

Self-Regulation in e-Learning Environments: A Remedy for Community College?

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ABSTRACT

A mixed-methods study was conducted to examine the effects of self-regulated learning (SRL) strategy training on learners' achievement, motivation and strategy use in a web-enhanced College Success course at a community college in southeast US. It was found that training assisted with students' overall course performance and accomplishment of long-term tasks, enhanced students' self-satisfaction, and persistence. This study empirically tested the effects of a technology-enabled strategy training intervention in a field setting; it contributes to the understanding about SRL and persistence in the community college population; and it is a pioneering trial of conducting learning strategy research using mixed methodologies. Results and implications for future research and instructional design are also discussed.

Keywords

Self-regulated learning, Web-enhanced instruction, Mixed-methods study, Achievement, Motivation

Introduction

With about 42% (7.8 million students) of all undergraduates in the country on their rosters (Knapp, Kelly-Reid, & Ginder, 2012), community colleges are considered essential providers of postsecondary education in the United States. Yet, student retention in community colleges is a concern for many educational researchers and administrators because the problem of high attrition rates has come despite the affordable expense and open-access policies of community colleges. A large number (30 to 50 percent) of students who started their postsecondary education in community colleges never complete it (Horn & Nevill, 2006; Knapp, Kelly-Reid, & Ginder, 2012).

Various interrelated causes for students' early departure from community colleges have been documented. In addition to demographic characteristics such as old age, family responsibilities, working full-time, and part-time enrollment, which inherently make it harder for community college students to succeed in their academic career (Horn & Nevill, 2006; Schmid & Abell, 2003), many of these students are identified with poor educational preparation (Wirt, Choy, Rooney, Provasnik, Sen, & Tobin, 2004), low first-year achievements (Bradburn & Carroll, 2002; Horn & Nevill, 2006), and a lack of learning strategies (Byrd & MacDonald, 2005; Schmid & Abell, 2003).

It was found that remedial or study skills courses could provide under-prepared students with math, reading, and study skills to enhance achievement (Tuckman, 2002; 2003), and to improve retention (Stovall, 2000; Tuckman, 2003). Therefore, researchers (Byrd & MacDonald, 2005; Schmid & Abell, 2003) pointed out the need for interventions that concentrate on the academic needs of students, and proposed the use of remedial education and study skills courses. Numerous remedial or study skills interventions have been developed using the research on academic self-regulation (Shafer, Lahner, Calderone, Davis, & Petrie, 2002; Tuckman, 2003) as a theoretical framework.

This mixed-methods study attempted to investigate the effects of an intervention, which included a web-based tutorial on SRL and online Study Plans and Self-Evaluations, on students' achievement, motivation and self-reported use of strategies in a College Success course. This was another endeavor, hoping to facilitate student retention through the teaching of SRL strategies.

Self-regulated learning

Over the last decade, learners' self-regulation of their cognition, motivation, and behaviors to promote academic achievement has received increasing attention in the field of education. Driscoll (2005) refers to self-regulation as skills that learners use for goal setting and managing their own learning and performance.

Pintrich (1995) emphasizes the regulation of three general aspects of learning in his interpretation of SRL. First, learners self-regulate their behavior including the control of various resources, such as time, study environment, and students' use of peers and faculty members for help (Garcia and Pintrich, 1994); second, learners self-regulate motivation and affect through controlling and modifying motivational beliefs such as efficacy and goal orientation to adapt to the demands of a course; third, learners self-regulate their use of various cognitive strategies to achieve learning outcomes.

Furthermore, SRL is particularly appropriate to the college context. Traditional academic environment rarely encourages the use or development of self-regulatory skills (Orange, 1999). It may be hard for busy college students, especially those with jobs and family responsibilities, to find time to learn to use self-regulation strategies. This is why it is suggested (Orange, 1999; Pintrich, 1995) that self-regulation strategies should be taught at all levels of education.

Recently, Wolters (2010) identified the connection between SRL and the 21st Century Competencies (CC) (Partnership for 21st Century Skills, 2011) in that self-direction and individual adaptability are key aspects of the 21 CC framework, which have the closest fit to concepts within the SRL context.

Importance of the study

Decades ago, McKeachie, Pintrich, & Lin (1985) conducted a study to evaluate a semester-long introductory cognitive psychology course that taught both concepts of cognitive psychology and their application to learning strategies with intact groups of students. Their study found that the learning strategies course was substantially successful in affecting students' self-reported study habits and modestly successful in affecting students' achievement in the two semesters following the study.

Normally, providing comprehensive training on SRL strategies to students in various traditional classroom settings led to improved task performance (Hofer & Yu, 2003; Weinstein, Husman, & Dierking, 2000) and metacognitive understandings (Ching, 2002), more positive motivation (Ching, 2002; Weinstein et al., 2000), more strategy use (Hofer & Yu, 2003), and even a better retention rate (Weinstein et al., 2000).

New learning environments, such as web-based or -enhanced instruction, require more proactive learning to construct knowledge and acquire skills. As Schunk & Zimmerman (1998) mentioned that "an area that lends itself well to self-regulation is distance learning, where instruction originates at one site and is transmitted to students at distant sites... Self-regulation seems critical due to the high degree of student independence deriving from the instructor's physical absence" (p. 231-232).

Bandura's (2000) social cognitive theory has been successfully used with Internet-delivered interactive guidance for self-management of health issues, such as weight-control (Taylor, Winzelberg, and Celio, 2001) and Dietary changes (Clark, Ghandour, Miller, Taylor, Bandura, & Debusk, 1997).

Azevedo and Cromley (2004) conducted a study to provide students with a 30-minutes training on SRL in order to facilitate their learning about the circulatory system with hypermedia. They found that SRL training did foster more sophisticated conceptual understanding and use of learning strategies.

According to the 2009 Faculty Survey of Student Engagement, 72 percent of faculty used course management systems (The Chronicle of Higher Education, 2010). More universities or colleges are using web-enhanced instruction, and instructors are spending less time on face-to-face contact if they used emails to communicate with students or websites to post course-related information (Warburton, Chen, & Bradburn, 2002).

Self-regulation has been identified as one of the major determinants to completion in community college education; however, fewer studies have empirically examined the role of SRL strategy training in community college student success. Considering the large percent of college faculty using web-based or -enhanced instruction (Warburton, et al., 2002), the relationship between academic self-regulation and educational outcomes in the e-Learning environments, especially at community colleges, has not been extensively examined for the benefit of learners as well as sponsors for college education.

Method

The purpose of this study was to examine, in a community college web-enhanced College Success course, whether a web-based SRL strategy training will positively influence: (1) achievement measured with individual assignment scores and final grade for the course, (2) learner motivation in terms of task value, self-efficacy, goal orientation and self-satisfaction, and (3) learners' self-reported use of strategies. This study was conducted in a fall semester.

Participants

The participants in this study were 21 (8 treatment vs. 13 control) undergraduate students enrolled in 2 sections of the course. The participants were freshmen (N=18) and sophomores (N=3), whose ages ranged from 17 to 24 (M=18.9). Fifteen (71%) of the participants were female and 6 (29%) were male. They were made up of 7 (33%) African-Americans, 13 (62%) Caucasians, and 1 (5%) Hispanic. Five (62.5%) participants in the treatment and seven (53.8%) in the control condition were required to take this College Success course because of deficiency on College Placement Test. Only students who completed all the intervention procedures constituted the participants in this study, and comparison between the pre- and post-intervention results were made on exactly the same set of individuals.

Instructional context

The course, College Success, was designed to develop and reinforce skills necessary for college and career success. It covers topics such as interpersonal relationships, employability skills, financial management, choosing a college major and other career planning topics. The course was designated as web-enhanced, which means materials, such as syllabus and course schedule, were posted to the course's Blackboard website and the instructor and students could use the website for instructional purposes.

Intervention materials

The SRL strategy training included two parts: an online tutorial on SRL Strategies and web-based interactive strategy application practices using online questionnaires.

The web-based tutorial focused on what SRL strategies are, more specifically, the definitions of metacognitive, motivational and cognitive strategies, and examples of the strategies and when and how to use them. Participants were required to complete the tutorial at least once. In addition to knowledge about SRL strategies, the tutorial also provided participants with practice on the knowledge in each chapter. Some multiple choice or case-study exercises were used for participants to become familiar with SRL (See Figure 1 for a tutorial screen capture).

After they practiced the knowledge about SRL, the learners were encouraged to apply the strategies to their actual studying of the course through completing a series of interactive online questionnaires.



Figure 1. Screen Capture of Web-based Tutorial

Procedure

This study consisted of 4 stages, which lasted for 14 weeks.

In the 2nd week of the semester, an email with the informed consent was sent to students to solicit participation. Interested students began by completing the first set of online questionnaires, within which they provided demographic information, such as year in school, age, gender, GPA, and completed an assessment on their initial motivation indicators and use of SRL strategies. During this stage, the researcher assigned the 2 intact sections of the course to the treatment and control conditions.

One week after the beginning of the 1st stage, students received another email to start their participation in Stage II. Within this stage, treatment participants went through Chapters 1 to 5 of the online SRL tutorial consistent with their instructional content for the course, and they completed all the exercises and a test within the tutorial. Participants in the control condition did not receive any of these treatments. This stage lasted for 4 weeks.

After the 2nd stage, treatment participants received another email to start their participation in Stage III, within which they first completed an online study plan, and then a self-evaluation for a learning period of 4 weeks. Study plan questionnaires appeared at the beginning of each 4-week period for learners to set goals and select strategies for completing tasks. Self-evaluations appeared at the end of each 4-week period for learners to reflect on their progress and effectiveness of strategies. Control participants did not receive any of these treatments. This stage lasted for 8 weeks (2 learning periods).

After Stage III, participants in both conditions received another email with a link to the final questionnaires. In this stage, which lasted for 1 week, learners' motivation indicators and reported use of strategies were measured again. Open-ended questions were also used to collect qualitative data about participants' use of learning strategies.

Data sources and analysis

Data on students' learning achievement were obtained from the course instructor. Data on the other two dependent variables, motivation and reported use of learning strategies, were collected using self-reported on-line questionnaires.

Questionnaires adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991) were used to measure the quantitative part of the motivation and strategy use. The original MSLQ included 81 items and was designed to assess motivation and use of learning strategies by college students. The modification of the questionnaire included changing the scale from a 7-point to a 5-point Likert scale, rewriting and eliminating statements for the nature of course and the participants. The Self-Satisfaction Scale (SSS) consisted of 4 researcher-designed items, and was used to measure aspects such as enjoyment from the course and fulfillment of goals. Participants rated on a 5-point Likert-type scale for each item ranging from A (Not at all true of me) to E (Very true of me), with C equaling “Moderately true of me.” Cronbach’s alpha coefficients for each section of the instruments were 0.93 for Motivation, 0.85 for Self-Satisfaction and 0.91 for SRL Strategies Questionnaire respectively.

During the study, participants were also asked to answer thirteen open-ended questions, which were designed to explore students’ motivational beliefs and use of learning strategies qualitatively. These questions were exactly the same at the beginning and end of the study, except for the tense. Present tense was used at the beginning to gather participants’ general use of strategies, while past tense was used latterly to ask about students’ use of strategies during the study. Some examples for these questions include: “What study strategies do you use that have helped you most in the past? How will your approaches to studying change as the semester progress? Why?”; “How do you know when you understand something really well? What do you do if you don’t understand something?”

Participants' responses to these questions were transcribed verbatim and analyzed using the NVIVO 7 software to help explain results from quantitative data. To analyze these data, the researchers followed the guidelines for qualitative content analysis (Chi, 1997), using an inductive constant comparative method (Glaser & Strauss, 1967) because the purpose was to understand the strategies used during a learning process. The researchers read participants' answers to questions and highlighted comment units or references (i.e., word(s), phrase(s) or sentence(s)) that described a type of learning strategy (open-coding) to capture main ideas, themes. Then, a search was performed for patterns within the data on each of the participants, and then across all participants (axial coding) to portray relationships. Finally, learning strategies and motivation were summarized with the patterns found across all participants into a list of 18 categories (See Appendix I) based on the theoretical framework of Pintrich’s (1995) general expectancy-value model and Bandura’s (2000) social cognitive model of self-regulation. To ensure confidentiality of participants, each participant was assigned a number and a series of numbers were used to indicate responses from each subject; for example, R₀₀₁ stands for a response from the first person of the Control condition, R₁₁₂ means a response from the twelfth person of the Treatment condition.

In this study, quantitative data were analyzed using nonparametric statistical procedures (Wilcoxon-Mann-Whitney Test for between-group comparison and Wilcoxon Signed Ranks Test for within group comparison) due to the small sample size (Siegel & Castellan, 1988). A correlation analysis was conducted on all quantitative measures after possible relationships were noticed from qualitative data analysis. Kendall’s tau for non-parametric correlation was used because of a small data set (Field, 2005).

Results and discussion

Learning achievement

A significant difference was found between the treatment and control participants on overall achievement ($U = 28.50$, $p < .05$, $r = .47$), and scores on 3 of the 7 course assignments, such as Test 3 ($U = 27.00$, $p < .05$, $r = .51$), Career exploration paper ($U = 28.50$, $p < .05$, $r = .48$) and Final exam scores ($U=28.00$, $p<.05$, $r=.48$). These were tasks completed later in the semester and required more time and effort to prepare. Adding the SRL strategy training seems to help with students’ accomplishment of long-term tasks, which involves continuing effort. The descriptive statistics for achievement measures are presented in Table 1.

Table 1. Descriptive statistics for achievement

	Treatment group (N=8)			Control group (N=13)		
	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>
Achievement measure						
Overall Course	93.88	4.55	95.50	88.77	9.04	92.00

	<u>Treatment group</u> (N=8)			<u>Control group</u> (N=13)		
Test 3	91.13	2.36	92.00	85.92	10.00	90.00
Paper	87.63	7.74	88.50	58.38	41.01	79.00
Final Exam	89.13	4.79	91.00	83.77	8.74	86.00

Experimental students might have been using the training materials (esp. online questionnaires) as reminders to work on and complete long-term tasks. The following excerpts from qualitative data might help explain this.

R₁₀₂:

Q: When, during these past 2 weeks, did you start working on the tasks?

A: The day the study plan began, and I usually work about 2 to 3 hours every day.

R₁₀₁:

Q: How did you motivate yourself to complete these tasks?

A: looked at the future with the met goal.

During the study, all of the treatment participants completed each of their course assignments, while 4 of the control participants did not complete 1 to 2 of the long-term assignments (project and paper). This could be the reason why the control group received significantly lower average scores on these assignments and the final course grade. These findings on learners' achievement are in line with results from studies conducted by other researchers (McKeachie et al., 1985; Shafer et al., 2002; Tuckman, 2002, 2003).

Learner motivation

Self-Satisfaction

A significant difference was found between the treatment and control group on self-satisfaction ($U = 27.50, p < .05, r = .39$). Adding the SRL strategies training appears to raise students' self-satisfaction from taking the course. However, no significant difference was found between the treatment and control students in terms of task value, self-efficacy, intrinsic and extrinsic goal orientation.

The positive correlation ($\tau = .50, p < .01$) between self-satisfaction and final cumulative course scores might be an explanation for this result. Since the treatment learners achieved significantly better on the final cumulative score and 3 of the 7 course assignments, it might be reasonable that they would generally feel more satisfied with their learning outcomes from the course. Qualitative data also seem to support a relationship between self-satisfaction and achievement. Within all 29 references related to self-satisfaction, 20 were made by students who received A's for their course grade, 6 were from students who received B's, and 3 were from students who received C's. The following excerpts might help illustrate this.

Q: What goal(s) were you working toward in this course? ... So far, how have you done with reaching your goals?

R107, A student:

A: To learn the material, just studying, **i've done well, completed all to get an A and use skills for other classes**

R102, A student:

A: Becoming a better college student. **Yes. Very well, I am passing my class. 90%**

Task Value & Goal Orientation

Experimental participants reported significantly lower task value ($z = -2.21, p < .05, r = .55$) and extrinsic goal orientation ($z = -2.21, p < .05, r = .55$) at the end than at the beginning of the study (please see Table 2)

Table 2. Wilcoxon Signed Ranks Test for Motivation (treatment)

Motivation measure	Z	Asymp. Sig. (1-tailed)
Task Value after - Task value before	-2.214	.01
Extrinsic G after - extrinsic G before	-2.207	.01

a Based on negative ranks.

b Based on positive ranks.

c Wilcoxon Signed Ranks Test

The quantitative result of significantly lower task value for the treatment condition was out of expectation. However, this result was supported by qualitative findings because there was an increase in the number of references for task value from the beginning ($n = 0$) to the end of the study ($n = 6$). Yet all the remarks in Phase IV were negative. For example, 5 Treatment and 11 Control participants said the course was too easy and there was no need for them to use other resources and 1 Treatment and 5 Control participants mentioned they did not have to deal with any obstacles. This implies that both groups experienced reduction in task value. It was predicted that the treatment learners would have higher task value at the end of the study because of their engagement in SRL; however, it looked like task value was influenced more by other variables, such as whether the course was challenging enough. This following excerpt might help illustrate this.

R013:

Q: Did you use any other resources besides the textbook and material offered online in studying?

A: No, i **didnt even study for this class.**

The quantitative result of significantly lower extrinsic goal orientation for the treatment condition was consistent with the expectation. There might be an effect of the treatment to help learners reduce their emphasis on performance because the web-based tutorial was designed to advocate the importance of intrinsic and both goal orientations. Yet, this quantitative result is opposite to the qualitative findings, which indicated that there was a slight increase in references for the extrinsic goal ($n = 2$ to $n = 3$) from the beginning to the end. There might be several perspectives to look at this inconsistency between the qualitative and quantitative findings.

First, participants tend to select choices for more socially desirable behaviors when they are completing self-report 5-point Likert-type instruments (Ley & Young, 1998). This might have been one reason for the significantly lower extrinsic goal orientation for the treatment learners at the end of the study. Second, it is harder for participants to be dishonest when they answer open-ended questions, yet they might have become less enthusiastic to provide really meaningful answers as the study progresses. With the end of the semester coming closer and final grades being the usual major measure of achievement in courses, it might be reasonable for students to become more extrinsic- or both- goal oriented when they were under extreme pressure for outcome. These following excerpts might help explain this.

R101 (intrinsic → both goals):

Phase I: learning better testing strategies, and prioritizing,

Phase VI: Study Habits, Making good grades and Learning how to balance my time. Try different things and see which is better for me.

Reported use of strategies

Concerning the effects of the strategy training on students' reported use of strategies, even though the treatment group ($M = 37.13, 67.19, 60.25, 164.56$) did report higher use of metacognitive, cognitive and resource management strategies and the total strategies than the control group ($M = 36.85, 61.46, 59.15, 157.46$), the differences did not reach statistical significance.

A positive correlation was found between self-satisfaction and use of cognitive ($\tau = .65, p < .01$), metacognitive ($\tau = .40, p < .05$), resource management ($\tau = .69, p < .01$) and total strategies ($\tau = .67, p < .01$) after the intervention. The intervention, especially the online Study Plans and Self-Evaluation, was intended to encourage treatment participants to engage more in SRL. Treatment learners' immersion in SRL might have brought about higher self-satisfaction, even though the treatment effect might not be strong enough to make their use of strategies significantly

different from those of the control group. This finding is consistent with the result from Zimmerman & Kitsantas' (1999) study on combining a series of kernel sentences into a single nonredundant sentence. In their study, girls who were involved in self-monitoring during the process of combining sentences reported higher degrees of satisfaction than those who did not.

The treatment students also reported significantly higher ($z = -1.98, p < .05, r = .50$) use of rehearsal strategies at the end ($n = 121$) than at the beginning ($n = 109$) of the study and significantly lower use of resource management strategies ($z = -1.96, p < .05, r = .49$) at the end than at the beginning of the study (please see Table 3).

Table 3. Wilcoxon Signed Ranks Test for learning strategy (treatment)

Strategy measure	Z	Asymp. Sig. (1-tailed)
REH_2 - REH_1	-1.997	.02
Resource Mgt after - Resource Mgt before	-1.960	.03

a Based on negative ranks.

b Based on positive ranks.

c Wilcoxon Signed Ranks Test

The quantitative result about significantly lower use of resource management strategies was opposite to the prediction. In addition, the qualitative data also supported this result with a decrease in the number of references to resource management strategies provided by the treatment participants from Phase I to Phase VI. There is a decrease in number of references for overall resource management ($n = 77$ to $n = 66$) and the subcategories of peer learning ($n = 22$ to $n = 17$) and help seeking ($n = 24$ to $n = 13$).

This discrepancy between the findings and hypothesis might be explained from several angles. First, it was found that there was a significantly positive correlation ($\tau = .57, p < .01$) between task value after the intervention and use of resource management strategies. The following excerpts might also confirm this correlation.

Phase VI

R010:

Q: What study strategies did you use that have helped you most to be successful in the course? How did your approaches to studying in this course change as the semester progressed? Why?

A: As the semester passed by I realized that it wasn't really challenging so my study time decreased a lot

R108:

Q: Did you use any other resources besides the textbook and material offered online in studying? Why/Why not?

A: No (other resources), all I needed to know was given to me in class or in the book.

With learners' experiencing significant decrease in their task value, it might be reasonable that they stopped using or at least reduced the frequency of using some of the strategies. The level of course difficulty might not have provided learners enough opportunity to utilize the strategies that they learned from the training and as a result compromised the treatment effect on reported use of strategies. This finding is in line with results from previous research on the positive relationship between valuing (Miller, Behrens, Greene, & Newman, 1993), interest (McWhaw & Abrami, 2001) and the use of SRL strategies.

A second explanation might be that higher frequency may not necessarily mean effective use of strategies. On the contrary, reducing the use of certain strategies might be an effective adjustment according to task difficulty. It might not have been appropriate to hypothesize that the more a student used a strategy, the more successful he or she would be in SRL. Sometimes intentional decrease in strategies may even indicate improvement in strategy use or metacognitive awareness. This might be the case with the treatment learners in this study.

Persistence

In this study, persistence (Stovall, 2000) was assessed in terms of (a) First-term credit hour completion, (b) First-term GPA, (c) Continuing enrollment until the 2nd term, (d) Second-term credit hour completion, and (e) Second-term GPA. The descriptive statistics for persistence measures are presented in Table 4.

Table 4. Descriptive statistics for persistence

Persistence measure	Treatment group (N = 8)			Control group (N = 13)		
	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>
First-term credit hour completion (0-15)	11.50	2.78	12.00	11.00	2.08	12.00
First-term GPA (0-4.0)	3.17	.60	3.39	2.81	.66	2.79
Second- term credit hour enrollment (0-15)	11.25	3.41	12.00	12.08	1.50	12.00
Second-term credit hour completion (0-15)	9.75	4.95	10.50	8.46	5.13	9.00
Second-term GPA (0-4.0)	2.75	.53	3.00	1.77	1.27	2.00

Ranges of students' possible scores in each category are given in parentheses.

The treatment learners ($M = 2.75$) achieved significantly higher than the control learners ($M = 1.77$) on 2nd-term GPA ($z = -1.95, p < .05, r = .43$). It was also found that, during the semester for the study, there was no drop-out from the course among the treatment participants, while one control participant withdrew from the class. Furthermore, during the 2nd term, the drop-out rates increased to 29% and 12.5% for the Control and Treatment conditions respectively. However, the treatment condition still had a much lower incompleteness rate. The treatment might have had some positive effects on keeping the treatment participants on task and staying with the course, and it might also have had a long-term effect on GPA and overall persistence.

Treatment learners' better performance on persistence might also be related with students' achievement and self-satisfaction. Significant positive correlations exist between cumulative course score and four of the measures for persistence, which are 1st-term credit earned ($\tau = .49, p < .01$), 1st-term GPA ($\tau = .36, p < .05$), 2nd-term credit earned ($\tau = .50, p < .01$), and 2nd-term GPA ($\tau = .54, p < .01$). Significant positive correlations are also present between satisfaction and three of the persistence measures, which are 1st-term credit earned ($\tau = .41, p < .05$), 2nd-term credit earned ($\tau = .35, p < .05$), and 2nd-term GPA ($\tau = .36, p < .05$).

With the treatment learners achieving significantly better than the control students, they might more likely to feel satisfied with the learning experience and be more persistent when facing difficulty or in the long run. With the final participants in this study mainly consisting of 18 freshmen, this reasoning is in line with the research about public 2-year institution attrition, which indicated that students' academic achievement during the freshman year was negatively related with attrition rate at postsecondary institutions (Bradburn & Carroll, 2002; Horn & Nevill, 2006).

Limitations

This study's external validity was potentially affected by mortality and history threats, which caused the ending uneven small sample size. This study required participants to be involved with the treatment intensely for 14 weeks due to the time requirement for effective learning strategy training (Pintrich, 1995), and only collected self-reported data online, it was very likely for individuals to drop out of the study due to changes in availability or interest.

Within the treatment condition, 8 students completed and 19 left the study. All these 27 participants completed the pretest to measure motivation and learning strategies. The pre-intervention data showed no significant differences between the dropouts and the completers on demographic information (e.g., age, credit hours attempted, etc.); motivation and 10 of the 11 indicators for use of strategies. Thus, it was assumed that the dropouts and the completers were generally similar. However, this might also suggest that the indicators used to identify similarities may not have picked up every significant factor. Although data were analyzed with the recommended nonparametric statistical procedures, the small sample size was still a threat to external validity. Results may be biased and not reliably apply to other populations.

Implications and conclusion

Abundant studies in the field of e-Learning have been conducted on outcomes of instructional media, learner characteristics, learner perceptions and interaction (Simonson, Smaldino, Albright, & Zvacek, 2000), but fewer have

actually examined facilitation on learning strategies at community colleges. This current study can be valuable to the academic community in several respects.

The findings of this study supported the notion that SRL strategy training could assist learners with achievement and self-satisfaction, and it showed a tendency for training to be superior in facilitating use of learning strategies. The e-Learning intervention used by this study can be easily integrated into any Learning Management System as an online orientation for distance education, similar to what Cerezo and her colleagues (2010) did with integrating the TRAL project into Moodle. This can be especially useful for community colleges because a large portion of 2-year public institutions students need remedial education or academic counseling, especially when taking e-Learning courses and it has become a burden for many such institutions (Dembicki, 2006). The intervention from this study can be further adapted for implementation on Mobile devices to provide ubiquitous guidance on Self-regulatory strategies for learning (Jeng, Wu, Huang, Tan & Yang, 2010). Personalized SRL strategy applications can be “pushed” to learners as reminders through their smart phones or tablets. This can allow us to provide embedded scaffolds in hypermedia environments through creative use of the revolutionary advances in new technologies.

The result of this study might challenge the conventional concept of effective strategy use as it concerns adjustment based on task demand. Learners in this study reduced use of resource management strategies, or did not implement any help-seeking strategies after they found out the course was not as challenging as they expected. These deliberate adjustments in strategies might be signs of improvement in students’ strategy use or metacognitive awareness. Many traditional studies considered the more frequent use of strategies the better. Future studies might want to investigate the definition of effective use of learning strategies by observing expert and novice learners and reexamining whether resource management strategies are most susceptible to changes in task difficulty. Future research can also investigate if we can use SRL strategies to help students keep themselves motivated, and eventually get more out of courses they perceive as not especially challenging or relevant.

Furthermore, the findings of this study suggested that the training on SRL strategies might be beneficial to learners’ persistence. If future research can revalidate the effects of this e-Learning intervention with a larger sample size, more challenging course content, data-mining for more individualized SRL guidance and more effective control for study dropouts, we might be able to find a decent solution for the low completion rate at 2-year higher education institutions, especially for cultivating more 21st century competent e-Learning completers.

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Appendix

I. Definition of Categories

Strategy/Belief	Description	Example
Goal setting	Determining target results of learning or setting of sub-goals	“My goal for this course was to learn how to manage my time and study more.”
Strategic planning	Selection of learning strategies or methods to achieve the desired goals	“My goals were to do better on my quizzes .the plan was to study hard.”
Self-monitoring	Monitoring of attention, comprehension and learning outcomes.	“I asked myself questions while reading.”
Self-evaluation	Comparing feedback information from self-monitoring with certain kind of standard or goal to self-judge if they are making progress.	“i dont think i came to any (obstacles) in this course.”
Task value	Perceptions of a particular course in terms of interest, importance and utility	“i would just read and recite. Nothing (no strategy) changed because there was no need for it to.”
Self-efficacy	Personal beliefs about their capabilities to learn or perform skills for completing the course.	“this class was so easy, i cant think of anything i would have had trouble with”
Mastery/Intrinsic goal orientation	Participating in a task for reasons such as challenge, curiosity, mastery and concentration on learning, comprehending the material and self-improvement.	“in this course i was looking forward to gaining skills that will hepl me be a better college student”
Performance/Extrinsic goal orientation	Participating in a task for reasons such as performance, evaluation by others, and competition and focuses on grades, approval from others, rewards, or winning.	“I waned to get an A.”
Both goal orientation	The situation when students have a tendency to focus on both mastery/intrinsic and performance/extrinsic goals	“...to get an A and use skills for other classes”
Self-satisfaction	Feelings about the fulfillment of their learning goals and enjoyment from taking the course.	“I’ve done pretty well.”
Rehearsal	Selecting and encoding information in a verbatim manner	“read the chapters over and over till I rememberd them”
Organization	Constructing internal connections among information given in the learning material	“I would read my book and then outline what was important. Then I would go back through the chapter that I read and make an outline of what I underlined.”
Elaboration	Making information meaningful and building connections between information given in the learning material and a learner’s prior knowledge	“I made up accronyms for things and little rythmic notations to help me”
Time management	Scheduling, planning, and managing one’s study time.	“All of my classes start around noon, so i would usually utilize my time between 10 am and 12 pm to do all my school work.”
Study environment management	Making study environment organized, quiet, and relatively free of visual and auditory distractions	“i would go to school and study in the library”
Effort Regulation	Controlling effort and attention when facing distractions and uninteresting tasks.	“Really try to ignore them (distractions)”
Peer learning	Collaborating with peers, and using dialogue with peers to help clarify course	“Study Groups and individual study. Because I have made new friends and we

Strategy/Belief	Description	Example
	material and reach insights that may not have been attained when he or she studies alone	can have study groups when major tests are coming up.”
Help-seeking	Securing assistance from others or tools to cope with academic difficulty	“If I didnt understand something I just asked my teacher.”