The Role of Self-Regulation in Web-Based Learning

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November 28, 2005
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*Why is self-regulation important in a web-based environment?*

Educational opportunities have increased in web-based environments. With this environment comes a greater responsibility for students to self-regulate their learning. Often in a web-based educational setting, learners find themselves having a greater need to facilitate their learning. They can no longer passively sit in the classroom relying on the questions of others for clarification. They must actively seek answers to their inquiries, identify their goals, and organize them into a temporal framework. Many students are unsuccessful in web-based environments not because the content is too difficult, but because of limited motivation, limited help seeking skills, poor time management, and low self-efficacy. In short, the students lack self-regulatory skills that would aid them in succeeding in a web-based educational environment.

*What is self-regulated learning?*

Self-regulated learning encompasses the social cognitive methods by which students facilitate their learning. Self-regulated learning consists of four phases: forethought, monitoring, control, and reflection. The phases are not linear, but cyclical in nature (Schunk 2005). In the forethought phase, highly self-regulated learners will set goals for learning, access prior knowledge (procedural as well as content based), perform task analysis, and evaluate their self-efficacy in relation to the assignment. In the monitoring stage, highly self-regulated learners will evaluate what they understand as they are learning new concepts. Accordingly, they will monitor and change strategies to benefit their learning. In
addition, they will evaluate their feelings of self-efficacy as tasks change over time. In the control phase, highly self-regulated learners will adapt their learning strategies based on their effectiveness in the progression toward their goals. Highly self-regulated learners reflect on the outcomes of their learning. They reflect on how the strategies they have used have influenced the outcome. In evaluating their effectiveness, they develop a plan for the next learning opportunity (Zimmermann 2003).

In addition, self-regulated learners' completion goals are geared toward mastery of concepts versus performance goals. For example, self-regulated learners are more concerned about understanding why the earth revolves around the sun than in getting high letter grades on their solar system project or outperforming others in their class. The motivation of the students is for understanding and learning and not for external performance awards. Having a goal boosts students' feelings of self-efficacy (Kitsantas, Reiser & Doster 2004).

Self-regulation leads to high achievement in educational settings. “Compared with low-achieving students, high achievers report setting more specific learning goals for themselves, using more strategies to learn, self-monitoring learning processes more frequently, and more systematically adapting their efforts on the basis of learning outcomes,” (Zimmerman, Bonner, & Kovach 2002). As a result of self-regulatory activities, learners feel a great sense of self-efficacy, which leads to continued control of their learning processes, (Zimmerman et al.2002).
Self-regulatory skills can be taught. They are not inherent abilities. Higher order thinking skills as well as self-regulation strategies were explicitly taught to forty-two high school students to aid in reading comprehension (Cooper, Horn & Strahan 2005). As a result, students increased their awareness of self-regulatory skills and some students’ goals shifted from being performance based to being mastery based. This finding hints that the trend of students not completing their online courses can be stopped by the inclusion of explicit education in self-regulation. Explicit education in self-regulation has already been used to some extent in computer-based learning environments.

*How are computer based programs aiding in self-regulation?*

Many computer-based programs have been designed to incorporate the explicit teaching of self-regulatory skills. Inquiry Island software helps elementary students to self-regulate their learning in developing and implementing a research project. The program has characters built in that give advice and represent many of the phases of the self-regulation and the inquiry cycle. Each of the characters acts as an advisor. For instance, Quentin Questioner has specific goals that he helps the students meet. One of those goals is to provide feedback in helping the students develop a hypothesis for their research project. Other characters who aid in promoting self-regulation are Pablo Planner, Molly Monitor and Sydney Synthesizer. Each character helps the students with their cognitive and metacognitive skills (White & Frederiksen 2005).
Point & Query is a program that helps to build students’ abilities to choose deep thoughtful questions. Research indicates that students who are tasked with a complex goal utilize more thoughtful questions to reach that goal (Grasser, McNamara & VanLehn). This program gives students exposure to higher order thinking.

Another approach to enhancing students’ questioning abilities is to provide a tutor that helps the students in solving problems. The tutor adapts to the needs of the students. AutoTutor is one such program that attempts to simulate the moves of a human tutor (Graesser et al.) Studies have shown that adaptive feedback given by a human tutor can help students to activate prior knowledge, create goals, engage in self-questioning, and use effective strategies such as making inferences and summarizing (Azevedo 2005b). AutoTutor holds conversation in natural language in the form of an animated agent. AutoTutor like a human tutor, prompts students to delve deeper into questioning and developing hypotheses until the student has met specific goals and expectations for learning.

Lastly, iSTART is a program developed to increase the self-regulatory strategies used in reading comprehension. It consists of three phases, introduction, demonstration, and practice. In the introduction phase, the students are introduced to the reading strategies with the use of animated agents. In the demonstration phase, the agents demonstrate the use of a reading strategy and the students identify which strategy is being used. In the last phase, practice, the
animated agent gives adaptive feedback as the student begins to use the strategies (Graesser et al. 2005).

All of these programs help to mediate self-regulatory strategies for students. As different aspects of these programs are integrated into the design of web-based courses, the students’ abilities for self-regulation will most likely increase. The animated computer agents used in all three programs may prove to be useful as they are integrated into more web-based courses.

**Designing web-based learning environments**

In designing web-based learning environments, researchers have looked for ways to increase self-regulation for students in online environments. Traditional self-regulation strategies can be used in a web-based environment; however, some adaptations must be made for the special features of the environment (Whipp & Chiarelli 2004). In a qualitative study, Whipp and Chiarelli chose to look at how self-regulation strategies were used in a current web-based course. The researchers, using six students representative of the population taking the course, interviewed the students and asked them at various intervals in the course to describe the strategies they had used in accessing the course material. In addition, in journals the students were asked to evaluate their motivations while learning online and to evaluate their performance. The instructor was also interviewed and asked to describe self-regulation strategies that he or she observed during the course of the semester. The interviews and student journals were coded to assess what self-regulation strategies were
adapted for a web-based environment. They found that in addition to traditional self-regulatory strategies, accessing timely technical expertise, using web-based helpers, and using student postings, as models were strategies unique to the web-based environment. In designing for the web, these strategies need to be taken into consideration along with traditional self-regulatory strategies.

Other studies found that adaptive guidance or the use of a computer or human mentor aided in promoting self-regulation in students taking a web or computer based course (Bell & Kozlowski 2002; Azevedo 2005). In Bell and Kozlowski’s study adaptive guidance was employed to give students feedback during the course of mastering complex tasks. They found that students who had adaptive guidance while training demonstrated higher levels of basic and strategic knowledge than those who only received general feedback. In addition, a higher percentage of students who had adaptive guidance were able to transfer the knowledge to a more complex task than those who had general feedback. Students were able to effectively self regulate their learning with specific feedback geared toward their previous work in the form of adaptive guidance. In addition, they found that adaptive guidance promoted high self-efficacy in the early stages of the training. The integration of targeted feedback is essential to supporting self-regulated learning in a web-based environment.

Another study showed that controlled computer environments, environments in which the decisions in content access were controlled, helped to support students with low-self regulatory skills. Contrarily these environments had little effect on those students with high self-regulatory skills (Eom, Wooyong
and Reiser 2000). “[S]tudents who lack key metacognitive and self-regulatory skills learn very little from … open-ended environments and that some kind of scaffolding is usually necessary to support their learning of conceptually challenging topics,” (Azevedo 2005b). This has implications for the design of web-based environments. In courses in which the learner has more leeway in making decisions in the direction of their inquiry, self-regulatory prompts should be incorporated to aid those with low self-regulatory skills. The integration of self-regulatory scaffolding is essential for a students success in a web-based learning environment. In designing for web-based environments adaptive feedback, web specific self-regulated learning skills and controlled computer scaffolds need to be taken into consideration.

Conclusion

There is little theoretical and empirical evidence about self-regulation in web-based learning environments. The research that does exist suggests that components that enhance, mediate, or prompt self-regulatory skills need to be embedded in the design of web-based learning environments. Self-regulatory skills can be taught. Self-regulatory scaffolding in the form of prompts and animated agents can help to increase students’ success in web-based learning environments. The use of a tutor, human or computer based, has been shown to be the most effective component in enabling self-regulation. Explicit lessons in self-regulation strategies have also proved to be effective.
Further research needs to be developed to provide a theoretical framework for the design of web-based learning environments. Currently, many web-based learning environments mimic traditional face-to-face environments without taking into consideration the differences in pedagogy that might exist between the two environments. Web-based environments designed around the concept of self-regulatory strategies might help to increase the number of students who are successful in web-based learning.
References


