of studies examining behavioral factors have focused on prior computer use. These studies have categorized different types of prior computer use to better understand the relationship between specific types of previous computer use and computer self-efficacy. For example, Houle (1996) examined various characteristics of college students who were enrolled in a computer skills course, including whether a student had taken a computer course in high school and

the type of high school computer course and whether the student had taken a prior computer class since high school. Results indicated that previous experiences with CBLEs, including having the experience of taking a spreadsheet and database course in high school and owning a computer, are positively correlated with computer self-efficacy. However, findings on the relationship between specific types of computer use and computer self-efficacy have been somewhat contradictory. For example, although Houle found a positive relationship between previous use of spreadsheets and database courses with computer self-efficacy, Hasan (2003) found that experience with computer programming and graphics applications has a stronger relationship with computer self-efficacy. Although these studies focused on whether or not students used CBLEs in the past, others studies examined how frequently students use CBLEs. This research suggests that measuring the frequency of usage, above and beyond just assessing whether or not students have used CBLEs, is a more appropriate measurement to analyze the relationship between behavioral factors and computer self-efficacy (Salanova et al., 2000).

Nonexperimental studies have also examined how computer self-efficacy changes during the use of CBLEs. For example, Dunlap (2005) examined how computer self-efficacy changed for 31 undergraduate students during a 16-week capstone course in which they learned with a problem-based software learning environment. Although the students' self-efficacy was low in the beginning of the course, their reported self-efficacy was significantly higher at the end of the course. Dunlap suggests that the students' participation in the problem-based learning environment seemed to have influenced personal appraisals of their capability for using this particular CBLE.

*Experimental studies.* Experimental studies examining factors related to computer self-efficacy indicate that it is not merely using a CBLE that leads to increased computer self-efficacy. For example, Ertmer et al. (1994) assigned 32 undergraduates to treatment conditions to investigate the effects of experience on computer self-efficacy for specific CBLEs. Examining the quantity and quality of computer use, the researchers found that there is not a direct relationship between the use of CBLEs during learning and computer self-efficacy. Instead, it is the quality, and not the quantity, of computer experience that is the most critical determinant in computer self-efficacy. Whereas *quantity* refers to the frequency in which CBLEs are used, *quality* refers to how CBLEs are used. Some researchers have suggested that the quality of computer use may be related to technical support and early success with technical demands and that early access to these two functions may be related to increased computer self-efficacy (Whipp & Chirelli, 2004).

Experimental studies have also examined how different training methods provided during learning with CBLEs are related to computer self-efficacy. For example, Chou (2001) examined the relationship between behavioral and instructional-based methods and computer self-efficacy. Although the instruction-based method is a traditional approach that follows a deductive way to learning, the behavioral modeling approach is grounded in Bandura's (1969) social learning theory and involves observing, imitating, and then extending the model's behavior. Using 92 high school students, Chou examined how these two different training approaches are related to students' computer self-efficacy when students used a commercialized reference book for World Wide Web homepage design. Results indicated that

students in the behavioral modeling training method had significantly higher computer self-efficacy than did students in the traditional instruction-based method.

Similarly, Gist et al. (1989) used an experimental design in which they compared the relative effectiveness of a tutorial and a modeling approach for enhancing self-efficacy with a software package for basic editing and data entry. Whereas the behavioral modeling condition allowed the participants to observe, imitate, and then extend steps needed to accomplish each step in the task, participants in the tutorial condition were told what to do to complete each step. Results suggest that behavioral modeling may be a more effective training approach because it enhances computer self-efficacy significantly more than the tutorial training approach does.

In addition to examining training methods that focus on behavioral modeling, experimental studies have examined how strategy instruction is related to computer self-efficacy. Meyer et al. (2002) examined the relationship between the computer self-efficacy of fifth graders and the provision of strategy instruction during learning with a CBLE. The strategy instruction involved training the participants to identify and use five basic top-level strategies, including describing the main idea, sequencing ideas, presenting causal links, creating a problem solution, and comparing ideas based on differences and similarities. Results suggest that the administration of strategy instruction is positively related to computer self-efficacy for fifth graders.

Experimental studies also have examined how the administration of feedback is related to computer self-efficacy. For example, Martocchio and Dulebohn (1994) tested two types of feedback, one that attributed past performance to factors outside participants' control and one that attributed past performance to factors within participants' control. Using a spreadsheet program, the researchers tested 86 full-time employees. The results indicated that feedback that conveys performance within the trainee's control resulted in higher computer self-efficacy when compared to providing feedback to factors outside their control. Similarly, Bandura and Wood (1989) tested the hypothesis that perceived controllability would affect self-regulatory mechanisms, such as self-efficacy. They found that assumed uncontrollability had debilitating effects on computer self-efficacy for 60 graduate students while they made managerial decisions with a simulation.

The relationship between self-evaluation and computer self-efficacy has been the focus of other experimental studies. Examining 44 undergraduates enrolled in a computer skills applications course (e.g., word processing, spreadsheets, etc.), Schunk and Ertmer (1999) used four conditions to examine how self-evaluations and goals affect self-efficacy: (a) process goal of learning computer applications, with self-evaluation; (b) process goal of learning computer applications, with no self-evaluation; (c) product goal of learning computer applications, with self-evaluation; and (d) product goal of learning computer applications, with no self-evaluation. Results indicated that students who received the process goal and were asked to do a self-evaluation had the highest computer self-efficacy. Similarly, Russon et al. (1994) experimentally examined the relationship between asking students to make self-evaluations and how they used an Apple IIe micro-computer. Results indicated that students who were asked to make subjective evaluations of success had higher self-efficacy than those not asked to make subjective evaluations.

### Summary and Critique

What factors are related to students' computer self-efficacy? Nonexperimental and experimental research has suggested that both psychological and behavioral factors are related to computer self-efficacy. Nonexperimental research has found that psychological factors such as a positive attitude, curiosity about CBLEs, and intrinsic motivation to use CBLEs are positively related to computer self-efficacy. In terms of behavioral factors, research has typically found that prior usage of CBLEs is positively related to computer self-efficacy. In particular, prior usage that includes opportunities to complete meaningful, relevant tasks with CBLEs (Boud, 1995) allows students to engage in mastery experiences (Dunlap, 2005). These mastery experiences allow for the development of more resilient perceptions of capabilities (Bandura, 1994). On the other hand, experiences of easy successes may undermine the development of self-efficacy through the unrealistic expectation of similar results in the future (Bandura, 1994).

Research also has used experimental designs to examine the relationship between various factors and computer self-efficacy. One line of experimental research has examined the relationship between training methods and computer self-efficacy and has generally found that behavioral modeling is more strongly related to positive computer self-efficacy when compared to the traditional method of instruction-based training. In addition, research also suggests that the administration of both feedback and strategy instruction are positively related to computer self-efficacy. However, although these studies have identified factors that are related to computer self-efficacy, future research should consider two theoretical issues in this line of research. First, this line of research has examined a relatively limited scope of factors. According to Bandura (1994), there are four underlying factors related to the development of self-efficacy: mastery experiences, vicarious experiences, social persuasion, and emotional states. Although experiences of easy successes may undermine the development of self-efficacy through the expectation of similar results in the future, mastery experiences, in which individuals experience some difficulties in attaining the desired level of performance, allow for the development of more resilient perceptions of capabilities (Bandura, 1994). In addition, vicarious experiences through social modeling develop positive self-efficacy (Bandura, 1994). Observing other people sustaining effort to achieve goals allows the observer to believe that he or she also possesses the capabilities to achieve a similar performance level. Social persuasion also assumes an important role in developing self-efficacy. Verbal persuasion, in which it is suggested that an individual has the capability to succeed, has been shown to be an effective means to boost self-efficacy (Bandura, 1994). Finally, emotional states influence the development of self-efficacy, especially in prolonged activities that require persistence. Although fatigue and stress reactions may be perceived as indications of poor performance and thus decrease self-efficacy, positive emotional states may enhance self-efficacy. Although a few studies have focused on the relationship between specific factors and computer self-efficacy (i.e., vicarious experiences and computer self-efficacy; Dunlap, 2005), there is a need for more research that systematically addresses how each factor, as outlined by Bandura, is related to the development of computer self-efficacy.

Second, there is a need for a systematic approach to examining how factors are related to computer self-efficacy for different types of CBLEs. Some CBLEs may

be used as either "mindtools" (technologies that function as intellectual partners with the learner so that critical thinking can be facilitated; Jonassen & Reeves, 1996) or productivity tools (technologies that improve efficiency; Jonassen & Land, 2000). Mindtools include CBLEs such as hypermedia and intelligent tutoring systems, whereas productivity tools include such software packages as spreadsheets. These two types of CBLEs are distinct because they are designed to support different processes. Whereas mindtools support knowledge construction and exploration, productivity tools are used primarily to increase students' efficiency and production. Because these two types of CBLEs are fundamentally different, it is feasible that factors related to computer self-efficacy are a function of the type of CBLE. For example, although Houle (1996) found that mastery experience with a productivity tool (i.e., spreadsheet and database) is positively related to computer self-efficacy, it is unclear whether this relationship holds true for mindtools, such as hypermedia. Previous research did not identify whether the relationship between computer self-efficacy and CBLEs depends on the type of CBLE, and as such, there is a need to address this gap in this line of research. The theoretical and methodological issues with this line of research is addressed in the Discussion section of this article.

#### *What Is the Relationship Between Computer Self-Efficacy and Learning Outcomes With CBLEs?*

This section presents findings from studies that focused on the relationship between computer self-efficacy and learning outcomes. This research question includes five studies that examined two themes: (a) the general relationship between computer self-efficacy and learning outcomes with CBLEs and (b) the relationship of specific dimensions of computer self-efficacy and learning outcomes with CBLEs. Thompson et al. (2002) examined the relationship between students' computer self-efficacy and their use of the Internet for a search task. The researchers used a data collection technique with Netscape Communicator Internet browser that captured a record of every Web site used by the participants. Results indicated that there was a positive correlation between participants' computer self-efficacy and the number of correct search results produced. However, although this research suggests that computer self-efficacy may be strongly related to learning outcomes with CBLEs, other research suggests that the relationship between computer self-efficacy and learning outcomes is not stable. For example, Mitchell et al. (1994) tested 110 undergraduate students using a complex computer task that simulated the job of an air traffic controller. Participants completed seven trials with a computer simulation during which their performances were scored based on the total number of planes landed during each trial minus any error points accumulated (e.g., landing a 747 on a short runway). In addition to performance scores, the researchers collected data on the participants' expected scores and goals for each trial. Interestingly, the participants' computer self-efficacy was more highly correlated with performance ( $r = .27$  on Trial 1) than with their goals on the early trials ( $r = .09$  on Trial 1). However, the participants' goals were actually more highly correlated with performance ( $r = .85$  on Trial 7) than with their self-efficacy in later trials ( $r = .58$  on Trial 7). These researchers suggest that future research should use methodology that examines computer self-efficacy throughout the

learning process because the relationship between computer self-efficacy and learning changes over knowledge acquisition.

Research has also examined the relationship between different dimensions of self-efficacy and learning outcomes with CBLEs. For example, Shapka and Ferrari (2003) measured the proximal and distal computer self-efficacy of 56 preservice teachers to investigate how computer-related attitudes relate to learning outcomes with a challenging computer task. In this study, *proximal self-efficacy* referred to the participants' self-reported ratings of how successful they thought they would be at the computer task, whereas *distal self-efficacy* referred to the participants' self-reported ratings of how confident they were in these ratings. The results suggest that proximal self-efficacy is significantly associated with the number of searching behaviors and task success when learning with a CBLE, whereas distal self-efficacy is not related to task success. Other research has also assumed that self-efficacy varies among different dimensions and that these dimensions are differentially related to learning with CBLEs. For example, Holladay and Quiñones (2003) used a sample of 82 undergraduates to examine the role of computer self-efficacy generality and intensity as a motivational mechanism in explaining the relationship between practice variability and transfer in a computer naval air defense simulation task. Using hierarchical regression to predict transfer performance from self-efficacy, the researchers found that both self-efficacy intensity ( $\beta = .359$ ) and generality ( $\beta = .232$ ) influenced far transfer performance of the participants, although self-efficacy generality served as mediator between practice variability and far transfer.

#### *Summary and Critique*

Relatively few studies have examined the relationship between computer self-efficacy and learning outcomes with CBLEs. Although some studies have indicated that computer self-efficacy is positively related to learning outcomes with CBLEs, other studies have suggested that the relationship between computer self-efficacy and learning outcomes changes with knowledge acquisition. In addition to accounting for the relationship between computer self-efficacy and learning outcomes, this line of research has, to a certain degree, accounted for the different dimensions of computer self-efficacy in learning outcomes with CBLEs.

The results of these studies have methodological implications for future research. First, the results suggest that the relationship between computer self-efficacy and learning may change as students acquire knowledge, and thus, methodology should be used to account for this changing relationship. For example, research should consider measuring computer self-efficacy at several points during the learning process, including before and during the learning task, to account for the dynamic relationship between computer self-efficacy and CBLEs. Second, research also indicates that several dimensions of computer self-efficacy (in particular, intensity and generality) may be differentially related to learning outcomes with CBLEs. This assumption suggests that methodology should include measures that account for different dimensions of computer self-efficacy, which is consistent with the conceptual definition of self-efficacy proposed by Bandura (1997). According to Bandura, self-efficacy can vary along three dimensions: level, strength, and generality. First, individuals may differ in their self-perceptions of capability for completing tasks of differing difficulty (level). Individuals may also

differ in their confidence in attaining a certain level of task performance (strength). For example, although an individual may perceive that he or she can complete a task (level), that individual's confidence level in completing that task may be low (strength). Finally, self-efficacy beliefs associated with a specific activity can be generalized to similar activities (generality). From a methodological standpoint, results from these studies suggest that measures that include distinct dimensions of computer self-efficacy will more accurately account for learning outcomes with CBLEs.

#### *What Is the Relationship Between Computer Self-Efficacy and Learning Processes With CBLEs?*

Due to the design of some CBLEs, it is important for research to consider the relationship between students' computer self-efficacy and how they learn with CBLEs. For example, some CBLEs offer students a learning environment that is nonlinear and flexible (Jacobson & Archodidou, 2000; Jacobson & Kozma, 2000; Jonassen & Reeves, 1996). In these learning environments, the student determines which information to access, and thus, there may be individual differences in how students use these learning environments. This section presents findings from studies that suggest that computer self-efficacy may explain these individual differences. Finally, this section ends with a summary of the studies reviewed in this section, which includes a critique and implications for future research.

Studies have suggested that individual differences in computer self-efficacy may explain why there are individual differences in how students use CBLEs. For example, MacGregor (1999) videotaped 7th and 11th graders while they used a commercially produced instructional hypermedia system to learn about 12 biotomas (e.g., tundra, desert, temperate deciduous forest). The focus of this study was to investigate the relationship between students' computer self-efficacy and their navigation in this hypermedia learning environment. Students' navigations were grouped into three categories: concept connector, sequential studier, or video viewer. The students were characterized as being concept connector navigators if they demonstrated need for further examples by cross-linking to other related nodes of information. Sequential studiers were described as students who accessed objects on the screen in a sequential order, typically from left to right or top to bottom. Students who were typified as being video viewers demonstrated a primary interest in videos. Results indicate that there is substantial variability in how students use hypermedia. In particular, students with higher levels of self-efficacy tended to structure their navigation in a more purposeful manner because they made nonsequential connections of nodes (concept connectors). On the other hand, students with lower self-efficacy tended to be characterized as sequential studiers, due to their sequential navigation of the hypermedia environment.

Other studies have examined the relationship between self-efficacy and how students use features within CBLEs. For example, Brosnan (1998) used a self-efficacy framework to examine how 50 undergraduates navigate a database. Measures of how these participants used the database included the time they chose to take on each of the three tasks and the number of look-up tables used during each task. Results indicated that participants with higher self-efficacy tended to take advantage of certain aspects of the CBLE. For example, these participants used the look-up tables significantly more than the participants with lower self-efficacy.

Furthermore, results indicated that the participants' self-efficacy was strongly positively correlated with how long the task was attempted.

#### *Summary and Critique*

Although these studies have provided informative data on the relationship between computer self-efficacy and how students learn with CBLEs, there are some theoretical issues that should be addressed in future research. These studies have typically examined the relationship between students' computer self-efficacy and how students use specific features within the CBLE, such as look-up tables. However, it is also important to consider how computer self-efficacy may be related to other psychological factors during learning with CBLEs. For example, some students have difficulty learning challenging topics with CBLEs (e.g., Azevedo et al., 2005). To identify why some students may have difficulty learning with CBLEs, research has examined the role of individual factors in learning. Previous research using Winne and Hadwin's (1998; Winne, 2001) theoretical framework of self-regulated learning (SRL) has demonstrated that the use of self-regulatory processes facilitates learning with CBLEs (Lajoie & Azevedo, 2006). However, research has also found that some students do not use key self-regulatory processes when learning with hypermedia (Azevedo et al., 2004). The issue of why some students do not use self-regulatory processes when learning with CBLEs has been relatively unaddressed. Computer self-efficacy may explain individual differences in students who use specific SRL processes during learning with CBLEs. Furthermore, due to the limited experimental research in this area, the relationship between computer self-efficacy and how students learn with CBLEs has not provided a definitive examination of causality. In other words, this relationship has been addressed in terms of strength and direction but not in terms of causality. Future experimental research is needed to clarify the extent to which there is a causal relationship between computer self-efficacy and learning processes with CBLEs.

#### **Discussion and Directions for Future Research**

The research highlighted in this literature review examined three critical issues related to computer self-efficacy. First, both behavioral and psychological factors are related to computer self-efficacy. Behavioral factors, such as prior exposure to CBLEs (e.g., Houle, 1996) and the frequency with which students have previously used CBLEs (e.g., Salanova et al., 2000), have been found to be positively correlated to computer self-efficacy. Research has also demonstrated that psychological factors such as positive attitude (Torkzadeh & Van Dyke, 2002) and curiosity about CBLEs (Wang & Newlin, 2002) are positively related to computer self-efficacy. Furthermore, experimental research indicates that students who receive behavioral modeling during learning report significantly higher computer self-efficacy than do students who receive the more traditional instruction-based method when learning with CBLEs (Chou, 2001).

Second, research has also suggested that computer self-efficacy is related to learning outcomes with CBLEs (Thompson et al., 2002) and that this relationship changes as students acquire skills and knowledge (Mitchell et al., 1994). Finally, research that has examined the relationship between computer self-efficacy and the process of learning suggests that computer self-efficacy is related to navigational paths (e.g., Brosnan, 1998; MacGregor, 1999). However, it should be noted that the results from

studies that have examined the relationship between computer self-efficacy, learning outcomes, and learning processes with CBLEs could only be tentatively discussed. As previously highlighted in this literature review, research in this area of computer self-efficacy is limited. In the following section, the theoretical and methodological issues of these findings are presented that will, in part, discuss the need for more research that examines this area in computer self-efficacy.

#### *Theoretical Issues*

Although research examining computer self-efficacy has provided informative findings, there are several theoretical issues with this line of research. First, the vast majority of studies in this literature review used Bandura's (1986) operational definition of self-efficacy, which assumes that self-efficacy can vary along three dimensions (level, strength, and generality). Although computer self-efficacy is grounded in Bandura's original conceptualization, a substantial portion of research examining computer self-efficacy has treated this construct as one dimensional. These measurements have typically examined the strength of an individual's computer self-efficacy, whereas the other two dimensions of level and generality have rarely been included in these measurements. Despite a handful of studies that have treated computer self-efficacy as multidimensional (e.g., Shapka & Ferrari, 2003), the theoretical framework of computer self-efficacy needs to be clarified. This advancement will be made when future research either (a) clearly articulates and empirically tests a theoretical framework of computer self-efficacy that suggests the dimensions of computer self-efficacy differ from the original conceptualization of self-efficacy or (b) better aligns measurements with Bandura's self-efficacy theory by including measurements that capture different dimensions of computer self-efficacy (level, strength, and generality).

Furthermore, very little empirical research has explored the relationship between computer self-efficacy and other forms of self-regulating processes that have been shown to facilitate learning with CBLEs. For example, although CBLEs have been used in classrooms to help students learn about challenging topics (Lajoie, 1993, 2000; Lajoie & Azevedo, 2006), research has begun to question the effectiveness of these learning environments (see Azevedo, 2005; Jacobson & Archoldidou, 2000; Jonassen & Land, 2000; Williams, 1996).

Recent research has demonstrated that students may need to use certain SRL processes in order to learn challenging topics with CBLEs (Azevedo et al., 2004). For example, students' use of specific SRL processes, such as metacognitive monitoring and prior knowledge activation, is positively associated with their ability to learn with CBLEs (Azevedo et al., 2005). However, this line of research has also found that some students of all ages do not always use key SRL processes (Azevedo et al., 2004). As suggested by Lepper, Woolverton, Mumme, and Guttner (1993), students' self-efficacy may affect how they regulate their learning. However, the relationship between students' computer self-efficacy and how they regulate their learning with CBLEs is an issue that has been largely unaddressed (Lajoie & Azevedo, 2006; Lepper & Woolverton, 2004). To extend the original conceptualization of self-efficacy, which is grounded in SCT, future research should also account for the relationship between computer self-efficacy and other self-regulatory processes.

#### *Methodological Issues*

Capturing computer self-efficacy presents difficult methodological challenges for future research. First, a more systematic approach is needed in examining computer self-efficacy with different types of CBLEs, such as mindtools and productivity tools. These two types of CBLEs are fundamentally different, and thus, factors related to computer self-efficacy may depend on the type of CBLE. For example, although certain psychological (e.g., positive attitude and curiosity about CBLEs) and behavioral (e.g., prior usage) factors have been found to be related to computer self-efficacy, these findings are from studies that have typically focused on productivity tools (e.g., databases). Given that relatively few studies have used mindtools (e.g., hypermedia), there is a gap in our understanding of how factors relate to computer self-efficacy for a variety of CBLEs.

It is critical to measure computer self-efficacy with a variety of different CBLEs because the cognitive and metacognitive demands vary between distinct CBLEs. Some CBLEs, such as hypermedia, place high levels of cognitive and metacognitive demands on learners (Azevedo, 2005). Because of these various demands, the relationship between computer self-efficacy and learning with different CBLEs may vary. A current challenge to this line of research is to develop methodologies that identify factors related to computer self-efficacy for distinct CBLEs, such as hypermedia and multimedia, and determine if the relationship between computer self-efficacy and learning varies between distinct CBLEs.

In addition, future research is needed that emphasizes the second and third research questions of this literature review. The vast majority of previous research on computer self-efficacy has examined factors related to the motivation construct. There has been substantially less research examining the relationship between computer self-efficacy, learning outcomes, and the process of learning with CBLEs. Furthermore, even with the relatively few studies that have examined these relationships, there is variability in several aspects of the research, including substantial difference in measurements of task performance. Task performance in the reviewed studies ranged from the correct number of Internet searches to performance scores on a complex computer simulation. Although both of these are valid measures of learning outcomes, successfully searching the Internet is a different learning outcome from performance in a complex problem-solving activity with a computer simulation. It is difficult to clearly identify the relationship between computer self-efficacy and learning outcomes with CBLEs given the relative scarcity of studies in this area. There is a need for future research to more systematically measure task performance, including cognitively complex tasks. For example, research has examined how students learn about challenging science topics, such as the circulatory system, with hypermedia (e.g., Azevedo et al., 2005). Learning about the circulatory system requires knowledge of facts (declarative knowledge; Graesser et al., 2005; McCruden, Schraw, & Kambe, 2005) as well as understanding of the interrelationships between the facts (conceptual knowledge; Chi, 2000, 2005; Markman & Gentner, 2000). Examining the relationship between computer self-efficacy and task performance that includes measures of declarative and conceptual knowledge may clarify this relationship with cognitively complex tasks.

There are also some methodological concerns with some of the previous studies that have examined the relationship between computer self-efficacy and how students learn with CBLEs. The few studies that have used process data to examine how computer self-efficacy is related to the process of learning have typically focused on contextual factors. For example, the learning context of most CBLEs offers an open-ended environment in which the student controls the access of information. Thus, research has examined how computer self-efficacy is related to navigational paths during learning with CBLEs. However, self-efficacy may be related to other psychological factors that have been shown to facilitate learning with CBLEs, such as self-regulation (Azevedo et al., 2005). Research using think-aloud protocols to measure how students self-regulate their learning with hypermedia (e.g., Moos & Azevedo, 2006, in press) has demonstrated that there is substantial variability between students of all ages. Measuring computer self-efficacy immediately prior to a learning task, and then using think-aloud protocols to measure self-regulation during learning (see Azevedo et al., 2004, for details) is a promising direction for future research.

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# John Dewey's Influence on the Origins of the Social Studies: An Analysis of the Historiography and New Interpretation

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*This article offers a critical review of the historical literature on the National Education Association's (NEA) 1916 Committee on Social Studies (CSS) report, the document generally believed to have launched the social studies movement in American secondary schools. The review begins with a critical analysis of the four most pervasive interpretations of the report. Drawing upon these interpretations, the author suggests that there are three central issues at the heart of these disputes: The first is over the ideological origins of the report; the second, its institutional origins; and the third, its epistemological position. It is argued that the influence of John Dewey is the key to overcoming these disagreements by suggesting that the members of the Committee agreed upon a core of shared beliefs that reflected his philosophical ideas.*

**KEYWORDS:** social studies education, curriculum, history, high schools, immigration/immigrants.

Historians commonly link the origins of the social studies at the secondary level to the publication of the National Education Association's (NEA) Committee on Social Studies (CSS) report, the document Diane Ravitch (1987) called the "birth certificate of the social studies field" (p. 348). Since its publication in 1916, the origins, orientation, meaning, and influence of the CSS report has been disputed. In this article I offer a critical review of the historical literature on this influential report by outlining four major historiographical interpretations. The first interpretation depicts the CSS report as a humanistic document centering on academic content, the second as a form of social control, the third as an anti-intellectual betrayal of the academic-centered curriculum, and the fourth as a democratic product of progressive education. These four conceptions of the report have more or less coexisted over the past 30 years. Drawing upon these interpretations, I suggest that there are three central issues at the heart of these disputes. The first is over the ideological origins of the report; the second, its institutional origins; and the third, its epistemological position.

I argue that the influence of John Dewey is the key to overcoming these disagreements by suggesting that the members of the CSS agreed upon a core of shared beliefs that centered on his philosophical ideas. By focusing on how Dewey