Learning Behavior and Motivation of At-Risk College Students: The Case of a Self-Regulatory Learning Class

Jerry Chih-Yuan Sun, Youn Joo Oh, Helena Seli, and Matthew Jung

Abstract: The purpose of this study was to explore the motivational characteristics and learning behaviors affecting at-risk college students. To explore how motivation and learning behaviors are related to academic achievement, the relationships between (a) self-efficacy, (b) learning and study strategy indicators, and (c) academic outcomes were assessed. The trajectories of self-efficacy changes were also examined. Data were collected in three sets from freshmen in a self-regulatory learning class at a university in the Southwestern United States. Confirmatory factor analysis and structural equation modeling were conducted to examine the relationships among the observed variables. Changes in self-efficacy scores were examined during the semester. The results revealed a positive change in self-efficacy. Certain learning strategies and motivational characteristics, including attitude, interest, and attention, significantly predicted academic outcomes for the at-risk college freshman population studied. Implications and recommendations for future studies are discussed.

The transition from high school to college is difficult for many students, particularly at-risk freshmen. According to a report on national college dropout and graduation rates conducted by American College Testing (2014), the dropout rate between the freshman and the sophomore year in public four-year colleges or universities in the United States was about 29% in 2012, compared to about 26% in 2008. Harvard University’s Pathways to Prosperity Project Report also indicated that “only 56 percent of those enrolling in a four-year college attain a bachelor’s degree after six years, and less than 30 percent of those who enroll in community college, succeed in obtaining an associate’s degree within three years” (Symonds, Schwartz, & Ferguson, 2011, p. 6). According to the Organisation for Economic Co-operation and Development (2016, p. 175), in 2014, only 49% of undergraduate students in the United States obtained their bachelor’s degrees on time; approximately half of the students surveyed were not able to complete their bachelor’s educational level on time. Therefore, the purpose of this study was to examine the motivational characteristics and learning behaviors of at-risk freshmen at a four-year university as well as to identify the class-level components of an effective self-regulatory learning course designed for this population in a university setting. The students who were required to enroll in the course entered college with lower high school GPAs and SAT scores than the university desired and were thus considered at risk. The researchers proposed a series of hypotheses about the relationships among (a) self-efficacy, (b) learning and motivation indicators, and (c) academic outcomes for this population in general. A conceptual model of this study is shown in Figure 1. The overarching research question addressed in this study is: How do the self-efficacy and the learning and study strategies of at-risk college students influence their academic achievement?

This question is addressed through the following subquestions:

1. What is the relationship between the self-efficacy and the learning and study strategies as predictors, and academic achievement as an outcome, of at-risk college students?
2. Is there an increase in students’ self-efficacy as a result of their participation in a self-regulatory learning class?
3. Which particular learning and study strategies best predict the academic achievement of at-risk students?

Figure 1. Model of research questions.
Literature Review

The theoretical framework for the current study includes research on the influences of self-efficacy, motivation, and learning and study strategies on students’ academic achievement. Of specific interest for the current study were the effects of these factors on at-risk freshmen. There are several ways of determining whether students are at risk. In exploring such factors within an at-risk college freshman population, the characteristics and implications of at-risk categorization are also reviewed.

At-Risk College Students

Early researchers have examined at-risk K-12 students (Lemon & Watson, 2011; MacMath, Roberts, Wallace, & Xiaohong, 2010); however, there is no clear definition of at-risk college populations (Thompson & Geren, 2002). Gray (2013) indicated that universities define the students who are not able to achieve success in school due to factors such as socioeconomic status, family status, and academic failure as at-risk students. In Ports and Schulz’s (2008) study, low Scholastic Aptitude Test (SAT) or American College Testing (ACT) scores, a low class ranking, or a low high school GPA was used to classify incoming freshman as at risk.

Results of the early studies (Jolly, 2008; Melendez, 2007) showed that certain student populations, such as athletes, have greater risks of failure than the typical college student because of the time demands of athletics (i.e., drill and practice time). These heavy demands can overwhelm student athletes with stress and leave them susceptible to depression (Jolly, 2008), further compromising their academic success.

Academic failure may also occur because student athletes lack effective study skills or self-regulation strategies (Thompson & Geren, 2002). Tang and Wong (2014) pointed out that one of the struggles that freshmen face is related to the issue of executive functions (self-management), as freshmen tend to lack such self-management skills when confronted with difficulties in a new environment. Therefore, this study examined a self-regulation course that focused on developing learning strategies for a targeted population that included a majority of students.

Academic Self-Efficacy of At-Risk Students

The current study focused on students’ self-efficacy as a predictor of academic success. Bandura (1997) defined self-efficacy as an individual’s judgment of his or her capability to execute and perform tasks successfully in a specific domain. Academic self-efficacy is the general conceptualization of self-efficacy in an educational setting that is not limited to a particular academic subject (Majer, 2009). Huang (2014) believed that the most likely psychological problems that freshmen might encounter occur when they are forced to undertake compulsory courses and when acquiring poor test scores caused by lack of basic knowledge. Results of prior research showed that academic self-efficacy (self-efficacy in general academic subjects) is positively correlated with academic performance (Chemers, Hu, & Garcia, 2001; Gore, 2006; Jungert & Andersson, 2013; Mäkinen & Olkinuora, 2004; Mills, Pajares, & Herron, 2007; Vrugt, Hoogstraten, & Langereis, 1997). However, Schunk and Pajares (2002) stated that low levels of self-efficacy are correlated with adverse outcomes, such as doubting one’s capabilities, dwelling on inadequacies, and avoiding challenging tasks, all of which are related to academic success. Conversely, college students who have a high level of academic self-efficacy are academically successful because they implement effective learning strategies (Caprara et al., 2008; Pajares & Valiante, 2002).

In an empirical study, Chemers et al. (2001) found that academic self-efficacy was correlated with academic performance in first-year college and university students. That is, students who entered college with high levels of academic self-efficacy performed significantly better in college compared with students who had less academic self-efficacy. The results of their 2001 study showed that students who believed that they could succeed did perform at higher levels. In their study, the authors explained that this could result from students’ persistence and effort at implementing learning strategies. Students with low levels of academic self-efficacy may avoid challenging tasks because of their lack of academic confidence. Such students seldom give themselves the opportunity to validate learning strategies or develop motivational learning strategies. The implications of the study were that academic self-efficacy should be developed and maintained in at-risk students. Also, these efforts should start as early as the preschool years and continue through postsecondary education.

One of the main goals of the current study was to examine the association between academic self-efficacy and academic achievement of students in a self-regulatory course and, specifically, to determine whether students’ academic self-efficacy changed as a result of their participation in the course. There is a lack of studies related to first-year, at-risk college students’ academic self-efficacy in a college course (Chemers et al., 2001; Vrugt et al., 1997). As Bandura (1997) conceptualized, students derive self-efficacy from four sources: (a) previous experiences with success (mastery) or failure; (b) vicarious experiences of observing others; (c) social persuasion from others; and (d) emotional and physiological states (e.g., anxiety, fatigue, stress). The most significant source of self-efficacy is a student’s experiences of success in a learning setting. Therefore, examining the academic self-efficacy of at-risk students in what is often their first course in college is important for determining both the immediate academic impact of self-efficacy and its effect on students’ learning strategies.

Motivational Learning Strategies of At-Risk Students

Proctor, Prevatt, Adams, Reaser, and Petscher (2006) examined the differences between the use of learning strategies by at-risk college students and by college students who were not at risk. The Learning and Study Strategies Inventory (LASSI; Weinstein, Palmer, & Schulte, 1987) was administered to all student groups to determine their scores on different motivational subscales. The LASSI
includes 10 constructs: anxiety, attitude, concentration, information processing, motivation, selecting main ideas, self-testing, study aids, test-taking strategies, and time management. The results of the study showed that at-risk college students scored lower on the self-reported use of learning variables (i.e., attention, concentration, and motivation) compared with students who were not at risk. Weinstein et al.’s (1987) study supported the hypothesis that learning strategies are correlated with academic achievement. Thus, the researchers proposed that at-risk students be identified by their incoming GPAs as well as their LASSI scale scores.

According to Plant, Ericsson, Hill, and Asberg (2005), the time and effort students devote to their studies do not necessarily predict college course performance; however, the effectiveness of the time spent studying is predictive of college course performance. Robbins, Lauver, Langley, Le, and Davis (2004) examined the relationship between learning strategies and academic performance in college students. They found that self-efficacy was the best predictor of GPA. However, Pajares (2003) added that a strong sense of self-efficacy may also promote greater interest and attention in academic settings. Likewise, a student’s level of interest or attitude toward school-related tasks might predict his or her ability to be attentive in the classroom, thus enabling better work habits (Weinstein & Palmer, 2002).

Schunk, Meece, and Pintrich (2013) defined interest as a student’s attraction to any given subject. Samuelsson (2008) examined the relationships between various teaching methods and factors related to motivation. Compared with students who use positive learning strategies, those who are reluctant to use learning strategies (Lee, Teo, & Bergin, 2009; Onatsu-Arivilommi, Nurmi, & Aunola, 2002; Zuckerman, Kieffer, & Knee, 1998) tend to have lower academic achievement and less problem-solving ability. In Samuelsson’s (2008) study of 119 students who were enrolled in a mathematics course, the participants’ self-regulated learning skills were assessed using the Program for International Student Assessment (PISA) scored on a 10-point Likert scale (don’t agree = 1 to totally agree = 10). Sample items included the following: (a) I enjoy reading about mathematics, (b) I look forward to my mathematics lessons, (c) I do mathematics because I enjoy it, and (d) I am interested in the things I learn in mathematics. The results indicated improved academic achievement in quantitative concepts among students with higher scores for interest or affective motivational factors. The study concluded that the participants demonstrated significantly higher levels of interest as a result of teaching methods, which indicates the importance of improving students’ self-regulated learning skills.

Attention is considered one of the abilities needed for a student to complete learning tasks. Weinstein and Palmer (2002) defined concentration as a student’s ability to be attentive during academic tasks. Likewise, the ability to focus on a particular goal allows students to inhibit distractions, thereby increasing their likelihood of learning and implementing effective strategies (Weinstein & Palmer, 2002). Specifically, the ability to concentrate on a particular goal or activity allows students to avoid distractions, thereby increasing their likelihood of learning and implementing effective strategies (Weinstein & Palmer, 2002). Early researchers (Alexander & Murphy, 1998) indicated that students were more likely to be focused on learning and remembering when they were interested in the content that was being taught. According to Razza, Martin, and Brooks-Gunn (2010), attention is defined as a set of psychological and behavioral responses that are affected by the environment, which is then consciously controlled by the individual. Attention can be described as both selective and sustained; the former focuses on a specific object and tunes out other objects, and the latter maintains focus over time (Derryberry & Rothbart, 1997; Fan et al., 2009). Goldberg, Maurer, and Lewis (2001) state that selective attention improves sharply from middle childhood to adulthood as individuals become more able to inhibit impulses and keep their minds on competing objects. Previous research (Alexander & Murphy, 1998) has noted that students are more likely to be attentive to learning and remembering when the content they are learning is connected with their interests.

Tuckman (2003) has examined the utility of teaching university students learning strategies for improved performance, but Tuckman did not perform analyses focusing on at-risk students, and changes in students’ self-efficacy were also not examined. The majority of the participants in Tuckman’s (2003) study were students who were considered at risk. The implications of this study may add to the existing body of research on developing programs that specifically target potentially at-risk freshman students and provide them with self-regulation courses. These programs may lead to an increase in retention rates and an overall increase in academic performance for the targeted students (Jenkins & Guthrie, 1976; Thompson & Geren, 2002). Therefore, this study aimed to identify particular learning and study strategies that were associated with academic achievement, which was measured by the at-risk freshmen students’ course quiz scores and final course grades. We hypothesized that instruction on effective learning strategies incorporated into a college success course aimed at enhancing self-regulatory behavior would enable students to study effectively and achieve greater success, thereby increasing their self-efficacy.

Methods
Participants
The majority of the students were athletes considered at risk because they entered college with lower high school GPA and SAT scores than the college desired. Of the 177 students who participated in the study, 50.6% (n = 89) were female. The students’ mean age was 18.35 (SD = .74). All of the students in this study were freshmen, and more than 95% of the students in this course were required to take it because of their at-risk status. Self-reported data were collected from freshmen who participated in a college success course that taught self-regulatory learning over three semesters. Course materials and some assignments
were delivered through the university’s course management system, BlackBoard®. The course was taught by the same instructor at a university in the southwestern United States. This mandatory class, delivered via a 1.5-hour lecture and a 1.5-hour laboratory over a 15-week period, applied cognitive psychology along with motivation theory and research to improve students’ learning in different academic disciplines. Instruction was based on the textbook Motivation and Learning Strategies for College Success (Dembo & Seli, 2008, 2012) and included the topics of academic self-management, learning and memory, motivation, goal setting, management of emotion and effort, time management, the physical and social environment, and preparation of textbooks, lectures, and exams.

Instrumentation

The instruments used in this study were adapted from existing validated scales: the Self-Efficacy for Learning and Performance scale from the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) and the 10 subscales from LASSI (Weinstein et al., 1987). All of these were five-point Likert-type scales.

The MSLQ was developed by the National Center for Research on Improving Postsecondary Teaching and Learning at the University of Michigan in 1986 (Pintrich et al., 1991), including six subscales: Intrinsic Goal Orientation, Extrinsic Goal Orientation, Task Value, Control Beliefs, Self-Efficacy for Learning and Performance, and Test Anxiety. The subscale self-efficacy for learning and performance in this instrument was used to measure college students’ levels of self-efficacy for learning. The internal consistency coefficient (Cronbach’s α) in the current study was .89 for the Self-Efficacy for Learning and Performance, which met the standard of .70 (Nunnally & Bernstein, 1994).

The 10 constructs from the LASSI (Weinstein et al., 1987) were examined for college freshman students in a self-regulatory course. The LASSI is an 80-item assessment that includes 10 subscales: anxiety, attitude, concentration, information processing, motivation, selection of main ideas, self-testing, study aids, test-taking strategies, and time management. Sample items include: “I feel confused and undecided as to what my educational goals should be” and “I translate what I am studying into my own words.” Weinstein and Palmer (2002) proposed that the strategic learning constructs contribute significantly to success in higher education and that these strategies can be taught in educational learning environments, such as self-regulatory courses. For the purpose of this study, the researchers examined the relationships between the 10 constructs listed and academic achievement, as measured by the students’ course quiz scores and final course grades.

For data analysis, we used the LASSI percentiles rather than the actual scores because the lowest scores of the 10 subscales were not consistent, ranging from low scores of 10 to 18 to the highest scores of 38 to 40, providing different weights for each subscale. Thus, we converted the actual scores to their percentiles with the lowest as 1 and the highest as 99 for all subscales, with equal weight.

The subscales and their reliabilities in the current study were as follows: Information Processing (α = .82), Selecting Main Ideas (α = .91), and Test Strategies (α = .79); Attitude (α = .78), Anxiety (α = .88), and Motivation (α = .87); and Self-Testing (α = .85), Concentration (α = .88), Time Management (α = .89), and Study Aids (α = .74). The overall scale reliability was calculated to be .96. All of the Cronbach’s α values met the standard of .70 (Nunnally & Bernstein, 1994). To measure student self-efficacy in quizzes, a 10-point scale was used. Quiz scores were also given on a 10-point scale.

Procedures

In the first week of classes, the students took the LASSI inventory (Weinstein et al., 1987) to assess their use of learning and study strategies and MSLQ (Pintrich et al., 1991) to assess their self-efficacy in learning and performance. Eight quizzes were given during this course to examine the students’ understanding of motivation and self-regulatory learning strategies. After the students read the prompts, but before they started the quiz, they recorded their efficacy scores for the quiz on a scale of 1 to 10 (1 = lowest to 10 = highest). Each quiz was worth 10 points. The students’ LASSI percentiles on 10 subscales and their self-reported self-efficacies for quizzes were recorded for data analysis. In addition, survey data were collected at the end of each semester to measure the students’ Self-Efficacy in Learning and Performance (Pintrich et al., 1991). The students’ final course grades and actual quiz scores were retrieved from the university’s course management system. The research procedure is shown in Figure 2.

Figure 2. Research procedure.
Data Analysis

SPSS 16 and AMOS 17 were used to conduct the data analyses. For descriptive statistics, the means, standard deviations, and minimum and maximum values of all variables were calculated. The Pearson product correlations among variables, a confirmatory factor analysis, and a structural regression model were established. A theoretical model that specified the relationships between the three latent variables (self-efficacy, learning and study strategies, and academic achievement) and their indicators was created. This model was tested using confirmatory factor analysis and a structural regression model approach that predicted the academic achievement of college freshmen in a self-regulatory learning class. The indicators for self-efficacy as a latent variable were the scaled score for Self-Efficacy in Performance and Learning and the quiz efficacy scores. The indicators for learning and study strategies included the students’ attitude and interest levels and the students’ concentration and attention to academic tasks. These indicators were chosen because these two subscales had significant correlations with self-efficacy scores and achievement scores. The academic achievement indicators included actual quiz scores and final course grades, as retrieved from the university’s course management system. A trajectory analysis and an RM-ANOVA were conducted to compare the changes in the quiz self-efficacy scores and the actual quiz scores simultaneously. Lastly, a regression analysis was conducted to examine how learning and study strategies may predict students’ academic achievement.

Results

Preliminary Analysis

The means, standard deviations, minimums, and maximums for the measured variables are summarized in Table 1. To test the assumption that learning and study strategies predict academic achievement, preliminary analyses with correlations were conducted among all 10 LASSI variables, final grades, and quiz scores. The following variables produced correlations with achievement: (a) attention and concentration; (b) attitude and interest; (c) motivation, diligence, self-discipline, and willingness to work hard; and (d) time management. Their correlations with final grades were ($r = .24$), ($r = .19$), ($r = .16$), and ($r = .19$), and their correlations with quiz scores were ($r = .32$), ($r = .27$), ($r = .27$), and ($r = .25$), respectively. These variables were used as indicators for the latent variable of learning and study strategies. However, the probability level that emerged from this model was .002, and the fit indices were $\chi^2 = 38.66$, $\chi^2/df = 2.27$, CFI = .94, TLI = .88 and RMSEA = .09, which did not indicate that the model fit the data as presented in Figure 3. As a result, the theoretical model was modified by removing the motivation, diligence, self-discipline, willingness to work hard, and time management indicators.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>104</td>
<td>17.00</td>
<td>21.00</td>
<td>18.18</td>
<td>.75</td>
</tr>
<tr>
<td>Self-Efficacy for Learning and Performance</td>
<td>176</td>
<td>2.50</td>
<td>5.25</td>
<td>4.39</td>
<td>.55</td>
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<tr>
<td>Self-Efficacy for Quiz</td>
<td>153</td>
<td>.00</td>
<td>10.00</td>
<td>7.41</td>
<td>1.45</td>
</tr>
<tr>
<td>Attitude and Interest</td>
<td>159</td>
<td>1.00</td>
<td>99.00</td>
<td>41.93</td>
<td>30.58</td>
</tr>
<tr>
<td>Concentration and Attention to Academic Tasks</td>
<td>159</td>
<td>1.00</td>
<td>99.00</td>
<td>47.66</td>
<td>29.07</td>
</tr>
<tr>
<td>Final Grade</td>
<td>169</td>
<td>3.00</td>
<td>12.00</td>
<td>9.88</td>
<td>1.72</td>
</tr>
<tr>
<td>Quiz Score</td>
<td>153</td>
<td>4.78</td>
<td>10.00</td>
<td>8.07</td>
<td>1.11</td>
</tr>
</tbody>
</table>
As Table 2 shows, self-efficacy for performance and learning was significantly and positively related to quiz efficacy scores ($r = .22$), attitude and interest ($r = .17$), final course grades ($r = .17$), and actual quiz scores ($r = .31$). In other words, at-risk college freshmen with higher levels of confidence in their performance and learning had more positive attitudes toward learning and reported higher levels of interest in the course. They also earned higher quiz efficacy scores and higher actual quiz scores, and they performed better in class, as measured by the final course grade, compared with the students who had lower levels of confidence in their learning and performance. Attitude and interest were highly correlated with concentration and attention to academic tasks ($r = .57$), final grades ($r = .24$), and quiz scores ($r = .32$).

At-risk college students’ self-efficacy and their learning and study strategies can be used to predict academic achievement. A confirmatory factor analysis and a structural regression analysis were performed to answer this question. According to a preliminary analysis of the correlations between latent variables, including self-efficacy, learning and study strategies, and academic achievement, the probability level of the chi-squared test was .239, indicating that the model fit the data. The fit indices were $\chi^2 = 7.98$, $\chi^2/df = 1.30$, CFI = .99, TLI = .95 and RMSEA = .04. Without any modification to the model, structural regression analysis was conducted. Figure 4 presents the standardized estimate of the confirmatory factor analysis results with the three latent variables and their indicators.
Table 2

Pearson Product Correlations Among Measured Variables

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Self-Efficacy for Learning and Performance</th>
<th>Self-Efficacy for Quiz</th>
<th>Attitude and Interest</th>
<th>Concentration and Attention to Academic Tasks</th>
<th>Final Grade</th>
<th>Quiz Score</th>
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</thead>
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<td>Gender</td>
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<td>---</td>
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<tr>
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<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Self-Efficacy for Quiz</td>
<td>-.04</td>
<td>.22**</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
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<tr>
<td>Attitude and Interest</td>
<td>-.03</td>
<td>.17*</td>
<td>.21*</td>
<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Concentration and Attention to Academic Tasks</td>
<td>-.05</td>
<td>.14</td>
<td>.12</td>
<td>.57**</td>
<td>---</td>
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</tr>
<tr>
<td>Final Grade</td>
<td>-.04</td>
<td>.17*</td>
<td>.12</td>
<td>.24**</td>
<td>.19*</td>
<td>.19*</td>
<td>---</td>
</tr>
<tr>
<td>Quiz Score</td>
<td>-.26**</td>
<td>.31**</td>
<td>.53**</td>
<td>.32**</td>
<td>.27**</td>
<td>.37**</td>
<td>---</td>
</tr>
</tbody>
</table>

*p < .05. **p < .01.

Figure 4. Model 2—Confirmatory factor analysis of the revised model. Self-Efficacy (1 Efficacy = Self-Efficacy for Learning and Performance, 2 Efficacy = Quiz Efficacy); Learning and Study Strategies (1 LASS = Attitude and Interest, 2 LASS = Concentration and Attention to Academic Tasks); Achievement (1 Achievement = Final Grades, 2 Achievement = Mean Quiz Score).
The probability level of the chi-squared test was .24, which is higher than the .05 significance level. The fit indices, $\chi^2 = 7.98$, $\chi^2/df = 1.30$, CFI = .99, TLI = .95 and RMSEA = .04, indicate that the theoretical model in Figure 5 provided an excellent fit for the data. The values in the diagram reveal that self-efficacy and learning and study strategies accounted for 74% of the variance in the academic achievement of at-risk freshmen in a self-regulatory learning class. This indicates that at-risk freshmen achieved more when they had (a) high self-efficacy for learning and performance and for the weekly quizzes, (b) attitudes and interests with a focus on higher-level goal setting and persistence in day-to-day activities to achieve goals, and (c) adequate focus to allow them to study and listen in class without being distracted.

At-risk college students’ self-efficacy showed significant improvements. A repeated measures ANOVA (RM-ANOVA) was conducted to analyze the scores and the self-efficacy of the eight quizzes. Mauchly’s test of sphericity was statistically significant in the RM-ANOVA model ($\omega = .36$, $p < .001$). Because the sphericity assumption was invalid, the Greenhouse-Geisser correction ($\varepsilon = .85$) for the F value was applied. The result indicated that there were statistically significant differences between the eight quiz scores ($F = 3.04$, $p < .01$; see Table 3). For the quiz efficacy scores, Mauchly’s test of sphericity was statistically significant ($\omega = .69$, $p < .001$), so the Greenhouse-Geisser correction for the F value was reported. The RM-ANOVA result revealed that the values for the students’ eight efficacy scores were not statistically significantly different ($F = 1.94$, $p = .17$). However, a t-test between the eight efficacy values in the pairwise comparison showed that there were statistically significant differences between the third and sixth, fourth and sixth, and sixth and seventh quizzes (see Table 4). In summary, as student quiz self-efficacy scores increased, quiz scores increased. At the end of the course, including the seventh and eighth quizzes, quiz self-efficacy and actual quiz scores slightly decreased. Over the three semesters of the course, the self-reported self-efficacy scores and quiz scores gradually increased (see Figure 6).

At-risk college students’ attention and concentration has a significant predictive power on their academic achievement. As the preliminary analysis section indicated, learning and study strategies such as attention and concentration, and attitude and interest were significantly related to academic achievement for at-risk freshman students. Final grades were correlated with these objectives, with scores of ($r = .24$) and ($r = .19$), respectively. Quiz scores were correlated with these objectives, with scores of ($r = .32$) and ($r = .27$), respectively. Next, we applied a multiple regression, using attention and concentration and attitude and interest as explanatory variables to predict students’ final grades and quiz scores individually. The results are exhibited in Table 5. The results of the regression model of final grades showed no collinearity between attention and concentration and attitude and interest. The $R^2$ of the model was .25 ($p < .01$), indicating that attention and concentration and attitude and interest can be used to predict 25% of the total variance of final grades. The regression coefficient ($B$) of attention and concentration was 0.01 ($p = .04$), suggesting that when excluding the influence of attitude and interest, each unit of increase in attention and concentration will lead to a 0.01 unit of increase of the final grades. The regression coefficient ($B$) of attitude and interest was 0.01 ($p = .41$), showing that attitude and interest does not have a significant predictive power on final grades.

**Figure 5.** Structural Regression Model. Self-Efficacy (1 Efficacy = Self-Efficacy for Learning and Performance, 2 Efficacy = Quiz Efficacy); Learning and Study Strategies (1 LASS = Attitude and Interest, 2 LASS = Concentration and Attention to Academic Tasks); Achievement (1 Achievement = Final Grades, 2 Achievement = Mean Quiz Score).
Table 3

RM-ANOVA of the Eight Quiz Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Post hoc</th>
</tr>
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<tbody>
<tr>
<td>Between</td>
<td>104.89</td>
<td>5.49</td>
<td>19.12</td>
<td>3.04**</td>
<td>Quiz 2 &gt; Quiz 3**</td>
</tr>
<tr>
<td>Within</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block</td>
<td>990.60</td>
<td>105.00</td>
<td>9.43</td>
<td></td>
<td>Quiz 5 &gt; Quiz 1*</td>
</tr>
<tr>
<td>Error</td>
<td>3,620.26</td>
<td>575.91</td>
<td>6.29</td>
<td></td>
<td>Quiz 5 &gt; Quiz 3***</td>
</tr>
<tr>
<td>Total</td>
<td>4715.76</td>
<td>686.40</td>
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***p < .001. **p < .01. * p < .05

Table 4

RM-ANOVA of the Self-Efficacy Values of the Eight Quizzes

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Post hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>51.59</td>
<td>6.32</td>
<td>8.16</td>
<td>1.49</td>
<td>Quiz 6 &gt; Quiz 3*</td>
</tr>
<tr>
<td>Within</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block</td>
<td>2,804.09</td>
<td>152.00</td>
<td>18.45</td>
<td></td>
<td>Quiz 6 &gt; Quiz 4*</td>
</tr>
<tr>
<td>Error</td>
<td>5,250.91</td>
<td>960.58</td>
<td>5.47</td>
<td></td>
<td>Quiz 6 &gt; Quiz 7*</td>
</tr>
<tr>
<td>Total</td>
<td>8,106.59</td>
<td>1,118.90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05
Figure 6. Trajectories of the changes in self-efficacy and achievement. Black line (self-efficacy = self-reported quiz self-efficacy); blue line (achievement = quiz score).

Table 5

Summary of Multiple Regression Analyses for Variables Predicting Final Grades and Quiz Scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Final Grades</th>
<th></th>
<th></th>
<th>Quiz Scores</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
<td>B</td>
<td>SE B</td>
<td>β</td>
</tr>
<tr>
<td>Attention and concentration</td>
<td>0.01</td>
<td>0.01</td>
<td>0.20*</td>
<td>0.01</td>
<td>0.003</td>
<td>0.24*</td>
</tr>
<tr>
<td>Attitude and interest</td>
<td>0.01</td>
<td>0.01</td>
<td>0.08</td>
<td>0.01</td>
<td>0.004</td>
<td>0.14</td>
</tr>
<tr>
<td>R²</td>
<td>0.25</td>
<td></td>
<td></td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5.32**</td>
<td></td>
<td></td>
<td>8.93***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001.
The results of the regression model of quiz scores showed no collinearity between attention and concentration and attitude and interest. The $R^2$ of the model was .37 ($p < .001$), indicating that attention and concentration and attitude and interest can be used to predict 37% of the total variance of quiz scores. The regression coefficient ($B$) of attention and concentration was 0.01 ($p = .02$), suggesting that when controlling for the influence of attitude and interest, each unit of increase in attention and concentration leads to a 0.01 unit of increase in the quiz scores. The regression coefficient ($B$) of attitude and interest was 0.01 ($p = .16$), showing that the variable of attitude and interest does not have a significant predictive power on quiz scores.

**Discussions and Conclusions**

The results of the present study demonstrated that at-risk freshmen achieved more when they had (a) high self-efficacy for learning and performance and for the weekly quizzes, (b) attitudes and interests with a focus on a high level of goal setting and persistence in day-to-day activities to achieve goals, and (c) the focus to study and listen in class without being distracted. This finding is consistent with previous research, confirming that for both at-risk and traditional college students, self-efficacy is positively correlated with academic performance (Chemers et al., 2001; Gore, 2006; Mills et al., 2007; Vrugt et al., 1997). From the perspective of Bandura (2001), students’ prior experiences of success or failure significantly influence their self-efficacy. In a freshman self-regulatory class, it is important to promote students’ academic achievement by providing them opportunities to build their self-efficacy. This is especially important for at-risk students. The promotion of at-risk students’ self-efficacy should be an ongoing task. It is suggested to implement a long-term self-regulatory class to cultivate self-efficacy, thereby gradually enhancing academic achievement.

The results of the correlation analysis showed that the variable of attitude and interest was significantly correlated with student self-efficacy, supporting the conclusions of previous research (Pajares, 2003). Contrary to expectations, the at-risk students’ levels of concentration and attention to academic tasks were not correlated with either of the self-efficacy variables. However, all three major variables of interest (self-efficacy for learning and performance, attitude and interest, and concentration and attention) were significantly correlated with the students’ academic achievement. Similarly, a structural regression analysis showed that students with higher levels of self-efficacy and more learning and study strategies tended to have better academic achievement.

Students’ self-efficacy and quiz scores increased over time as a result of their participation in the self-regulatory class. This is consistent with prior research showing that academic self-efficacy is correlated with academic performance (Chemers et al., 2001) and indicating that it is important to develop and maintain at-risk students’ academic self-efficacy starting as early as the preschool years and continuing through postsecondary education.

Among the 10 LASSI constructs, interest and attitude and concentration and attention are important learning strategies related to the academic achievement of at-risk students. Furthermore, the regression analysis results showed that attention and concentration has a significant predictive power upon final grades and quiz scores. Hence, for at-risk students, attention is a predictor of their academic performance. The results of this study imply that courses for at-risk freshmen should be designed to promote students’ enhanced levels of interest in learning by teaching students how to set attainable academic goals and subgoals and promote enhanced concentration by designing interesting courses and teaching strategies that focus on day-to-day goal accomplishments. It is critical to examine instructional methods, teachers’ use of diverse topics, course materials, and content delivery platforms for at-risk students, including the use of Web-based learning and rich-text media for increased motivation and engagement (Ellis, Ginn, & Piggott, 2009; Sun & Rueda, 2012; Walsh, Sun, & Riconscente, 2011). Further research on course implementation that examines specific factors associated with increased self-efficacy and achievement is necessary, as is the use of a non-self-reported scale tool to examine the behavioral dimension of learning motivation. The fidelity of course implementation may be an important factor for student motivation and achievement. It will also be useful to examine how at-risk students transfer knowledge gained in self-regulatory classes to other classes via both qualitative and quantitative approaches.

**References**


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