

Self-Regulation, Goal Orientation, and Academic Achievement of Secondary Students in Online University Courses

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ABSTRACT

This study investigated the self-regulation, goal orientation, and academic achievement of 40 secondary students who completed online university courses in the sciences. Students were enrolled in one of three online university science courses. Each course was taught by a two-person team, made up of one university science professor and one secondary classroom science teacher, over a 6-week period. This study explored changes in self-regulation and goal orientation of students enrolled in the online course and the relationship between these factors and student achievement. Student data collected to investigate study questions included an abbreviated version (30-items) of the Motivation Strategies for Learning Questionnaire (MSLQ), collected before and after students completed the online course, and achievement measures (i.e., final grades). Data from application essays and focus interviews, conducted with all participating group members (secondary students, university science professors and the secondary high school teachers), are used to illustrate key findings and probe remaining questions. A description of this program and research resulting from the investigation of online secondary students' motivation, self-regulation, and achievement in online university courses is also presented and discussed.

Keywords

Self-regulation, Goal orientation, Achievement

Introduction

An increasing number of secondary students in the United States are now being required to take an online course as a graduation requirement. The state of Michigan, for example, now requires that all students take at least one online course for graduation from high school. There are also increased funding opportunities in the United States to support initiatives serving secondary students with options to take university courses in areas such as mathematics, science, and foreign languages, while still enrolled in secondary schools. To capitalize on these funding opportunities and increased competition and pressure to entice secondary students to universities, some universities are offering university courses for university *and* secondary school credit. These programs, often called Post-Secondary Programs, may have secondary students attend university part-time or have a secondary classroom educator teaching university courses to secondary students within their secondary classrooms.

The blurring, or erasing, of the line between secondary school and higher education is viewed by some to be very problematic for a variety of reasons. For example, the academic rigor of university course content taught within secondary schools is often called into question as are the qualifications of the secondary teacher to teach university courses. Furthermore, enticing secondary school students to attend university courses in which professors may or, more likely, may not understand the learning and developmental needs of adolescents and fail to provide them with the instructional support and guidance that they need to be successful university students. While this paper does not attempt to weigh in on these matters, they were important considerations for the design of the program illustrated in this paper.

This study investigated potential changes in motivation, goal orientation, and self-regulation of high achieving secondary students as they complete an online university course. Utilizing a pre-test/post-test design, changes in high-achieving secondary students' motivation and self-regulation after they complete an online university course was explored. This cross-sectional study also investigated the relationship between the self-regulation, goal orientation, and academic achievement of high school students enrolled in online college science courses. Data from application essays and focus interviews were also used to illustrate key findings and probe remaining questions. The primary question explored in this study was: What is the relationship between self-regulation, goal orientation, and academic achievement of high school students enrolled in online college courses?

Self-Regulation, Goal Orientation, and Achievement of K-12 Online Learners

The primary purpose of this study was to investigate key variables that have been found by researchers to influence student cognition, learning, and achievement: self-regulation and goal orientation (McCaslin & Hickey, 2001; Pintrich & DeGroot, 1990; Wolters, Yu, & Pintrich, 1996; Zimmerman, 1990, 1994, 2001; Zimmerman & Schunk, 2001). This study also investigated the use of self-regulation by high school students to navigate the completion of online college courses. The study is significant for it provided insight into the relationship between self-regulation, goal orientation and achievement of high school students enrolled in university courses. Furthermore, this study investigated the potential that online teaching and learning affords higher education, by creating a corridor to higher education for high school students.

Student achievement within Brick-and-Mortar learning environments has been found to be influenced by the degree to which a student has effective use of self-regulation, or the ability of students to plan, monitor, and evaluate their own behavior, cognition and learning strategies (McCaslin & Hickey, 2001; Winne, 2001; Zimmerman, 1990, 1994, 2001; Zimmerman & Schunk, 2001). In addition to having the ability to self-regulate, students must also be motivated to use developed or newly acquired self-regulation strategies effectively. Many factors influence the development and use of self-regulation and motivation strategies by students to be self-regulatory and, it is hoped, assist in academic achievement. One such factor is the student's perception of themselves as being intrinsically or extrinsically motivated to engage in learning activities; within educational environments this is known as student goal orientation (Barron & Harackiewicz, 2001; Elliot & Thrash, 2001). Student self-regulation and goal orientation are tightly interwoven constructs that influence student learning and cognition (McWhaw & Abrami, 2001; Pintrich, 1989; Wolters, Yu, & Pintrich, 1996; Zimmerman & Kitsantas, 1997).

Investigations of student cognition and learning have traditionally been conducted within laboratory settings or traditional, learning environments, not online learning environments. The number of K-12 students enrolling in online schools is increasing, given the rate at which K-12 online schools are becoming available to students and parents as an alternative to traditional, Brick-and-Mortar schools (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Mehlinger & Powers, 2002; Zucker & Kozma, 2003). The number of K-12 online schools, or an exact number of students attending these alternative schools, is difficult to determine and remains somewhat elusive due to the rapidly expanding nature of distance education (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Zucker & Kozma, 2003).

The investigation described here is important given that technology and the unique environmental constraints of online education have been found to influence the development and use of self-regulation and goal orientation of post-secondary students (Grabe & Grabe, 2001; McMahan, 2002; Nesbit & Winne, 2003; Niemi, Launonen, & Raehalme, 2002; Ng, 2002; Olgren, 1998; Song, Singleton, Hill, & Koh, 2004), yet little is known about the use and development of these key cognitive and learning processes of adolescent online students. A comprehensive review of the research literature found no longitudinal or cross sectional studies that investigated student cognition and learning within K-12 online educational environments.

There may be a variety of factors that have influenced the lack of research on student learning within K-12 online environments (see Zucker & Kozma, 2003). One, research concerning online education has largely been restricted to investigating the cognitive processes and learning of postsecondary students (McIsaac & Gunawardena; Ng, 2002; Song, Singleton, Hill, & Koh, 2004; Zucker & Kozma, 2003). Two, a number of empirical investigations of online learning have sought to compare post-secondary student cognition and learning within traditional, (Brick-and-Mortar) face-to-face and online educational environments (see Bernard, Abrami, Lou, Borokhovski, Wade, Wozney, Wallet, Fiset, & Huang, 2004). Many of these studies report "no significant differences" found between learning online and in traditional classroom environments (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004). These studies have been viewed as problematic for a number of reasons most notably, a lack of ecological validity (see Bernard et al., 2004). There is little ecological validity in comparing two environments (face-to-face and online) that have very different affordances and constraints, making it difficult to compare student learning and cognition with achievement outcomes.

The Post-Secondary On-Line Corridor (PSOLC) Project

The Post-Secondary Online Corridor (PAOLC) program was designed to address many of the concerns associated with post-secondary programs mentioned earlier. Three introductory college courses were redesigned by college faculty for the project using National Education Association (2004) Guidelines for Online High School Courses: Biology: Life in the Sea, Introduction to Environmental Science, and Weather and Climate. During the design process, university faculty and instructional designers were aware of and incorporated the US National Education Association's Guidelines for Online High School Courses (<http://www.nea.org/technology/onlinecourseguide.html>). The primary instructional feature incorporated into the online courses was the use of the discussion board to promote student-student and teacher-student interactivity. Two of the three faculty members had prior experience teaching online at the university, none had taught secondary school students.

To assist university faculty in teaching the online courses to adolescents, three secondary school science teachers were selected, from applicants within the immediate geographical area (i.e., within a 40 mile radius), to co-teach each of the online university science courses with university faculty. In addition to being qualified secondary science teachers, the three secondary teachers had advanced university degrees in classroom technology and extensive experience with adolescent learners. All secondary school teachers attended a daylong workshop on online learning and teaching strategies. The secondary teachers also had full access to all course materials and offerings as well as participation in discussion boards, web-chats, and all on-line activities.

Eligible secondary school students were selected from regional secondary schools (i.e., within a 60-70 mile radius) for the PSOLC program. Students were required to apply and be accepted into the university under a 'guest student' provisional status. Students were required to have a recommendation by a secondary school teacher and counselor, a minimum 3.5 out of 4.0 grade point average (GPA), and complete a short survey to assess if they were a "good fit" for online learning. Applications were accepted on a 'first come, first served' basis. The PSOLC program was originally designed to accommodate 90 high school students.

All students participating in the PSOLC program were required to attend an orientation and a final meeting on the university campus. During the initial visit, students attended an orientation to Blackboard (e.g., the course delivery portal), an online learning strategies workshop (one hour), and an orientation to and tour of university services (i.e., the library). The orientation also served as an opportunity for secondary school students to meet with their university instructor and the secondary teacher who would be co-teaching the online course. University courses were taught online as a 6-week summer course. Students, university faculty, and secondary teachers returned to the university campus at the end of the 6th week to share final course projects, discuss student learning outcomes, and complete program evaluations. All fees, including teacher salaries, student tuition and books, were paid for by a state supported grant.

Method

Fifty-eight (58) secondary students were accepted into the program, thirteen (13) students did not start the program, and one (1) student did not complete the program. A total of forty-three (43) students completed the program: twenty-three (23) in marine biology, ten (10) in geology, and ten (10) in environmental science. All secondary school students (junior and seniors) that were accepted for the PSOLC program were invited to participate in this study. Of the 43 students, forty (40) secondary students attended both orientation sessions and the wrap-up session, completing all pre- and post-test measures. The average GPA of the forty participants was 3.8 out of 4.0. Thirty-two (32) participants were female and eight (8) were male. None of the participants had previously participated in an online course.

Instrument and Procedures

Data for this study were collected from four primary resources. Student responses on the essay required for admittance to the PSOLC program were collected to explore student motivation for entering the program. Second, focus group meetings conducted by researchers not affiliated with the PSOLC program were conducted at the

conclusion of the program. Three different focus group meetings were conducted with students, faculty, and classroom teachers are used to illustrate key findings of this study related to program effectiveness and student self-regulation, goal orientation, and achievement. Student evaluations of the three courses completed on the last day of the course were also collected and will be used to illustrate study findings. Finally, the Motivation Strategies for Learning Questionnaire (MSLQ) was administered at the beginning and end of the program to explore changes in student self-regulation and motivation.

MSLQ. The primary instrument used to collect quantitative data used in this study is a modified version of the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991). This modified version of the MSLQ contained 10 items from the motivation subscale and 20 items from the learning strategies subscales, including subscales regarding resource management. After reviewing various tools used to assess self-regulation and goal orientation (i.e., motivation), the MSLQ was selected for use in this study as a primary assessment tool as it was the most widely used in studies investigating self-regulation, contained several subscales that were of interest in this particular study (namely motivational dimensions and resource management) as they are important to online learning, and its easy translation into an assessment that can be modified to address self-regulatory issues related to online learning.

Reliability coefficients for the motivation scales and the learning strategies scales were calculated by Pintrich, Smith, Garcia, and McKeachie (1993) as .68 and .62 respectively. With the exception of extrinsic goal orientation, all other motivation subscales illustrated significant correlations with final grade by Pintrich, Smith, Garcia, and McKeachie (1993). Further analysis conducted to explore the predictive validity of the MSLQ found that all subscales included on the modified MSLQ for this study were significantly correlated with final grades (Pintrich, Smith, Garcia, & McKeachie, 1993). One subscale for learning strategies, rehearsal strategies, did not illustrate a significant correlation and will not be used in this study. Peer learning and help seeking were not correlated to student grades in Pintrich, Smith, Garcia, & McKeachie's (1993) validation study of the MSLQ but time and study management and effort regulation were significantly correlated to grade.

Ten (10) questions focused upon motivation, including goal orientation, and twenty (20) questions focused upon self-regulated learning topics and activities. Each question requested the student to select from a likert-scale ranging from 1 (not at all true of me) to 7 (very true of me). Students selected their responses to each question on this 7-point Likert-scale. Modified MSLQ's were administered at the start of the online learning strategies session during the orientation visit to the university by the researcher. The modified questionnaire was also administered at the completion of the 6-week online university course, when the secondary students returned to campus. All questionnaires were coded and data was analyzed using SPSS.

Results

With the exception of one student, all secondary students who started the program completed the online university courses. The passage rate for the online science courses was relatively high at 95%; all but two (5%) of the secondary students successfully passed the university online science course. Twenty-three (57.5%) secondary students earned A's (4.0 out of 4.0), thirteen (32.5%) earned B's (3.0 out of 4.0), two (5%) secondary students earned a C (2.0 out of 4.0), one (2.5%) received a D (1.0 out of 4.0), and one (2.5%) student failed the online university course. For data analysis and exploration, students were divided into three groups of high achieving students (the 25 students that earned A's), average achieving students (the 13 students that earned B's), and low achieving students (the 4 students that earned C's, D's, and F's).

Motivation

Analysis of the essays ("Why I want to take an online college course..") submitted by secondary students with their application to the program revealed that 60% of students enrolled in the program as a way to prepare for university; becoming acquainted with the rigor and schedule of college life. Roughly half (48%) described their own interest in science and 43% mentioned that taking an online university course was a to their advantage, potentially reducing the number of courses that they will be required to take at a later time. Roughly one-third (36%) cited the convenience of taking an online course as a reason for enrolling in the program.

The average overall mean for the motivation subscale (10 questions) was relatively high (7=very true of me) before students started the online courses ($M=5.79$, $SD=1.05$) and only decreased slightly by the time students completed the course ($M=5.62$, $SD=1.12$). Paired t-tests were used to explore changes in student responses on individual motivation items.

Three questions from the motivational subscale (Q4, Q6, & Q9) were found to be significantly different before and after students participated in the online course. The mean of student responses to Question 4 “My main concern is (was) getting a good grade in this course” ($t = 2.36$; $p < .05$) decreased from $M=5.79$ ($SD=1.04$) on the pre-test to $M=5.24$ ($SD=1.34$) on the posttest. The mean of student responses on Question 6 “I will receive (received) better grades in this class than most of the other students” ($t = 4.16$; $p < .001$) also decreased significantly after completing the online course (from $M=5.83$, $SD=1.58$ to $M=4.69$, $SD=1.17$). The mean of student responses to Question 9 “I choose course assignments that I (could) learn from even if they don’t guarantee a good grade”, however, significantly ($t = -1.96$; $p < .05$), increased from pre-test $M=4.68$ ($SD=1.37$) to post-test $M=5.21$ ($SD=1.37$).

Pooled means and standard deviations for the ten motivation questions before and after students completed the course are illustrated in Table 1. A repeated measures analysis of variance (ANOVA) was conducted, maintaining a $p < .05$ alpha level, to explore differences in student group means (i.e., high achieving, average achieving, and low achieving) on the motivation subscale items before and at the conclusion of the online course.

Table 1. Means and Standard Deviations on Motivation Subscale by Achievement Level and Pre-Post Online Course

Achievement Group	Pre-Test M (SD)	Post-Test M (SD)	N
High Achieving	57.78 (5.78)	59.83 (3.55)	23
Average Achieving	56.23 (5.33)	51.92 (5.10)	13
Low Achieving	57.50 (9.88)	51.25 (9.21)	4
Total	57.25 (5.97)	56.40 (6.15)	40

There were significant differences in student scores on the motivation subscale before and after the online course, $F(1, 37) = 4.00$, $p < .05$ ($\eta^2 = .49$). Students in this study scored significantly higher on motivation subscale items before the online course ($M=57.5$, $SD=9.88$) than at the conclusion of the course ($M=51.25$, $SD=9.21$). Furthermore, the achievement level of students interacted with changes in the overall score on motivation items measured before and after the online course, $F(2, 37) = 4.75$, $p < .01$ ($\eta^2 = .76$). High achieving students had the highest means on the motivation subscale before ($M=57.78$, $SD=5.78$) and after ($M=59.83$, $SD=3.55$) the online course and differed greatly from their average counterparts (before the course $M=56.23$, $SD=5.33$ and after the course $M=51.92$, $SD=5.10$).

Self-Regulation

While students did not directly cite self-regulatory reasons for selecting the program on essays, 29% of students did mention that they wanted to continue learning throughout the summer as a reason to apply for the program. The overall mean for the self-regulation subscale (20 questions) was moderate (7=very true of me) before students started the online courses ($M=4.5$, $SD=1.46$) and only decreased slightly by the time students completed the course ($M=4.26$, $SD=1.71$). Paired t-tests were used to explore changes in student responses on individual self-regulation items.

Three questions from the self-regulation subscale (Q3, Q11, & Q12), however, were found to be significantly different before and after students participated in the online course. The mean of student responses to Question 3 ($t = 2.75$; $p < .01$), “When I become confused about something I read (was reading) for this course, I go (went) back and tried to figure it out” decreased from before ($M=6.44$, $SD=.85$) to after ($M=5.97$, $SD=1.18$) the online course. The mean of student responses also decreased from the beginning of the course ($M=3.21$, $SD=1.67$) to the end of the course ($M=2.67$, $SD=1.46$) significantly on the question ($t = 2.42$; $p < .05$), “I often found that after I had been reading for this class I did not know what it was all about” (Q11). Mean responses to Question 12 ($t = 3.76$; $p < .001$), “I asked the instructor to clarify concepts I did not understand well,” also decreased after completing the online course (from $M=5.38$, $SD=1.80$ to $M=3.85$, $SD=2.11$).

Pooled means and standard deviations for the 20 self-regulation questions before and after students completed the course are illustrated in Table 2.

Table 2. Means and Standard Deviations on Self-Regulation Subscale by Achievement Level and Pre-Post Online Course

Achievement Group	Pre-Test M (SD)	Post-Test M (SD)	N
High Achieving	88.61 (10.38)	83.35 (17.89)	23
Average Achieving	91.31 (7.30)	82.23 (7.82)	13
Low Achieving	93.50 (14.15)	95.00 (9.20)	4
Total	89.96 (9.77)	84.15 (14.82)	40

A repeated measures analysis of variance (ANOVA) was conducted, maintaining a $p < .05$ alpha level, to explore differences in student group means (i.e., high achieving, average achieving, and low achieving) on the motivation subscale items before and at the conclusion of the online course. There were no significant differences in mean scores on the self-regulation subscale before and after the course nor were there any significant interactions found between achievement and pre- and post- means on the self-regulation subscale. However, low achieving students had the highest scores on the self-regulation subscale items before the online course started ($M=93.5$, $SD=14.15$) and after the course ended ($M=95.00$, $SD=9.20$) than either the high achieving or average achieving students at the start or conclusion of the course. Additionally, the scores on the self-regulation subscale of low achieving students increased from pre- to post- while the scores of both high achieving and average achieving students decreased on the self-regulation subscale.

Discussion

In conclusion, this proposal highlights a model for providing secondary students online university courses. While not specifically discussed in this paper, the co-teaching of the university courses by university faculty and a secondary teacher was a successful component of the pilot program. Whether or not this program will serve as a corridor to this particular university for these high achieving secondary students remains to be seen as these students graduate from secondary schools and apply for university. Overall, the program was viewed as successful and is currently under consideration for expansion.

The question of how online learning environments influence motivation, self-regulation, and student achievement is still under investigation. However, results presented here indicate that goal orientation, as indicative of the motivation subscale changes, for secondary students is affected by taking an online university course. Secondary students appeared to enter the online university course with a performance goal orientation, concerned with getting a good grade (Q4 and Q6) or engaging in activities that would get them a good grade (Q9). At the end of the course, however, it appears that students are moving toward a learning orientation.

Overall, student motivation was impacted by taking an online university course, as illustrated by the significant decrease of means on the motivation subscale. There was also an interaction effect between student achievement level and pre- and post- measures of motivation. It appears that students who were high achieving became more motivated and confident in their ability to learn within an online university course when compared to their low and average achieving counterparts, with a significant difference found between the means of high and average achieving students.

Self-regulation subscale findings (Q3, Q11, and Q12) indicate a more complicated view of student's ability to plan, monitor, and evaluate their own learning of university course curriculum. Data indicate that students became less likely to try to figure out material if they were confused, as the semester progressed students found sticking to a schedule more difficult, and they were less likely to ask for help. Overall it appears that high and average achieving students became less confident in their belief to self-regulate their own learning as the semester progressed. On the other hand, low achieving students became more confident in their belief in their ability to self-regulate their own learning as the semester progressed. Secondary students belief of their own ability to monitor their comprehension (i.e., re-reading, asking the instructor questions, etc.), for example, may stem from an over-estimation of these activities within the face-to-face classroom, challenging university texts and curriculum, or constraints within the online university environments.

This paper illustrates interesting dimensions of the relationship between motivation and self-regulation of online secondary students, a more complete picture of how motivation and self-regulation are related to achievement is an important question still under exploration. As stated, each of the participants in this study were high achieving within the secondary school environment as all had high grade point averages and were ranked, by achievement, as in the top 7% in their secondary class. During this study, data was also collected from each secondary student regarding achievement (e.g., final grade) in the university online course. While a majority (88%) of secondary students received high scores (A's and B's; 4.0 out of 4.0 and 3.0 out of 4.0) for their final grade in the online university course, only a few (4) secondary students did not receive high scores.

The potential significance of this study is apparent on many levels. First, this project may serve as a model for higher education online offerings and programs targeting high school students, an emerging population of online learners. In addition to models for higher education, this project may also serve to inform collaborations between higher education faculty and high school teachers and present a method to scaffold the development of online course instructors.

Second, this project provides the foundation for a future research investigating the relationship between the self-regulation, goal orientation, and academic achievement of online high school students. Since little is known about these important influences on student cognition and learning within online learning environments, this study may provide a foundation for future research within a rapidly growing field. As online education becomes a more viable option for adolescent learners, supporting cognition and student learning within these environments and developing and implementing empirically sound instructional strategies to facilitate the development of cognitive strategies and support learning are critical.

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