SELF-REGULATION IN WEB-BASED COURSES A Review and the Need for Research

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The purpose of this article is to investigate the construct of academic self-regulation in Web-based learning environments. Self-regulation will be discussed in general using social cognitive theory as the framework of the discussion. The article concludes with a brief review of the limited amount of research on self-regulation in Web-based environments.

INTRODUCTION

Distance education is now commonplace in most institutions of higher learning, and the number of courses offered at a distance is on the rise. In a report by the National Center for Education Statistics (NCES, 2003) distance education was defined as "education or training courses delivered to remote (off-campus) sites via audio, video (live or prerecorded), or computer technologies including both synchronous (i.e., simultaneous) and asynchronous (i.e., not simultaneous) instruction" (p. 1). The authors of that study report that during the 12-month 2000-2001 academic year 56% of all 2- and 4-year Title IV eligible institutions offered distance education courses and 12% of all institutions indicated that they planned to start offering distance education courses in the next 3 years. During the reported academic year, it is estimated that 3,077,000 students were enrolled in distance education courses offered by 2-year and 4-year institutions. The Internet is the most commonly used technology with which to deliver distance education. The NCES also reported that during the 2000-2001 academic year, 90% of institutions offering distance education courses delivered the courses via the Internet. Additionally, the NCES reported that of the institutions that offered distance education courses or that planned to offer distance education courses in the next 3 years, 88% indicated plans to start using or increase the use of the Internet as their means of delivery for those courses. In a more recent report sponsored by the Sloan Consortium (Allen & Seaman, 2004) 2.6 million students were expected to be enrolled in online

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courses in the fall of 2004 and the average growth rate for online students in 2004 was predicted to be 24.8%. Also, it was reported in the Sloan Consortium report that 53.6% of the schools surveyed believe "online education is critical to their long-term strategy" (p. 7).

The millions of students enrolled now or who will enroll in distance education programs may find the courses to be attractive for many reasons, including the asynchronous nature of such offerings. However, once enrolled, the students may experience a sense of isolation with regard to the course. The standard motivating forces active in traditional classrooms such as group pressure, a familiar learning situation, and social factors are often absent in distance education programs (Zvacek, 1991). In many instances, to be successful in these online courses, learners will need to rely on their individual abilities of directing their learning and navigating through assignments and deadlines. That is, the learners will need to use self-regulated learning strategies.

SELF-REGULATION

Self-regulation refers to the degree to which learners are "metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 1989, p. 329). Self-regulation can be described as a triadic reciprocality. In such a reciprocality there are three basic, interdependent elements of the construct. In the case of self-regulation, those three elements can be described as behavior, environment, and self (Zimmerman, 1989). The reader should not assume that the three components of this reciprocality are weighted equally. At any given time, one or more of the components may be the predominant factor (Bandura, 1986).

Behavioral Components of Self-Regulation

Bandura (1986) proposed three internal subfunctions involved in one's self-regulation that result from one's interaction with the environment: self-observation, self-judgment, and self-reaction. In the same year as Bandura's proposal, McCoombs (1986) suggested a similar framework of self-awareness, self-monitoring, and self-evaluation. The outcomes of McCombs' processes are perceptions, judgments, and expectations, respectively. Whereas Bandura's terminology is most prominent in the literature, it will be used in this discussion. Self-observation serves the learner by providing the information necessary for setting reasonable goals. Self-observation is limited by certain factors. Bandura (1986) cautions that behaviors are most likely to be affected by self-observation when the time of the observation is in close proximity to the behavior and when there is noticeable progress. The positive effects of self-observation on self-regulation can be seen in the literature. Schunk (1983b) and Lan (1996) found that self-monitoring improved persistence and increased the use of self-regulated learning strategies, as well as increased skill and knowledge. Self-observation is indeed important, but without an evaluation of the observation, that information is of little help to the learner.

Zimmerman (1989) states that "self-judgment refers to students' responses that involve systematically comparing their performance with a standard or goal" (p. 333). Personal standards, valuation of the activity, and attributions are key elements of the self-judgment process (Bandura, 1986). Personal standards are developed mostly through social comparison. Valuation of the activity refers to the fact that people value activities that are relevant to them. Finally, attributions refer to whether or not success or failure is perceived to be due to ability or effort, or whether an outcome is the result of an external, uncontrollable force.

The processes of self-observation and self-judgment combined allow for the possibility of self-reaction. Bandura (1986) posits that self-observation and self-judgment lead to one of three possibilities: evaluative self-reactions, tangible self-reactions, or no self-reaction. Judging one's actions may lead to feelings of

satisfaction or dissatisfaction. Internal standards may be modified. Tangible rewards (e.g. relaxation, recreation) are sometimes used to motivate performance. As Bandura (1986) noted,

> Numerous studies have been conducted in which children and adults regulate their own behavior by arranging tangible incentives for themselves. The results show that people who reward their own attainments usually accomplish more than those who perform the same activities under instruction but without rewarding their attainments. (p. 351)

There is an obvious interdependent nature of Bandura's three behavioral components of self-regulation. This interdependence is described by Zimmerman and Schunk (1989) as an *enactive feedback loop.* This terminology captures the essence of the interdependence well.

Environmental Components of Self-Regulation

Learners can obtain much information from their learning environments. Exposure to peer models, verbal persuasion, and assistance from peers or teachers are some ways that learners may benefit from their environments. A learner's environment provides information regarding self-regulation mainly through enactive outcomes and vicarious experience (Bandura, 1986). Schunk and Hanson (1985, 1989) found that the observation of models who verbalized their methods of solving problems led to increased self-efficacy and achievement in their arithmetic tasks. In addition to models, verbal persuasion has been found to be valuable in the development of self-efficacy and academic achievement (Relich, 1984; Schunk, 1981, 1982, 1983a, 1984; Schunk & Hanson, 1989). These are explicit examples of how the environment affects self-efficacy, but due to the interdependent nature of the environment, self, and behavioral aspects of self-regulation, these environmental factors then affect self-regulation.

One does not only receive information from the environment, but a sense of control over the environment also has been shown to be important with regard to self-regulation. Bandura and Wood (1989) conducted an experiment in which participants managed a simulated organization. Participants who managed under the assumption that the organization was controllable exhibited a strong sense of self-efficacy and set challenging goals. Participants who did not believe the organization was controllable displayed low self-efficacy and set low goals. Zimmerman and Martinez-Pons (1986, 1988) found social and environmental aspects of self-regulation. The social component was displayed by learners seeking assistance from others in their environment, such as teachers and peers. Creating special study areas or arranging for access to resources by working in a library are examples of the environmental component of self-regulation.

Personal Components of Self-regulation

Zimmerman (1989) identifies self-efficacy as the most important construct related to one's personal components of self-regulation. Bandura (1997) noted that "perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3) Thus, self-efficacy beliefs influence students' behavior by influencing the decisions of which tasks in which to engage, what level of effort they will expend, and how long they will persevere in the face of difficulty. Goal intentions are the mediating concept between self-efficacy beliefs and self-regulation. The importance of goals for self-regulation is seen in Driscoll (2000), who states, "self-regulation becomes possible when learners acquire the metacognitive skills to monitor their progress toward goal attainment and sustain their own motivation during learning" (pp. 317-318). Bandura (1977) identified goals as an important element of motivation in his seminal work

on self-efficacy. Goals may be examined using several characteristics. Proximity, specificity, source, and orientation are the most common characteristics of goals associated with learning.

The proximity of a goal refers to the perceived discrepancy between the current performance and the goal performance. Proximity may refer to an actual time, such as a short-term goal versus a long-term goal, or to a level of performance such as a slight improvement or a major improvement in performance. In general, proximal goals are better motivators than distal goals. This could be because decisions in the self-judgment process are easier to make. Bandura and Schunk (1981) found that, with the use of proximal goals, learners "progressed rapidly in self-directed learning, achieved substantial mastery of mathematical operations, and developed a sense of personal efficacy and intrinsic interest in arithmetic activities" (p. 586). In the same study, the use of distal goals had no more effect than the use of no goals.

The specificity of a goal plays an important role in the achievement of that goal. Note that a lack of specificity would serve to confuse the process of self-observation and self-judgment. Thompson, Meriac, and Cope (2002) provided online learners with either a general goal of "do your best" or a specifically quantified goal in an Internet search task. Participants with the specific goal worked on the task longer than those with the less-specific goal. In addition to specificity, the source of the goal is an important issue.

Self-set academic goals have been shown to be more motivating than externally-determined goals. Zimmerman, Bandura, and Marinez-Pons (1992) found that students' self-efficacy beliefs for self-regulated learning affected their academic goals and achievement. The connection between self-efficacy for self-regulated learning was mediated by self-efficacy for academic achievement, which significantly impacted the students' grade goals. Of particular interest in this study was that the students' goals were a more important indicator of achievement than the goals set by the students' parents; empirically demonstrating a phenomenon observed by parents and teachers frequently. One should note how the Zimmerman, Bandura, and Marinez-Pons (1992) study is yet another example of how self-efficacy and self-regulation are interdependent. In this study, the *grade goals* of the students and parents was a factor. This is an example of the next and final characteristic of goals, goal orientation.

Goal orientation refers to the "type of standard by which individuals will judge their performance or success" (Pintrich & Schunk, 1996, p. 234). Goal orientation has been studied extensively in the literature (e. g., Ames, 1992; Dweck & Leggett, 1988; Maehr & Midegley, 1991). Two goal orientations can be identified from the various terminology used. The language of Ames (1992) adopted by Driscoll (2000) will be used in this discussion: *performance goals* and *learning goals*. Students operating with performance goals set standards of success based on external judgments such as test scores, rewards, or performances relative to their peers. Learning goals are those goals that students set for intrinsic reasons such as improving understanding, learning, or succeeding at a challenge. Driscoll summarizes that "performance goals foster the belief that intelligence is fixed" (p. 309), whereas "learning goals are associated with the belief that intelligence is malleable and can be developed" (p. 309). From these descriptions one can see the importance of learning goals for self-regulation. If a student believes that intelligence is fixed, then adapting, or regulating, one's learning to improve achievement would not change academic outcomes. On the other hand, if a student believes that intelligence is malleable, then that student may believe it is possible to control, or regulate, one's learning. In fact, these distinctions are found in the literature (Ames, 1992; Maehr & Midegley, 1991; Malpass, O'Neil, & Hocevar, 1999).

The preceding sections on self-regulation have developed the construct of self-regulation

and described how it is critically linked to self-efficacy through goals. Bandura (1986) delineates the relationship between self-efficacy and self-regulation well:

> People's judgments of their capabilities, in turn, affect their aspirations, how much effort they mobilize in pursuit of adopted goals, and how they respond to discrepancies between their performances and what they seek to achieve. (p. 470)

Self-Regulated Learning Strategies

Various authors have identified strategies or processes used by self-regulated learners. McCombs (1986) discussed maintaining attention, planning, monitoring, and self-evaluations. In the context of expert learners, Ertmer and Newby (1996) identified three components for self-directed learning: planning, monitoring, and evaluating. Zimmerman and Martinez-Pons (1986, 1988) conducted a series of studies to create and validate a model of student self-regulated learning strategies. The themes of McCombs (1986) and Ertmer & Newby (1996) can be seen in the work of Zimmerman and Martinez-Pons. Given the rigor evident in their developmental work, the strategies identified by Zimmerman and Martinez-Pons (1988) will be used in this discussion. Their specific strategies are listed in Table 1. Table 1 also illustrates how a learner might enact these strategies and classifies the components of self-regulation, self, behavior, or environment that are represented by each strategy.

Ley and Young (2001) suggest four instructional principles that should assist less-expert learners with the adoption of these self-regulation strategies:

> guide learners to prepare and structure an effective learning environment, organize instruction and activities to facilitate cognitive and metacognitive processes, use instructional goals and feedback to present student monitoring opportunities, and provide learners with continuous evaluation information and occasions to self evaluate. (p. 94)

Ley and Young offer these principles for any instructional situation regardless of delivery method or teaching method. Embedding opportunities for students to develop self-regulation strategies is important in the design of instruction. Pintrich (1999) stresses the importance by stating, "self-regulatory strategies are not easily developed or learned and there must be instruction and scaffolding of these strategies" (p. 469). Additionally, Pintrich indicates that researchers should investigate self-regulated learning in various contexts and study how classroom practices can be changed to cultivate self-regulation. Since that writing in

TABLE 1
Self-Regulation Strategies, Possible Action, and Component of Self-Regulation Reciprocality

Strategy	*Possible Use by Learner*	*Component of Reciprocality*
Self-evaluating	I check my work to make sure I did it right	Behavioral regulation
Organizing and transforming	I make an outline	Self or personal regulation
Goal-setting and planning	I start studying two-weeks in advance and pace myself	Self or personal regulation
Seeking information	I go to the library to get as much information as I can	Environmental regulation
Keeping records and monitoring	I took notes in class; I keep a list of the words I get wrong.	Behavioral regulation
Environmental structuring	I turn off the radio so I can concentrate.	Environmental regulation
Self-consequating	If I do well on a test, I treat myself to a movie.	Behavioral regulation
Rehearsing and memorization	I keep writing down a formula until I remember it.	Self or personal regulation
Seeking social assistance	I ask a friend or teacher for help.	Environmental regulation
Reviewing records	Reviewing notes	Environmental regulation

Source: Zimmerman (1989, p. 337). Copyright © 1989 by the American Psychological Association. Adapted with permission.

1999, the classroom and context of many educational endeavors has been the Internet. Self-regulation in Web-based learning environments will be addressed next.

SELF-REGULATION IN WEB-BASED LEARNING ENVIRONMENTS

Whipp and Chiarelli (2004) recently concluded that few research studies have addressed self-regulation of learning in Web-based courses. This claim does seem to have merit, thus this review begins with learner self-regulation in computer-based instruction, which is similar in many respects to Web-based instruction.

Tennyson, Park, and Christensen (1985) investigated the effects of the length of time that examples in instructional materials were displayed to the learners. The researchers concluded that an adaptive-controlled model for displaying the examples was superior to a learner-controlled model. The participants' lack of strategies to manage their learning environment was listed as a possible explanation for this observation. Young (1996) came to similar conclusions. Young's experiment used either program control or learner control over a computer-based instructional unit on propaganda in advertising. He found that using program control minimized the performance differences between high and low self-regulatory learners. This led him to the conclusion that students in learner-controlled, computer-based instruction require strong self-regulatory skills to succeed.

As the Internet gained popularity and acceptance, the focus of self-regulation research shifted from the context of computer-based instruction to Web-based, or hypermedia instruction. Generally, researchers have found various subsets of the strategies identified in the Zimmerman and Martinez-Pons (1988) study to be important for Web-based learners. Self-efficacy for Internet use and self-regulation are often mentioned as important characteristics of Web-based learners.

Hill and Hannafin (1997) found that participants with more self-reported prior knowledge of the subject material or self-efficacy for using the World Wide Web used more self-regulation strategies than the participants lacking in those characteristics. These observations would indicate that those learners with prior knowledge of the subject and high self-efficacy beliefs regarding Internet use would have more time to devote to learning the task at hand. The researchers found that monitoring one's learning in the Web-based environment was a critical skill to possess.

In their review of literature, Cennamo and Ross (2000) identified five strategies used most often by students with high levels of self-regulation: keeping records and monitoring, reviewing notes, organizing and transforming, seeking information from nonsocial sources, and seeking teacher assistance. In the context of a Web-based child development course designed to foster self-regulation, Cennamo and Ross found that the most effective strategies to support self-directed learning were reviewing notes, keeping records, and self-evaluating. They note that the absence of seeking information from social sources and teacher assistance from this list of effective strategies may be due to the solitary nature of many learners in Web-based environments.

Joo, Bong, and Choi (2000) found that self-efficacy for self-regulated learning significantly related to student confidence, both in classroom learning and using the Internet. Self-efficacy for self-regulated learning related significantly to Internet self-efficacy, but self-regulation strategy use did not relate to performance. The authors hypothesize that this was possibly due to the self-report nature of self-regulation strategy used in their study.

Other recent studies have found self-regulation components to be important elements of success for Web-based learners. Shih and Gamon (2001) studied the relationships of student motivation, attitude, learning styles, and achievement in a Web-based course. Motivation was the only factor in their study that related significantly to achievement. Shih and

Gamon used less specific-measures of motivation than other researchers. However, the top three rated questions on their motivation survey indicated that their participants wanted to get better grades than their classmates; believed they could do well in the class; and that they could do better, if they studied appropriately. Note that each of these statements could be classified as either a self-regulation strategy or positive self-efficacy belief. Thompson, Meriac, and Cope (2002) had participants engage in an Internet search task. Much like Shih and Gamon (2001), Thompson, Meriac, and Cope determined that elements of self-regulation and self-efficacy were important characteristics of a successful learner. Specifically, participants who had goals worked longer at their task than those with no goals, and participants with higher Internet self-efficacy performed better than those with low Internet efficacy scores. Self-regulation skills were once again found to be important in a hypermedia environment by Azevedo, Guthrie, and Seibert (2004). Azevedo, Guthrie, and Seibert investigated college students' abilities to regulate their learning while using a hypermedia environment to learn about the human circulatory system. They found that learners who showed an increase in knowledge were those students who regulated their learning with specific strategies such as setting goals, monitoring their learning, and planning. In a study designed with a qualitative approach, Whipp and Chiarelli (2004) found that successful learners in a Web-based course used self-regulatory strategies, but that they had adapted them specific to the context of the Web-based course. For example, students planned daily logons to the course as a way of keeping up with the course. These logons could be classified as monitoring, goal setting, or planning activities. The students also used the postings in a threaded discussion to monitor their levels of interaction compared to others, and the students used the online grade book to check their grades; both are Web-specific adaptations of self-monitoring and record keeping.

Thus far, evidence has been put forth that demonstrates a positive relationship between success in Web-based learning and learners' ability to self-regulate. Learners who possess self-regulatory skills succeed. When learners have not been successful, a lack of self-regulatory skills has been shown or suspected. Design practices have been suggested to support and foster learners' self-regulatory skills. Recently, research has shown that training in self-regulated learning strategies can help students succeed in hypermedia environments (Azevedo & Cromley, 2004).

The limited amount of research on self-regulation and Web-based learning continues the trend established in more traditional learning environments, that self-regulation is an important skill for learners to possess. Research indicates that building self-regulatory scaffolding into Web-based courses or simply providing instruction on self-regulation can be effective components of a course. In particular, monitoring learning has emerged as a common strategy used by learners in Web-based courses (Azevedo et al., 2004; Cennamo & Ross, 2000; Hill & Hannafin, 1997; Whipp & Chiarelli, 2004).

Lan (1996) stresses that, as learners become engaged in complex tasks, they focus much of their cognitive capacity on the content, and other mental processes such as self-regulation may be forgotten (p. 113). Hence, instructional designers and educational practitioners need to understand the features of Web-based courses that can assist students with the self-regulation of their learning. Additional research should be conducted to determine those features of Web-based courses that promote self-regulation and the strategies learners employ for effectively using them. It is important that online learners be made aware of the self-regulatory tools and strategies available to them, possibly through overt training in their use.

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REFERENCES

Allen, I. E., & Seaman, J. (2004). *Entering the mainstream: The quality and extent of online education in the united states, 2003 and 2004*. Needham, MA: Sloan Consortium.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 82*(3), 261-271.

Azevedo, R., & Cromley, J. G. (2004). Does training on self-regulated learning facilitate students' learning with hypermedia? *Journal of Educational Psychology, 96*(3), 523-535.

Azevedo, R., Guthrie, J. T., & Seibert, D. (2004). The role of self-regulated learning in fostering studnets' conceptual understanding of complex systems with hypermedia. *Journal of Educational Computing Research, 30*(1 & 2), 87-111.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology, 41*(3), 586-598.

Bandura, A., & Wood, R. (1989). Effect of perceived controllability and performance standards on self-regulation of complex decision making. *Journal of Personality and Social Psychology, 56*(5), 805-814.

Cennamo, K. S., & Ross, J. D. (2000). *Strategies to support self-directed learning in a Web-based course. Access ERIC: FullText* (141 Reports—Descriptive; 150 Speeches/Meeting Papers). Virginia.

Driscoll, M. P. (2000). *Psychology of learning for instruction* (2nd ed.). Needham Heights, MA: Allyn & Bacon.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256-273.

Ertmer, P. A., & Newby, T. J. (1996). The expert learner: Strategic, self-regulated, and reflective. *Instructional Science, 24*(1), 1-24.

Hill, J. R., & Hannafin, M. J. (1997). Cognitive strategies and learning from the World Wide Web. *Educational Technology Research and Development, 45*(4), 37-64.

Joo, Y. -J., Bong, M., & Choi, H. -J. (2000). Self-efficacy for self-regulated learning, academic self-Efficacy, and internet self-efficacy in web-based instruction. *Educational Technology Research and Development, 48*(2), 5-17.

Lan, W. Y. (1996). The effects of self-monitoring on students' course performance, use of learning strategies, attitude, self-judgment ability, and knowledge representation. *Journal of Experimental Education, 64*(2), 101-115.

Ley, K., & Young, D. B. (2001). Instructional principles for self-regulation. *Educational Technology Research and Development, 49*(2), 93-103.

Maehr, M. L., & Midegley, C. (1991). Enhancing student motivation: A schoolwide approach. *Educational Psychologist, 26*(3 & 4), 399-427.

Malpass, J. R., O'Neil, H. F., & Hocevar, D. (1999). Self-regulation, goal orientation, self-efficacy, worry, and high-stakes math achievement for mathematically gifted high school students [Electronic version]. *Roeper Review, 21*(4), 281-295.

McCombs, B. L. (1986). The role of the self-system in self-regulated learning. *Contemporary Educational Psychology, 11*(4), 314-332.

National Center for Education Statistics. (2003). *Distance education at degree granting postsecondary institutions: 2000–2001, NCES 2003-017.* Retrieved March 7, 2004, from http://nces.ed.gov/pubs2003/2003017.pdf

Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International Journal of Educational Research, 31*, 459-470.

Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, NJ: Merrill/Prentice Hall.

Relich, J. (1984). Learned helplessness in arithmetic: An attributional approach to increased self-efficacy and division skills. In B. Southwell, M. Cooper, J. Conroy, & K. Collis (Eds.), *Proceedings of the Eighth International Conference for the Psychology of Mathematics Education* (pp. 487-503). Sydney: International Group for the Psychology of Mathematics Education. (ERIC Document Reproduction Service No. ED306127)

Schunk, D. H. (1981). Modeling and attributional effects on children's achievement: A self-effi-

cacy analysis. *Journal of Educational Psychology, 73*(1), 93-105.

Schunk, D. H. (1982). Effects of effort attributional feedback on children's perceived self-efficacy and achievement. *Journal of Educational Psychology, 74*(4), 548-556.

Schunk, D. H. (1983a). Ability versus effort attributional feedback: Differential effects on self-efficacy and achievement. *Journal of Educational Psychology, 75*(6), 848-856.

Schunk, D. H. (1983b). Progress self-monitoring: Effects on children's self-efficacy and achievement. *Journal of Experimental Education, 51*(2), 89-93.

Schunk, D. H. (1984). Sequential attributional feedback and children's achievement behaviors. *Journal of Educational Psychology, 76*(6), 1159-1169.

Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology, 77*(3), 313-322.

Schunk, D. H., & Hanson, A. R. (1989). Influence of peer-model attributes on children's beliefs and learning. *Journal of Educational Psychology, 81*(3), 431-434.

Shih, C.-C., & Gamon, J. (2001). Web-based learning: Relationships among student motivation, attitude, learning styles, and achievement. *Journal of Agricultural Education, 42*(4), 12-20.

Tennyson, R. D., Park, O.-C., & Christensen, D. L. (1985). Adaptive control of learning time and content sequence in concept learning using computer-based instruction. *Journal of Educational Psychology, 77*(4), 481-491.

Thompson, L. F., Meriac, J. P., & Cope, J. G. (2002). Motivating online performance. *Social Science Computer Review, 20*(2), 149-160.

Whipp, J. L., & Chiarelli, S. (2004). Self-regulation in a Web-based course: A case study. *Educational Technology Research and Development, 52*(4), 5-22.

Young, J. D. (1996). The effect of self-regulated learning strategies on performance in learner controlled computer-based instruction. *Educational Technology Research and Development, 44*(2), 17-27.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329-339.

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*(3), 663-676.

Zimmerman, B. J., & Martinez-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal, 23*, 614-628.

Zimmerman, B. J., & Martinez-Pons, M. (1988). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology, 80*(3), 284-290.

Zimmerman, B. J., & Schunk, D. H. (Eds.). (1989). *Self-regulated learning and academic achievement: Theory, research, and practice*. New York: Springer-Verlag.

Zvacek, S. M. (1991). Effective affective design for distance education. *Tech Trends, 36*(1), 40-43.