Online Mathematics Achievement: Effects of Learning Strategies and Self-Efficacy

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ABSTRACT: *A fluid and flexible learning strategies repertoire and self-efficacy have been documented as important factors for learning and achievement. However, there has been little research examining the effects of these same factors on achievement in an online learning environment. The current research investigates the strategies used by and self-efficacy demonstrated by successful college students in an online developmental mathematics course. This article provides evidence of the relationship between learning strategies, motivation, self-efficacy, and student achievement in this environment. Participants were 89 students enrolled in an online developmental mathematics course. Results indicate four types of learning strategies—motivation, concentration, information processing, and self-testing—along with self-efficacy predicting 42% (r=0.65) of the variance in grade achievement.*

As students transition from high school to college, frequently they are asked to be more responsible for their own learning.

As most faculty are painfully aware, success in a college course is dependent on more than just exposure to content knowledge. Students' success in a course depends largely on what they do with that content knowledge in order to pass exams and to be successful in subsequent courses within a domain. As education research has demonstrated, to be successful students have to be motivated to put effort into their studies and use learning strategies and skills that support meaningful learning (Weinstein, Husman, & Dierking, 2000). In an extensive review of current research concerning reading and learning strategies curricula, Simpson and colleagues (2004) have argued that high-risk undergraduate students would best be served through a comprehensive cognitive-strategies curricula. Simpson et al.'s review of the literature on learning strategies within developmental education contexts focuses, as most do, on traditional rather than Web-based or online learning contexts. The goal of the current study is to examine the relationship between specific cognitive and motivational strategies and high-risk student success in online/Web-based courses.

The need for this research stems from a growing trend in American universities to transition course delivery to Web-based teaching through online instruction. According to the United States Department of Education, the enrollment in online classes doubled between 1995 and 1998, and the rapid growth is expected to continue (Wood, 2001). Universities continue to offer more courses online and students are thus in need of skills that will help them succeed in these new learning environments. Some institutions are transitioning their developmental education courses onto the Web to provide greater access for students and to reduce teaching loads. Although the popularity of Web-based instruction is growing, very little research has been conducted that examines the use of learning strategies and their effects on student learning and achievement in Web-based courses. The current research seeks to better understand the impact of students' motivation and learning strategies on their performance in an online developmental mathematics course. Understanding how learning strategies influence learning in online courses may help instructors and course designers to provide tailored, and therefore more effective, course-specific instruction in these vital learning strategies.

Learning Strategies

As students transition from high school to college, frequently they are asked to be more responsible for their own learning and more active in their learning environment. Postsecondary education research has shown that students are more likely to make this transition successfully if they have mastered a strong repertoire of learning strategies (Alexander, Murphy, Woods, & Duhon, 1997). Learning strategies include "any thoughts, behaviors, beliefs, or emotions that facilitate the acquisition, understanding, or later transfer of new knowledge and skills" (Weinstein et al., 2000, p. 727).

It is important for teachers to know what strategies are most effective in ensuring success in any course and how to incorporate those into their curricula. This information may be particularly important when thinking about teaching postsecondary developmental education courses because students enrolled in developmental courses have encountered the information pre-

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viously and have not retained it, possibly due to a lack of appropriate learning strategies.

Colleges and universities have implemented various forms of academic assistance for underperforming students who lack the strategies needed for success (Hofer, Yu, & Pintrich, 1998; Simpson, Hynd, Nist, & Burrell, 1997; Weinstein et al., 2000). This assistance can take many forms from stand-alone courses to instruction embedded within regular coursework. A goal of strategy instruction has been to help students become "good strategy users" or "good thinkers" (Pressley, Borkowski, & Schneider, 1987; Pressley & McCormick, 1995). Likewise, hypermedia classrooms must contain strategy instruction needed to teach students strategies that are effective specifically in the online classroom (Azevedo, 2005; Zimmerman & Tsikalas, 2005).

Weinstein's model of strategic learning has emerged as a useful way to identify and organize the skills necessary for academic success (Weinstein et al., 2000). The model has the learner at its core, focusing on self-concept, individual difference factors, and learning history. Surrounding this core are three broad components of skill, will, and self-regulation, which are interactive; an overlap between the components and within the subcomponents occurs as a result.

The *skill* component involves the ability to use cognitive strategies effectively and the possession of knowledge about the self as a learner (Weinstein et al., 2000). The *will* component consists of a student's perception of self-efficacy and ability to set goals, maintain motivation, and sustain a positive attitude toward learning (Pintrich, 2003). The *self-regulation* component requires skills such as time management, self-testing strategies, and comprehension monitoring (Zimmerman & Schunk, 2001).

One tool widely used to assess the level of skill, will, and self-regulation among students is the *Learning and Study Strategies Inventory* (LASSI; Weinstein, Schulte, & Palmer, 1987). The LASSI has been a central assessment tool used to inventory the multitude of areas of strategic learning (Braten & Olaussen, 2000; Deming, Valeri-Gold, & Idleman, 1994; Kovach & Wilgosh, 1999; Nist, Mealey, Simpson, & Kroc, 1990; Olejnik & Nist, 1992; Schumacker, Sayler, & Bembry, 1995; Yip & Chung, 2005). The inventory measures 10 aspects of skill, will, and self-regulation: attitude, motivation, time management, anxiety, concentration, information processing, selecting main ideas, use of support techniques and materials, self-testing, and the use of test-taking strategies. Students respond to 77 items, indicating responses on a 5-point Likert scale from "not at all typical of me" to "very typical of me." The results are reported as standardized scores with national norms of relative strengths and weaknesses in each learning strategy. The LASSI provides diagnostic and prescriptive information for students wishing to expand their strategy knowledge base.

Web-Based Learning

Although most of the research on learning strategies and achievement outcomes has focused on a traditional classroom setting, the relatively new arena of online course delivery suggests research may have to revisit learning strategies research and consider which types of strategies are most useful in this new learning environment. Educators teaching courses presented solely in an online format can benefit from better understanding what strategies are most effective and how students use strategies in this environment.

Strategic learning for students in traditional educational settings requires students to be self-regulated in their thoughts and actions in order to attain personal goals. Students' levels of self-regulation have been measured by examining the ways they set goals, access resources to accomplish those goals, and manage the distractions and roadblocks that occur on the path to reaching those goals (Zimmerman & Schunk, 2001). Students enrolled in Web-based courses as a part of a traditional curriculum face the same responsibilities as students in traditional classrooms; yet the resources available to them and distractions they face may be quite different. Specifically, Web-based learners must become accustomed to a structured learning environment without direct instruction.

> *The increased autonomy of an online or Web-based learning environment may support students' motivation for learning.*

Research has shown that students enrolled in Web-based courses utilize some of the same self-directed learning strategies as traditional students while also incorporating many unique tactics specific to the Web-based learning environment (Kauffman, 2004; Whipp & Chiarelli, 2004). For example, Chang (2005) found that students in a Web-based course that included self-regulated learning strategy instruction had positive motivational orientations and were more self-directed as learners than those without learning strategy instruction.

Skills and Strategies

In both traditional and Web-based learning environments, effective learners are those who have developed a wide array of reliable learning strategies and use them flexibly and efficiently. In research conducted in traditional classrooms, student success has been related to having a large, fluid, and flexible repertoire of learning strategies (Weinstein et al., 2000). Even though university students have previously used effective learning strategies in a traditional classroom, they may not be able to transfer these skills into their new learning environment. One important aspect of all learning strategy use, which is likewise emphasized in online learning, is the motivation of students to learn the material and enact appropriate strategies to succeed. Motivation has been previously noted as a key component to student success in the traditional classroom (Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004), and thus would likewise be expected to be influential on success in an online course.

Motivation and Student Learning

Effective learning strategies increase students' self-efficacy, which in turn increases motivation and willingness to engage and persist in challenging tasks (Pajares, 1996). Although the increased autonomy of an online or Web-based learning environment may support students' motivation for learning, it also may create a situation in which motivation is even more important to students' success than in a traditional classroom setting. One aspect of motivation particularly critical in an online setting—which may be particularly lacking in the developmental students these settings are attempting to serve—is self-efficacy.

Self-Efficacy

Self-efficacy is known as the belief in one's capabilities to organize and execute the resources required to manage prospective situations (Bandura, 1997). Zimmerman (2000) and Brophy (2004) discuss the role of self-efficacy in influencing motivation through activity choice, effort, and persistence. Bandura and colleagues show that students with higher self-efficacy choose more challenging tasks, persist longer in the face of a challenge, and put forth more effort (Bandura & Schunk, 1981). Research has shown that a students' self-efficacy is influenced by the feedback they receive and the attributions they make regarding that feedback (Bandura, 1993, Schunk, & Gunn, 1986). In the ideal online classroom, students encounter many feedback tools that are available to them to help regulate their progress. However, without the face-to-face interaction that many students are accustomed to, there may be significant challenges in interpreting and/or using the feedback given. The effects of feedback on self-efficacy in the traditional classroom has been established (Zimmerman, 2000), but it has yet to be firmly determined in the online course environment. Because of the different forms of feedback, it is important to determine the effect that self-efficacy has on student performance in an online environment.

Purpose

In the preceding text we have argued that understanding the skills, motivation, and self-regulatory strategies developmental students bring to online or Web-based learning environments is important. However, little is known about which strategies have the greatest impact on student learning in the online environment. The current research is designed to investigate the learning strategies used by students who are successful in the online course environment. Although the current study is based on previous research related to learning and motivational strategy use in traditional course settings, it is crucial to apply this research within online course dynamics due to the increased number of postsecondary developmental education courses offered online. The research question guiding this study is, "Which of the learning, motivation, and self-regulatory strategies, examined by educational researchers as critical to the success of developmental education students, affect student success when instruction is provided in an online learning environment?" By identifying strategies that affect student learning in an online course, our goal is to help instructors become more efficient, allowing them to streamline their strategy instruction.

Method

Participants

The students who participated in this study were part of an online developmental mathematics course at a large Southeastern public university. For the spring semester, 511 students were placed in a developmental mathematics course based on their performance on a placement exam required of all incoming freshmen. Incoming freshman take a battery of placement exams prior to the beginning of the semester. These exams are intended to place students in ability-appropriate courses. Freshman students entering this university are required to take a mathematics placement exam if they score lower than 29 on the ACT math, lower than 640 on the SAT math, or have not completed high school calculus with a C- or higher. Students who score 0-189 out of 600 on the placement exam are required to take a remedial mathematics course in order to master algebraic skills that were not previously mastered.

Of the 511 students enrolled, 252 students were enrolled in the course for the first time; all others in the course had taken the course at least once and had received no credit. In the developmental mathematics course, students who earned a grade lower than a C or did not complete the required assignment received a grade of "no credit" and were required to continue taking this course until they earned a passing grade (C or above). Since this study focuses on the effects of learning strategies and motivational strategies on student learning, we were concerned that those who had already taken the course and failed may have had a different motivational profile and be affected differently than those taking it for the first time. Although all students enrolled in the class were asked to complete the surveys, only 89 completed all three of the surveys to be included in the current study.

This setting provided a unique opportunity to examine the learning strategies students utilized in order to manage learning in this new online environment.

Of the 89 participants included in the analysis, 61% of the participants were female, which is representative of the overall distribution of the students enrolled in the mathematics course. Eighteen percent of the students earned an A for their final grade, 36% earned a B, 34% earned a C, and 12% earned No Credit (NC) for taking the course. These grade distributions were similar to those of the entire class: In the sample for the current study, there was an 88% pass rate, whereas there was a 79% pass rate for the entire class. Similarly, university records for mathematics students enrolled in the online course since its inception revealed achievement levels similar to the semester of interest in the current study. Pass rates ranged from 70% to 81% over the 2000-2002 time period for the entire class. So, although the sample for the current study had a higher pass rate, there was not a major discrepancy between pass rates of participants and their fellow classmates from other semesters.

Setting

The project focused on a large undergraduate developmental math course. Students who did poorly on mathematics placement exams were required to pass a basic algebra course before advancing on to the compulsory math courses for their major. As basic algebra is part of all K-12 academic curricula in the states served by this university, most students who placed into basic algebra had already encountered and failed to learn the curriculum at least once.

What made this basic algebra class unique, however, was that the content was entirely delivered online through the use of a hypermedia-based math instruction package. The software provided students with lectures (through a video "teacher" who lectured on the content), practice exams, homework (which was graded automatically, providing immediate feedback), and major chapter exams. The class presented students with the opportunity for self-paced instruction, which also meant it required them to regulate their time and their environment in ways not necessary in their other classes. Thus, this setting provided a unique opportunity to examine the learning strategies students utilized in order to manage learning in this new online environment.

Procedure

Periodically throughout the semester, students responded to online surveys at several points as part of a larger program evaluation. The mathematics department was evaluating the online developmental math course and its effectiveness, and the surveys used for the current research were part of this larger set of surveys. Students were given extra credit to complete the surveys and were allowed to do so during their required lab hours. With the exception of the LASSI (Weinstein et al., 1987), which was administered by the researchers in a group setting in the mathematics laboratory, the students completed the surveys on their own during the appointed week for each survey. At the beginning of the semester, students were told of the opportunity to participate in research for extra credit over the semester. As surveys became available, the students were emailed a reminder to participate. Students responded to questionnaires described in this article during the final week of the semester.

Instruments

Learning Strategies Inventory. Students' learning strategies were assessed using the LASSI (Weinstein & Palmer, 2002). The LASSI is a diagnostic measure of learning strategies and

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skills that provides standardized scores (percentile score equivalents) and national norms for 10 different scales: attitude, motivation, time management, anxiety, concentration, information processing, selecting the main idea, use of support/materials, self-testing, and test strategies.

Self-efficacy. As recommended by Pajares and Graham (1999) and Bandura (2001), self-efficacy was measured by asking the students to indicate, on a scale from 0-10, how confident they were about their capability to successfully complete specific types of mathematics problems. The mathematics problems were created by an expert in the mathematics department. These mathematics problems were similar to the problems students encountered on the placement exam and the material covered in the course curriculum.

Achievement. Student achievement was operationally defined and measured as the total number of points the student received for the online developmental mathematics course during the semester. Points were accumulated through quiz and test performance and time spent in the mathematics lab (4 hours per week were required). Extra credit was given for completion of the surveys.

Results

A gender analysis of the 89 participants revealed few differences between male and female students taking the online developmental mathematics course with respect to their final grade received and their scores on the 10 subscales of the LASSI (see Table 1). Sixty-one percent of the sample is female and 39% male. Female and male students were significantly different only on their motivation, $t(87) = 3.17$, $p = .002$, with female students scoring higher on all three measures. These findings suggest there is very little difference between male and female students when examining the final grade received and their subscale scores on the LASSI.

A multiple regression analysis was conducted to examine the relationship between self-efficacy, learning strategies, and final grade. The analysis showed four learning strategies and self-efficacy significantly predicted the students' final grade, $R^2 = .42$, $F(11, 88)=5.01$, $p<.001$ (see Table 2). Self-efficacy, motivation, concentration, information processing, and self-testing strategies were significant in predicting final grade. Student attitude, time management skills, anxiety, selecting the main idea, use of support materials, and testing strategies did not contribute significantly to the overall model. An interesting finding was a negative relationship between self-testing and achievement. In this study, the results indicated that the more participants used self-testing strategies, the lower their achievement scores.

We divided participants into groups based on their achievement levels as evidenced by the grade they received in the course in order to examine the relationship between levels of performance and learning strategy use. The LASSI provided us with standardized, student percentile scores; therefore we have some information about the students relative to each other and to a larger national sample of students. It is apparent that students who earn a grade of a C or below, on average, scored below the 50th percentile on 7 of the 10 LASSI subscales (see Table 3, page 12). We further examined the relationship between performance level and the motivational and learning strategies determined to predict student achievement in the first half of this study by conducting a MANOVA using the grade the student earned as the independent variable and their learning and motivational strategies as the dependent measures. The goal of this analysis was to determine if the grade the students received reflected differences in their strategy use. The multivariate tests revealed the full model was significant: $F(3,73) = 3.21$, $p<.05$. When broken into groups by final grade, a univariate analysis revealed the students were significantly different in their self-efficacy, $F(3, 73) = 7.6$, $p<.001$; motivation, $F(3,73) = 5.84$, $p=.001$, and concentration, $F(3,73) = 5.05$, $p=.003$. Students in different grade groups were not significantly different in their information processing, $F(3,73) = 2.14$, $p=.10$ and self-testing strategies, $F(3,73) = 1.10$, $p=.36$. Table 3 also provides information concerning the mean differences between the grade groups and the results of the Least Squares Difference post hoc analysis.

Table 1

Students' Mean Scores on Motivational and Strategy Measures Reported by Gender

Motivation/Strategy Measure	Female X (n=54)		Male X (n=35)	
	M	*SD*	*M*	*SD*
Attitude	32.00	29.91	29.29	24.99
Motivation	53.87	31.03	34.09	24.71
Time management	67.11	25.08	61.97	18.70
Anxiety	45.91	25.73	52.20	29.83
Concentration	59.70	29.15	52.14	23.15
Information processing	65.85	27.02	62.14	25.46
Selecting main idea	59.91	28.17	47.89	31.82
Use of supporting materials	38.46	27.21	30.57	22.31
Testing strategies	50.06	29.45	41.77	26.78
Self-testing	50.70	30.31	42.31	23.57

Table 2

Standard and Unstandardized Coefficients for Regression Equations Predicting Grade with Self-Efficacy and Learning Strategies

Motivation/Strategy Measure	$\hat{B}$	$\hat{\beta}$
Self-efficacy	1.08	0.27**
Attitude	-0.03	0.01
Motivation	1.01	0.29*
Time management	-2.02	-0.04
Anxiety	0.63	0.16
Concentration	1.36	0.35*
Information processing	0.97	0.24*
Selecting main idea	-0.07	-0.02
Use of supporting materials	-0.27	-0.07
Testing strategies	-0.80	-0.22
Self-testing	-1.35	-0.36**

Note: Model 1—Predicting Grade with Self-efficacy and Learning Strategies: $R^2 = .42$, $F(11, 88)=5.01$, $p<.001$ $^*p< .05$ $^{**}p< .01$

Discussion

This study has examined students' learning strategies and motivation in the context of an online developmental mathematics course. There is a large body of literature indicating both learning strategies (Simpson et al., 2004) and student self-efficacy are critical to students' success (Pajares, 1996; Schunk, 1996), and learning strategy instruction has been shown to be of particular benefit to underprepared students (Weinstein

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Table 3

Mean Student Scores on Motivation and Strategy Measures Reported by Grade Group

Motivation/Strategy Measure	Grade A (n=16)	B (n=32)	C (n=30)	NC (n=10)
Self-efficacy	152.50[a]	135.60[b]	118.27[c]	120.20[b, c]
Attitude	42.19	32.94	17.00	24.90
Motivation	68.38	49.59	34.97	30.20
Time management	75.13	64.59	65.63	46.50
Anxiety	60.63	54.97	40.70	34.60
Concentration	75.88[a]	59.47[b]	50.83[b, c]	31.70[c]
Information processing	73.94	67.63	57.97	57.90
Selecting main idea	71.56	52.50	48.57	55.00
Use of supporting materials	38.81	37.44	27.23	44.60
Testing strategies	63.75	45.78	41.53	37.40
Self-testing	50.69	44.56	46.03	50.60

Note: Key motivation and strategy measures in **bold**. Means with different superscripts are significantly different $p<.01$.

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et al., 2000). Although research examining the effectiveness of specific learning strategies for supporting developmental student learning in online or Web-based instructional contexts is scarce, research has shown benefits from using metacognitive tools integrated into online software to keep students on track and remind them to use strategies such as note taking and reflection (Chang 2005, Quintana, Zhang, & Drajcik, 2005). As colleges and universities are being pressured to move toward providing computerized instruction, it is critical to understand what aspects of student learning need to be supported to ensure student success in these contexts. In this study, we found students' study strategy and self-efficacy applied to a Web-based setting is not substantially different from student learning in traditional developmental courses. Findings indicated that students in our sample reporting below-average study strategy use also received lower grades than those reporting above-average strategy use, thereby supporting previous research (Nist et al., 1990).

The regression analysis indicated students' reports of some learning and motivational strategy use at the end of the semester was highly predictive of their final performance in the course. Specifically students' percentile scores on the motivation, concentration, information processing, and self-testing strategy scales significantly predicted final grade; whereas, student scores on the attitude, time management skills, anxiety, selecting the main idea, use of support materials, and testing strategies did not contribute significantly to the overall model. It is not surprising in the context of this mathematics course that selecting the main idea would not significantly predict student performance. Within the sample, attitude, time management, anxiety, use of support materials, and testing strategies all followed expected patterns between groups with students receiving As getting higher scores than those receiving lower grades. Further research is needed to shed light on the importance of each individual strategy and how each strategy can most effectively be used in the Web-based classroom.

The good news is direct instruction can affect each of these factors.

Within the study sample, all of the students scored below the 50th percentile on the attitude and use of support strategies scales. As students in this class have experienced some academic failure in the past, it is not too surprising that, as a group, they would exhibit some skill deficiencies. These findings provide evidence of the need for learning skills and strategies instruction to be part of online or Web-based developmental education courses.

An interesting finding was the negative relationship between self-testing and achievement. Although there has been no previous research to examine exactly how the strategies students employ translate from a traditional to online learning environment, this negative finding suggests a call for such research. Thus, there appears to be a need for a learning strategies inventory designed specifically for an online learning environment. An examination of how traditional learning strategies should be adapted and used in an online course and what strategies are unique to the online classroom is warranted.

Limitations

There are a few limitations of the current study that need to be addressed and considered for future research. The first area of concern would be the sample size. With a sample size of 89 students, the current study does not provide strong evidence for generalizing the findings. Another limitation of the current study is the timing of the survey from which the data was collected: Using a survey that examines motivational strategies at the end of a semester may provide skewed results. A future study should either survey the students at a more neutral point in the semester, such as the middle, or collect data at two points during the semester to look for cohesion.

The motivation of students may have likewise been affected by the type of course they were taking. Because these students were required to take the developmental mathematics course, they may not have been as motivated as students who take developmental courses because they want to or know they need the additional education. As the course for the current research was only offered online, the students may have not been as motivated to come to the computer lab to complete their work instead of completing the work in their dorm rooms. This might have affected their grade as they were required to spend 4 hours a week in the computer lab for this course. Thus, some students may have had a higher grade if they simply had been motivated to do their work in the computer lab or if the grading procedure was changed to decrease the number of required hours in the lab.

Further, the fact that only 89 of the 511 students enrolled in the course completed all surveys for the study may indicate the sample was skewed to include those more motivated to succeed in the course. Students self-selected themselves by taking the time to complete all surveys and receive the extra credit. Thus, findings were limited to only those who chose to do the extra work to receive the extra credit.

Implications for Practice and Future Research

The findings of the current study suggest success in an online developmental mathematics course is dependent, in part, upon the learning strategies and self-efficacy of the students. More specifically, it is the students' self-efficacy, motivation, concentration, information processing, and self-testing skills that are of most importance when predicting grade achievement. The good news is direct instruction can affect each of these factors (Weinstein et al., 2000). Providing real examples and practice to students on how to transfer strategies from a traditional to an online classroom can give students tools to ensure success in the online classroom. In an online course, this may be a little difficult to do as students often have little to no face-to-face interaction with an instructor. Instructors may consider setting up meetings with students enrolled in the online course during which they focus on learning strategies and overtly teach students how to apply strategies in their online course. This study identifies strategies most important to success in an online mathematics course and previous research has identified direct methods to teach these strategies. The combination can help improve academic success even in online mathematics courses (Hofer, Yu, & Pintrich, 1998; Weinstein et al., 2000).

The current study is a foundational point from which future research may take several directions. First, future research should focus on teaching the strategies that are important to online learning success. By examining the differences between students who do and do not receive training on how to learn in an online course, research can help establish causality and look more closely at the direct influence of the learning strategies on student achievement.

A second recommendation for future research would be to compare success rates in developmental courses offered via a traditional versus an online classroom. If the same course material is covered in each class, this comparison would provide interesting data to discuss the effects of the classroom environment. Likewise, a comparison study between students who have or have not taken the course previously may provide evidence for strategy use and motivation of students taking the course a first time as compared to those who have previously taken the course and not succeeded.

Additionally, universities might consider screening who is and is not allowed to take an online course. The current research suggests that students with specific skills are more likely to succeed in the online classroom than students who lack those skills. Therefore, inventories to measure specific study skills could be part of a placement system. This may suggest the need for programs to perform some sort of learning-strategy screening for students wanting to enroll in online courses in order to offer students the most optimal learning environment for their own skill set.

Conclusion

As the use of online education continues to increase, there is a strong sense of urgency to understand student learning in this new environment (Picciano, 2002). Research has provided evidence for the importance of learning strategies in the traditional classroom but has yet to examine what strategies are important and useful in the online learning classroom (Weinstein et al., 2000). Although students in online courses are implementing many of the same strategies as their counterparts in traditional classrooms, there has been little evidence to show what strategies are most useful in this new environment and how some strategies may translate to a new learning environment (Kauffman, 2004). Understanding what is important for success in online educational environments is vitally important to the success of online education.

The current research implies that with strategy education, success rates for students in online developmental courses will increase. With the inclusion of specific learning strategy education imbedded within the course work, students can better use these powerful tools to improve their learning. The results of the current study provide insight into the importance of understanding learning strategy use and education in the developmental online education setting to ensure student success.

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