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A Measure of Self-Regulated Learning in Online Agriculture Courses

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Abstract

For students to be successful in the online learning environment, change from passive learners to active learners is essential. Students who successfully regulate and change their learning know where and how to acquire the knowledge necessary for success in the online environment. Introducing students early through dual enrollment programs can ensure students have the necessary skills for success. This project sought to determine the self-regulated learning level of students in an online agriculture course. Students were found to have the highest self-regulation within environmental structuring and goal setting. The lowest online learning self-regulation was in the area of task strategies. Females had a higher level of self-regulated online learning while there was found to be little difference by ethnicity. Low correlations were found between student experience with online courses and their perceived online self-regulated learning level. Students in an online agriculture dual enrolment course are encouraged to develop goals and at the conclusion complete a self-evaluation of their learning. Research should continue to help researchers understand and properly identify any personal, behavioral or environmental factors that influence secondary students' self-regulated learning in an online agriculture dual enrollment course.

Key Words: dual enrollment, self-regulated learning, online

Introduction

The past 20 years have been witness to dramatic change in student learning opportunities. Federal student achievement initiatives designed to quantify student progress towards earned college degrees and certification (Pettitt & Prince, 2010) has resulted in Common Core State Standards (Handley-More, Hollenbeck, Orentlicher, & Wall, 2013), Massive Open Online Courses (MOOCs) (Allen & Seaman, 2013), and online learning courses have realized a 400% increase in educational delivery in the past decade (Allen & Seaman, 2013). Researchers have posited that 13% of all students have taking online courses (Christensen, Horn, Caldera, & Soares, 2011), with enrollment in online courses increasing at a slightly higher rate than traditional courses (Allen & Seaman, 2008). In the fall of 2012 there were more than 7.12 million post-secondary students taking at least one online course, accounting for 33% of the total enrollment in college courses (Allen & Seaman, 2014). This growth in popularity of online classes creates a need for research targeting self-regulated learning in the online environment. This is specifically important in

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agricultural education, where little research has been conducted on the topic and where online and dual enrollment programming continues to increase.

For students to advance and achieve their educational goals, they must be successful in their courses, be it offered face-to-face, online or in a hybrid model. To be successful in online courses students must have management of their learner autonomy and practice individual responsibility (Andrade & Bunker, 2009; Harrell, 2008). However, students who do not practice individual responsibility, and are not persistent towards achieving their educational goals run the risk of attrition in an online environment (Hart, 2012). According to Hart (2012), multiple factors exist that are associated with the persistence necessary for successful completion of an online educational experience, which include ". . . satisfaction with online learning, a sense of belonging to the learning community, motivation, peer, and family support, time management skills, and increased communication with the instructor" (p. 19).

Students must learn self-regulation skills over time (Schunk, 2005). If expected to autonomously acquire these skills, most students will not be successful at transitioning into an online course (Artino, 2009; Harell, 2008). Lack of appropriate preparation can negatively influence student retention and academic performance (Bol & Garner, 2011; Lynch & Dembo, 2004; Swanson, 2008). For students to be successful in the online learning environment, they must transition from passive learners to active learners (Green & Azevedo, 2007). Passive learning environments, are often seen as the traditional mode of teaching, where the teacher is the primary delivery mode, providing content in the form of lecture (Smart, Witt, & Scott, 2012). Conversely, the active learner model charges students with acquiring knowledge through a constructivist based approach, where the student applies prior knowledge to assist in forming new educational concepts (Prince & Felder, 2006).

Students who successfully regulate and change their learning know where and how to acquire the knowledge needed to be successful in the online environment (Cunningham & Billingsley, 2003). Traits exhibited by students who regulate their learning include: thinking critically, taking responsibility for their own learning, and actively participating in the learning process (Chung, 2000). Self-regulated learning and learner autonomy is critical to student success in the online learning environment (Lynch & Dembo, 2004). Previous research found there is significant value in self-regulated learning in relation to student success, especially in online and blended courses (Hodges, 2005; Kitsantas & Dabbagh, 2010; Kramarski & Gutman, 2006).

In 2006, a study examined effects of self-regulated learning behaviors and epistemological beliefs on learner outcomes in the online learning environment, controlling for student computer self-efficacy and prior academic achievement (Bell, 2006). In a sample of 201 undergraduate students enrolled in a web-based program, the researcher did not find epistemological beliefs to be a significant predictor of academic achievement in the online learning environment. However, evidence was found to support the association of self-regulated learning skills with positive academic achievement among online learners.

Introducing students early to online and blended courses in dual enrollment programs can help ensure students have the necessary skills for success as full-time college students (Swanson, 2008). What is more, dual enrollment courses are benefitting ". . . a wider range of students with respect to race/ethnicity, socioeconomic status, and prior academic achievement" (Kanny, 2015, p. 59). With these benefits in mind, research presented in this article was conducted with the purpose of extending the body of knowledge related to self-regulation theories in online or technology enhanced learning environments.

Dual credit courses allow students to simultaneously earn high school and college credit while taking college coursework through their local community college (Estación, Cotner, D'Souza, Smith & Borman, 2011). Dual credit emerged in the 1970s and 1980s in response to a need to keep talented students challenged, easing the transition between high school and college, to develop vocational readiness, thereby reducing time necessary to obtain a college degree (Bailey & Karp, 2003; Burns & Lewis, 2000). Students who took dual enrollment classes felt better prepared for college and realized increased attainment of certificates or degrees in high school (Anderson, 2010; Hughes, 2010). Enrollment in hybrid and online dual enrollment courses was found to lead to enhanced relationships between high schools and colleges; increased course rigor, relieved student boredom and facilitated student recruitment (Andrews, 2001; Krueger, 2006; Barnett & Hughes, 2010). Programs with this hybrid model have shown to be successful because instructors deliver the same rigorous college content while considering pedagogical strategies better designed to engage secondary students (Whissemore, 2012). The focus of this study was to explore self-regulated learning in these hybrid dual enrollment courses in agriculture.

Theoretical Framework

Within the context of Bandura's social cognitive theory (1977; 2004), students' development of self-regulated learning skills and strategies are a function of interaction between personal, behavioral and environmental factors (Schunk, 2001). The process by which these self-regulated learning skills develop is dependent upon previously mentioned factors changing and growing as they interact within the learning environment. If there is satisfactory progress in the learners' behavior, there will be an increase in self-efficacy and motivation. Social Cognitive theorists feel self-regulated learning includes self-observation and self-reaction (Schunk, 2005). Self-regulated learning is an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate and control their behavior, guided and constrained by their goals and the contextual features in the environment (Pintrich, 2000).

Based on the social cognitive theory, Zimmerman (1998) proposed a three-phase model in relation to the development of self-regulated learning skills (see Figure 1). The first phase is forethought, which is the strategic processes that precedes effective learning. This phase includes goal setting and intrinsic motivation, closely paralleling with student success, to perform a learning task. These typically occur before the student enters the learning process. Students inclined to be self-motivated prior to entering the learning process will be efficacious in their beliefs with a clearly defined expectation for their educational outcomes (Zimmerman, 1998). The second phase, the performance control stage, occurs during the learning process. The processes within this include monitoring of learning, attention and task value. Self-observation and self-experimentation is important in this stage as it leads the learner to reflect upon their performance. The final phase of the model is self-reflection in which individuals perform self-evaluations (self-judgements) based upon social comparisons and personal performance, and then adjust their performance for the next learning task (Pintrich, 2000; Zimmerman & Schunk, 2001).

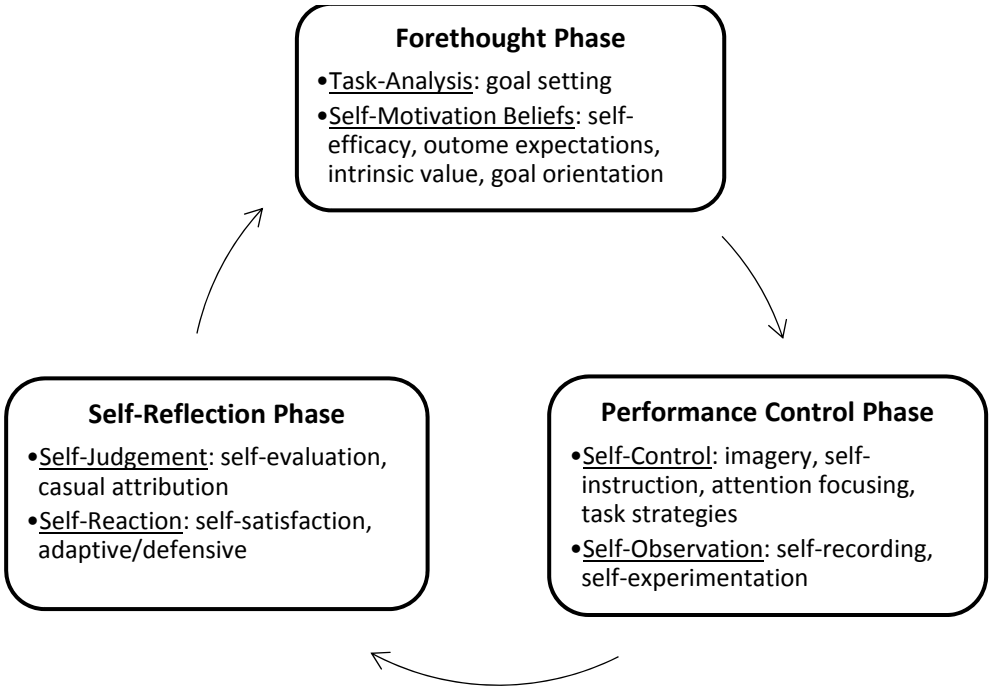

Figure 1. Zimmerman's Model of Self-Regulated Learning (Zimmerman, 1998)

Zimmerman's model of self-regulated learning suggests that before an individual can change and develop their self-regulated learning skills, an interaction of personal, behavioral or environmental factors must occur. Through interaction of these factors, individuals can change their self-regulated learning skills and strategies (Barnard-Brak, Lan & Paton, 2010). Self-regulated learning and interactions of personal, behavioral, and environmental factors are common in educational settings. For example, a student is accustomed to the educational behavior of studying shortly before a test, and when the student fails the test (environmental feedback) behavior is changed and his or her self-regulation of learning is modified.

Conceptual Framework

Researchers have operationalized the social cognitive theory (Bandura, 2004) and Zimmerman's (1998) model through the conceptualization of six constructs to capture and measure the essence of online self-regulated learning. Conceptually, we frame this study on these six constructs, which include environment structuring, goal setting, time management, help seeking, task strategies and self-evaluation (Lan, Bremer, Stevens & Mullen, 2004).

Purpose/Objectives

The purpose of this research study was to determine the level of online self-regulated learning with secondary students in hybrid and online dual enrollment agriculture courses. The researchers also sought to explain how demographic variables of the students influence the self-regulated practices. The objectives of this study are as follows:

1. Determine the levels of self-regulated online learning from students in an online agriculture dual enrollment course.
2. Determine differences between students' self-regulated online learning and demographic characteristics.

3. Determine the effects of previous online course experience upon students' self-regulated online learning scores
4. Determine the effects of gender and grade classification and the interaction of the two variables on student's self-regulated online learning score

Methods

The study was a descriptive survey that implemented a correlational research design. It was a census of all secondary students enrolled in one of two online *Introduction to Horticulture* and *Introduction to Animal Science* dual enrollment courses (N = 146) during the Spring 2015 in [STATE]. For purposes of this study, dual enrollment courses refer to courses in which high school students simultaneously earn high school and college credit while taking coursework through their local community college courses and taken as part of the high school curriculum. Student participation was optional and did not have any effect on students' grades. Due to the nature of this study, caution should be taken when generalizing the findings beyond the population. However, generalization with caution may contribute to the knowledge base and the improvement of distance learning with the context of agriculture science and dual enrollment courses.

Instrumentation

To measure self-regulation in an online agriculture course, a short form of the Online Self-Regulated Learning Questionnaire (OSLQ) was used (Lan et al., 2004). The short form of the OSLQ is a 24-item scale with a 5-point Likert-type response format with values ranging from strongly disagree (1) to strongly agree (5). Higher scores on this scale indicate better self-regulation in online learning by students (Barnard, Lan, & Paton, 2008). The short form was developed from an 86-item long form of the instrument by examining internal consistency and exploratory factor analyses results for data collected from the long form.

The OSLQ consists of six constructs of self-regulation in online learning: environment structuring, goal setting, time management, help seeking, task strategies and self-evaluation. Researchers have considered measures of central tendency within individual statements and constructs to measure students' level of self-regulated learning.

Instrument validity was established in previous studies where it has been used to investigate students' self-regulated learning in online courses through 18 different academic disciplines (Barnard, Lan, To, Patton & Lai, 2009). Previous research of the OSLQ has shown structural stability when comparing results between online and blended courses (Korkmaz & Kaya, 2012). The internal consistency score obtained for the short form of the OSLQ in this study was $\alpha = .96$ with post-hoc individual factor reliability yielding sufficiently high coefficients (see Table 1). Nunnally (1978) suggested reliability scores of .70 or better is acceptable when used within the context of social science research, therefore, we felt the instrument was sufficiently reliable for each of the constructs measured.

Table 1

Internal Factor Reliability of the OSLQ Post-Hoc

Construct	Cronbach's Alpha Reliability Coefficient
Environment Structuring	.90
Goal Setting	.94
Time Management	.87
Help Seeking	.90
Task Strategies	.87
Self-Evaluation	.90

Data Collection

Data was collected online through a link in the students' online learning shell (e.g. Blackboard). Students selected for this study were students across various schools in [STATE] taking an online dual enrollment introduction to animal science or introduction to horticulture course (N = 146). Courses were offered as an online/in-class hybrid model. Students participated in all lab activities in class with their secondary agriculture instructor and completed all assessments (tests, quizzes, discussion posts and final projects) online. The final project consisted of a student-made presentation that was recorded and submitted online. A total of 106 students completed the survey, for a response rate of 72.6%.

Data Analysis

Measures of central tendency were analyzed to assess the demographic characteristics of participants in this study. A One-way ANOVA was utilized to examine any significant differences between previous experience in online learning and student's scores from the Online Self-regulated Learning Questionnaire (OSLQ). Students' scores served as the dependent variable, and participants' previous experience in online learning served as the independent variable. Assumptions of normality, independence of errors, and homogeneity of variance (i.e., $F(7, 98) = 1.96$, $p = .068$) were met for this analysis. The level of significance was set at .05 *a priori*.

To analyze the main and interaction effects of the independent variables (i.e., gender & grade classification) on the students' self-regulated learning scores, a 2x4 factorial analysis of variance (ANOVA) was conducted. Ary, Jacobs, and Razavieh (2002) indicated a factorial ANOVA serves to partition the variance associated with a treatment and variance associated with error. Assumptions, normality, independence of error, and homogeneity of variance ($F(5,100) = 2.15$, $p = .066$) were met. The Statistical Package for the Social Sciences (SPSS), version 22, was used to analyze the data in this study. Likert-Scales (summated into constructs) were evaluated using Mean and Standard Deviation guided by the findings of Boone & Boone, 2012. Non-normal distributions of response data can result in a mean score that is not a helpful measure of the data's central tendency. However, statistical experts argue that if there is an adequate sample size (at least 5–10 observations per group) and if the data are normally distributed (or nearly normal), parametric tests can be used with Likert-scale ordinal data. (Jamieson, 2004) and our data was normally distributed along with an adequate sample size.

Findings

To establish credibility, we first sought to identify demographics of secondary school students taking an online agriculture dual enrollment course. Of the participants, there were more males (67.9%) than females (32.1%) enrolled in the online courses. Regarding school grade classification, 9.4% were sophomores, 54.7% were juniors and 35.8% were seniors. When asked about ethnicity, over half (52%) of the participants identified themselves as Hispanic, 33% identified as Caucasian, 14% as Native American and 2% as other. Out of the 106 students who completed the survey, 80% of the students indicated English as their first language. The majority of participants were from small schools with enrollments not exceeding 120 students. Of those surveyed, 75% had taken an online course previously, with 40.2% only taking one course. Of those surveyed, more than three percent had taken more than five online dual enrollment courses previously.

Objective one sought to determine the level of self-regulated learning of students taking an online agriculture dual enrollment course. Table 2 illustrates students' level of self-regulated learning in their online agriculture courses. Overall, participants mostly agreed with each of the individual items. There were two items with which participants neither agreed nor disagreed which included, "I am persistent in getting help from the instructor through email" and "I work extra problems in addition to the assigned ones." Overall, the construct of self-regulated learning with the highest mean was environmental structuring, followed by goal setting, time management, self-evaluation and help seeking (see Table 3). Task strategies was the construct yielding the lowest mean.

Objective two sought to describe differences between student demographic characteristics and self-regulated learning in the online environment. Female respondents reported elevated practical self-regulated learning scores overall in general comparison to their peers (i.e., goal setting, environment structuring, task strategies, time management, help seeking, and self-evaluation). Goal setting ($M = 4.01$, $SD = 0.90$) was the construct for which female dual-enrollment students reported the highest self-regulated learning score (see Table 4). Conversely, male dual-enrollment students scored highest in the construct of environment structuring ($M = 3.77$, $SD = 0.89$). The task strategies construct had the lowest self-regulated learning scores for both male ($M = 3.27$, $SD = 1.01$) and females ($M = 3.70$, $SD = .98$). Regarding self-regulated learning by ethnicity, there was no statistical difference in mean scores (see Table 5). Seniors were found to have the highest mean overall self-regulated learning scores and the lowest variability (see Table 6).

Table 2

Self-Regulated Learning of Online Dual Enrollment Students

Construct/Item	Mode
Environment Structuring	
I find a comfortable place to study	4
I choose the location where I study to avoid too much distraction	4
I know where I can study most efficiently for my online courses	4
I choose a time with few distractions for studying	4
Goal Setting	
I set standards for my assignments in online courses	4
I keep a high standard for my learning in my online courses	4
I set short-term as well as long-term goals)	4
I don't lower the quality of my work because it is online	4
I set goals to help me manage studying time for my online courses	4
Time Management	
I try to schedule the same time every day or week to study	4
Although we don't meet for class, I still distribute my studying	4
I allocate extra studying time for my online courses	4
Self-Evaluation	
I communicate with my classmates to find out how I am doing	4
I ask myself questions about the course materials when studying	4
I communicate with classmates to find out if I am learning different	4
I summarize my learning to examine knowledge gained	4
Help Seeking	
I find someone who is knowledgeable in course content for help	4
I share my problems with classmates online	4
I try to meet my classmates face-to-face	4
I am persistent in getting help from the instructor through email	3
Task Strategies	
I try to take more thorough notes for my online courses	4
I prepare my questions before joining a course discussion	4
I read aloud instructional materials posted online to fight distraction	4
I work extra problems in addition to the assigned ones	3
Summated Mean Score	102

Note. Construct items were measured on a five point scale from 1 "Strongly Disagree" to 5 "Strongly Agree."

Table 3

Overall Self-Regulated Learning Scores by Construct

Construct	*M*	*SD*
Environment Structuring	3.81	0.96
Goal Setting	3.78	0.95
Time Management	3.62	0.91
Self-Evaluation	3.62	0.92
Help Seeking	3.61	1.02
Task Strategies	3.40	1.02

Note. Construct items were measured on a five point scale from 1 "Strongly Disagree" to 5 "Strongly Agree."

Table 4

Self-Regulated Learning Scores by Gender

	Male (n = 72)		Female (n = 34)	
Construct	*M*	*SD*	*M*	*SD*
Goal Setting	3.68	0.95	4.01	0.90
Environment Structuring	3.77	0.89	3.97	1.06
Task Strategies	3.27	1.01	3.70	0.98
Time Management	3.50	0.90	3.90	0.89
Help Seeking	3.51	0.99	3.82	1.05
Self-Evaluation	3.55	0.95	3.78	0.86
Summated Mean Score	85		93	

Note. Construct items were measured on a five point scale from 1 "Strongly Disagree" to 5 "Strongly Agree."

Table 5

Self-Regulated Learning Scores by Ethnicity

	Caucasian (*n* = 35)		Hispanic (*n* = 55)		Native American and other (*n* = 16)	
Construct	*M*	*SD*	*M*	*SD*	*M*	*SD*
Goal Setting	3.77	0.89	3.74	0.95	3.82	1.17
Environment Structuring	3.77	1.07	3.79	0.88	3.81	1.05
Time Management	3.56	0.99	3.61	0.88	3.63	1.01
Self-Evaluation	3.56	0.90	3.62	0.94	3.59	0.99
Help Seeking	3.54	0.99	3.63	1.02	3.61	1.11
Task Strategies	3.26	1.06	3.44	0.95	3.47	1.10
Summated Mean Score	86		87		88	

Note. Construct items were measured on a five point scale from 1 "Strongly Disagree" to 5 "Strongly Agree."

Table 6

Self-Regulated Learning Scores by Grade Level

	10th Grade (*n* = 10)		11th Grade (*n* = 58)		12th Grade (*n* = 38)	
Construct	*M*	*SD*	*M*	*SD*	*M*	*SD*
Goal Setting	3.88	1.01	3.68	1.00	4.03	0.75
Environment Structuring	3.83	1.19	3.71	0.98	3.98	0.81
Time Management	3.63	0.98	3.51	0.95	3.83	0.78
Self-Evaluation	3.45	1.00	3.47	1.03	3.91	0.88
Help Seeking	3.43	0.78	3.48	0.96	3.64	0.88
Task Strategies	3.23	0.93	3.30	1.05	3.68	0.96
Summated Mean Score	86		85		92	

Note. Construct items were measured on a five point scale from 1 "Strongly Disagree" to 5 "Strongly Agree."

Interpretations of effect size of the Point-Biserial correlational relationship were based on Davis (1971), and are as follows: .01 to .09 – negligible; .10 to .29 – low; .30 to .49 – moderate; .50 to .69 – substantial; and .70 to 1.00 – very strong. The low (Davis, 1971), positive correlation between a student having previous online course experience and the student's summated score on the Online Self-regulated Leaning Questionnaire was significant $r_{rb}(106) = .20$, $p < .05$ (see Table 5). Additionally, the positive correlation with a low (Davis, 1971) association, between the summated score of the instrument and the students' grade classification was significant $r_{rb}(106) = .19$, $p < .05$.

Objective three sought to determine the effects of previous online course experience upon students' self-regulated online learning scores. The result of the one-way ANOVA was $F(7, 105) = 1.05$, $p = .40$, indicating the effects of previous online learning experience upon students' self-regulated learning scores was not statistically significant (see Table 7). On average, students who had previously taken six online courses ($M = 106.50$, $SD = 10.08$) received the highest scores on the OSLQ. Conversely, students with no previous online learning experience had the lowest average self-regulated learning scores ($M = 84.78$, $SD = 20.68$).

Statistically significant correlations were found between students gender and grade level $r_{rb}(106) = -.26$, $p < .01$, and between a student's ethnicity and previous online course experience $r_{rb}(106) = -.27$, $p < .01$. The students' summated score on the OSLQ did not yield a significant correlation with any aspect of gender, English as a second language, school size, or the ethnicity of the student.

Table 7

Comparative Analysis of Students' Summated Self-Regulated Learning Scores Based on the Number of Online Courses Students Had Taken (n = 106)

	SS	*df*	*MS*	*F*	*p*	ω^2
Between Groups	2326.65	7	332.38	1.05	.403	-
Within Groups	31064.11	98	316.98			
Total	33390.76	105				

Note. Number of online courses range from 0 – 6.

The fourth objective analyzed the combined effect of gender and grade classification on the participants' self-regulated learning scores (see Table 8). The results of the two-way ANOVA indicated there was not a significant interaction effect between gender and grade classification on the students' self-regulated learning scores ($F(100, 106) = .51$, $p = .604$). Although the interaction effect was non-significant in this analysis, Kirk (1995) indicated the analysis of main effects is necessary when no interaction effect is identified. The main effect of grade classification on self-regulated learning scores was also non-significant ($F(2, 106) = 3.02$, $p = .053$). The effect of grade classification on a student's self-regulated learning score was not statistically significant. Similarly, the results of the two-way ANOVA indicated there was not a significant main effect of gender on the student's self-regulated learning score $F(1, 106) = 1.52$, $p = .22$.

Table 8

Analysis of Variance Source Table of Effects of Gender and Grade Level on the Students Self-Regulated Learning Scores (N = 106)

Source	SS^a	*df*	*MS*	*F*	*p*	Partial η^2
Corrected Model	3645.88	5	729.18	2.37	.045	
Intercept	430602.74	1	430602.74	1396.97	<.001	
Gender	467.60	1	467.60	1.52	.221	-
Grade Level	1863.19	2	931.60	3.02	.053	-
Gender x Grade Level	312.40	100	156.20	.51	.604	-
Error	854982.00	106	308.24			
Total	34469.96	105				

Note. R^2 = .106, Adjusted R^2 = .061, **p* < .05, [a] = Type III Sum of Squares

Conclusions and Recommendations

The students in this study were of similar demographics when compared to secondary agriculture students in [STATE]. There were higher percentages of Hispanic and Native American students in the dual enrollment courses than were traditionally found taking dual enrollment courses (Karp, Calcagno, Hughes, Jeong & Bailey, 2007; Hughes, 2010). Could this difference be a result of the demographics of [STATE]; or indicative of the suppositions of Kanny (2015) who stated learners, regardless of past contextual variables (i.e., race/ethnicity, socioeconomic status, prior academic achievement), are increasingly benefitting from dual enrollment courses? [STATE] requires students enroll in at least one dual credit or advanced placement (AP) course to successfully meet the requirements for high school graduation. With this requirement, the researchers were not surprised to see most students had taken an online course before. However, the small percentage of students taking more than five different online courses while still in high school was unanticipated. This may relate to the high online self-regulated learning scores of the seniors.

Objective one sought to determine the level of self-regulated learning of the students enrolled in an online agricultural dual enrollment course. Of the self-regulated learning scores, environment structuring was the construct where dual-enrollment students scored the highest. A similar study on self-regulated learning (Davis & Neitzel, 2011) also found structuring of the environment to be the highest rated score in self-regulated learning. With the less restrictive schedule of asynchronous online education, students perhaps feel they have more control over their environment. According to Zimmerman's model (1998), more control over the environment would contribute to students' realization of the performance control phase (e.g. self-control). Conversely, participants indicated the lowest level of agreement with the statements related to the task strategies construct. Davis and Neitzel (2011) found a significant relationship between the self-regulated learning task strategies and resistance to web based teaching. The dual enrolment students' limited experience in the online learning environment might serve as a barrier in the transition from passive to active learning. These findings suggest secondary students, who are accustomed to the pedagogical process of learning, have not yet acquired task strategies needed in the self-directed environment of online learning.

A significant relationship was found between previous experience in online learning and the students overall self-regulated learning. Previous research indicated prior experience with online learning was a positive predictor of satisfaction, perceived learning, and intentions to enroll in online courses in the future (Artino, 2007). Furthermore, Zimmerman and Schunk (2001) indicated self-regulatory skills develop across time and the source of influence appears to shift from environmental to more personal factors. Based on previous research, these findings suggest that as students gain experience in online learning, their levels of self-regulated learning will increase as well. A significant relationship was also found between the summated score of the instrument and the student's grade classification. Our findings also support the claim that upperclassmen (i.e., juniors and seniors) display higher levels of self-regulated learning due to more experience in the online learning environment. Of the variables explored, no significant relationships were discovered between self-regulated learning and gender, English as a second language, ethnicity or school size.

Based on the findings of this study, we suggest that courses continue to be offered with both university faculty and secondary agriculture science teachers working with students to help them further develop their online self-regulated learning skills. Following Zimmerman's (1998) guidelines, students should be encouraged to make goals before taking an online dual enrollment course, and at the conclusion of these courses, complete a self-evaluation of their learning. The contextual features of an online hybrid dual enrollment course can provide the necessary environment to guide, and if necessary, correct actions to positively influence students' development of self-regulated learning skills. Increased rigor from college curriculum combined with the pedagogical guidance of secondary teachers may aid in the active process of self-regulated learning (Pintrich, 2000). We would also encourage teachers and course facilitators to structure courses in a way that allows for student-directed active learning activities to occur. A more constructivist approach can perhaps lead to more effective self-regulated learning. Research exploring self-regulated learning in the context of direct and guided instruction methods should be conducted.

Previous research has shown students develop self-regulated learning skills through problem-based learning and authentic assessments (Iran-Nejad & Chissom, 1992). Course developers are encouraged to incorporate these concepts in course objectives and create assessments that challenge students' higher order thinking skills. An example of such tasks can include students uploading a presentation that they develop, present in class and upload for grading online. The researchers also suggest that self-regulated learning be supported though the use of consistent course feedback and an established method of self-monitoring (discussion posts, blogs, online journals, etc.).

It is clear that the enrollment of students in blended online learning environments and dual credit courses will continue to increase. Thus, assessing the self-regulatory skills of students in these types of courses is timely. Further research must be conducted to help researchers understand and properly identify any personal, behavioral or environmental factors that influence secondary students' self-regulated learning in an online agriculture dual enrollment course. By being able to identify which type of factors influence student learning, we can more readily impact the growth and development of their self-regulated learning skills. We suggest future studies be performed that include a broader range of learners, including a comparison of the self-regulated learning of secondary and post-secondary students.

With an increased requirement by school districts in [STATE] specifying at least one dual credit or advanced placement (AP) course to successfully meet the requirements for high school graduation, how do [STATE] students rank academically with other states that have the same

graduation requirements? Have these increased requirements resulted in a higher acceptance percentage for students that choose to pursue higher education degrees? Additional research studies targeting these questions should also be conducted.

More research is needed, especially in regards to blended dual enrollment courses, to examine students' ability to self-monitor their learning. We suggest future studies also look at effective pedagogical practices that encourage self-regulated learning and ways that secondary and postsecondary faculty can work together to foster this type of learning. Previous research has shown that self-regulated learning behaviors are "highly context dependent" (Schunk, 2001), thus research should be conducted to replicate the results of the current study across several domains in order to cross-validate this study's findings.

Some questions generated from this research include; what types of interactivity exist in dual enrollment courses? To what extent does instructor–student interaction in the online environment affect learner academic success? Further research should be conducted to determine the levels of academic success that can be correlated to the instructor–student interaction. When increased interactivity is considered detrimental with faculty in online courses, does the level of academic success decline for the learner? Additional research should be conducted in this area.

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