Rapport, Course Technology, and Self-Regulated Learning as Predictors of Student Satisfaction in an Online Horticulture Program

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Abstract

Online courses have proliferated in higher education, which has provided greater opportunities for institutions and students. However, student attrition from online programs has been a perennial problem. One potential solution to help increase retention is to improve student satisfaction. Instructor characteristics, technology, and self-regulated learning are all variables, which could contribute to greater student satisfaction in online courses. However, little research exists regarding these variables within the context of online agriculture programs. Therefore, the purpose of this study was to determine predictors of student satisfaction in the Alliance for Cooperative Course Exchange in the Plant Sciences (ACCEPtS) program, which is an online, multi-institutional, horticulture program. Students enrolled in ACCEPtS courses during spring and fall of 2020 were surveyed to determine their perceptions regarding professor-student rapport, technology, self-regulated learning, and course satisfaction. Results showed that students had favorable perceptions regarding professor-student rapport and technology, they mostly agreed they used self-regulated learning behaviors, and they were generally satisfied with ACCEPtS courses. Technology and professor-student rapport were significant predictors of student satisfaction; however, rapport was more robust and explained about a quarter of the unique variance in satisfaction. Rapport is an important contributor to student satisfaction in online courses, and instructors should utilize behaviors that contribute to the building of relationships.

Keywords: online teaching, student satisfaction, horticulture

Distance coursework has become ubiquitous in American higher education, growing tremendously over the past twenty years (Kebritchi et al., 2017). Seaman et al. (2018) reported that while in-person enrollment declined over a four-year period, enrollment in distance education courses increased to almost 6.5 million students during the same timeframe. Growth in online education has provided benefits such as the ability of colleges and universities to reach more students and expand learning opportunities, and it has given learners flexibility to pursue college degrees at their convenience (Song et al., 2004). However, while distance education has shown many benefits, the attrition rate in online courses has been almost double that of face-to-face courses (Soffer & Cohen, 2019; Wells, 2007), which many have attributed to lower student engagement and self-regulation (Soffer & Cohen, 2019). According to Angelino et al. (2007), increasing retention in online programs is important for institutions from both an economic and quality perspective. Bolliger and Martindale (2004) noted that student satisfaction in online courses has been an important predictor of retention, therefore, one important consideration for increasing retention in online courses is to improve student satisfaction.

Student satisfaction in online courses can be influenced by multiple factors, including instructor characteristics; communication; technology; course management and website; interactivity; and student responsibility (Bolliger & Martindale, 2004). Bolliger and Martindale (2004) specified that instructor variables, which included factors such as availability, responsiveness, and quality and timeliness of feedback, were the greatest predictors of student satisfaction in online courses. In addition, they suggested that frequent communication by instructors, particularly regarding course goals and

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objectives, is essential to satisfaction. Bolliger and Martindale (2004) further indicated that technological considerations play a role in student satisfaction. They recommended that course-related and instructor-student communication technologies be easy to use, familiar to students, accessible, reliable, and proper technical support should be provided. Additionally, their recommendations for management and organization of the course website and learning management system proposed that course websites be attractive, logically arranged, consistent, and easily navigable. Moreover, interactions among individuals within the course increase satisfaction, thus instructors should provide opportunities for social interaction and collaboration among peers. Lastly, student characteristics such as motivation, organization, and commitment also contribute to satisfaction in online courses (Bolliger & Martindale, 2004). Because student satisfaction is an important component of online education and has been shown to be a key predictor of retention, an examination of student satisfaction in online courses is warranted.

The online program examined in this study was the Alliance for Cooperative Course Exchange in the Plant Sciences (ACCEPtS). ACCEPtS is an online consortium created for the purpose of sharing online horticultural courses among four universities: Louisiana State University, Mississippi State University, Oklahoma State University, and the University of Arkansas (Evans et al., 2011). ACCEPtS is not a stand-alone degree program, instead it is a course sharing system, whereby students at participating institutions may register for ACCEPtS courses to fulfill degree requirements at their home institution. Courses in the ACCEPtS program utilize synchronous and asynchronous methods of online instruction, including recorded lectures, chats, blogs, discussion boards, and assigned readings (Evans et al., 2011). Previous evaluations of the ACCEPtS program have shown gains in specific learning outcomes (Evans et al., 2011), however, no research has been conducted to determine student satisfaction with the program.

Literature Review

Student satisfaction in online agriculture programs has been minimally investigated. Previous studies of student satisfaction have revealed that online graduate students (Burbuagh et al., 2014; Strong et al., 2012) and undergraduate students (Jayaratne & Moore, 2017; Neu et al., 2017; Roberts & Dyer, 2005) are generally satisfied and have positive attitudes toward online agricultural programs and courses. In horticulture, VanDerZanden and Woline (2008) evaluated students' perceptions of an online, introductory horticulture course and found that respondents were generally satisfied with the course, but preferred face-to-face courses over online. They indicated that assignment difficulty, desire for more information, technical issues, and instructor feedback were factors detracting from students' online learning. Conversely, Sciarappa et al. (2016) compared face-to-face, hybrid, and online horticulture courses and found that students preferred hybrid and online courses over face-to-face. Other researchers have studied teaching horticulture in hybrid environments and identified varying student preferences regarding course formats; however, student preferences are typically driven by instructor interaction, technology and self-regulation of learning (Hoch & Dougher, 2011; Rhoades et al., 2009; Woline & VanDerZanden, 2010). Consequently, more research into student satisfaction in online horticultural education is warranted, thus this study seeks to examine the role of professor-student rapport, technology, and student self-regulated learning on students' satisfaction within courses in a multi-institutional, online horticulture program.

Wilson et al. (2010) defined professor-student rapport as "the positive relationship between teacher and student" (p. 247), which is established through teacher characteristics such as, caring, encouragement, accessibility, approachability, fairness, and open-mindedness (Lammers & Gillaspy Jr., 2013; Lowman, 1995). Professor-student rapport has been positively associated with various student outcomes in face-to-face courses, including class attendance, time invested in studying, motivation and engagement in the classroom, increased retention, and student satisfaction (Estepp & Roberts, 2013; Glazier, 2016; Meyers, 2009; Wilson & Ryan, 2010). However, the nature of the online classroom increases distance between teacher and learner making it more difficult for instructors to engage with students and establish rapport (Martin & Bolliger, 2018; Glazier, 2016). Lowered rapport can lead to feelings of isolation and negative student outcomes including attrition (Martin & Bolliger, 2018). As a result, rapport has been suggested to be of greater importance in online settings (Glazier, 2016; Lammers & Gillaspy Jr., 2013).

Online programs can be offered using a variety of technologies; however, the most used technology in online higher education is the learning management system (LMS; Sivo et al., 2018). The LMS allows instructors to disseminate course information, assess learning, evaluate the course, facilitate class discussions, and provide web-based instruction synchronously or asynchronously (Chung et al., 2013). Adzharuddin and Ling (2013) proffered that "The LMS is not just viewed as an instructional trend but as a tool that...facilitates 'any time, any place, any pace' access to learning content and management" (p. 250). While the LMS has provided instructors an efficient way to provide online education, studies have shown that technical problems, incompatibilities of operating systems or internet browsers, software design, firewalls, poor course design, lack of technical support, lowered interactivity among students and teachers, poor time management, feelings of isolation, and operator error can all lead to student frustration, lowered perceptions of course technology, and reduced student satisfaction (Sivo et al., 2018; Song et al., 2004). However, according to Murphrey et al. (2012), instructors should use a variety of technologies to communicate with online students, as this "can help to reach all types and backgrounds of students...[and] Attention to this factor could improve the overall quality of instruction and learner satisfaction" (p. 24). Inquiries into technology use within the context of online agriculture programs, have shown that students recognize the benefits of online instruction and that online coursework has helped students expand

their knowledge and experience with various technologies (Alston & English, 2007).

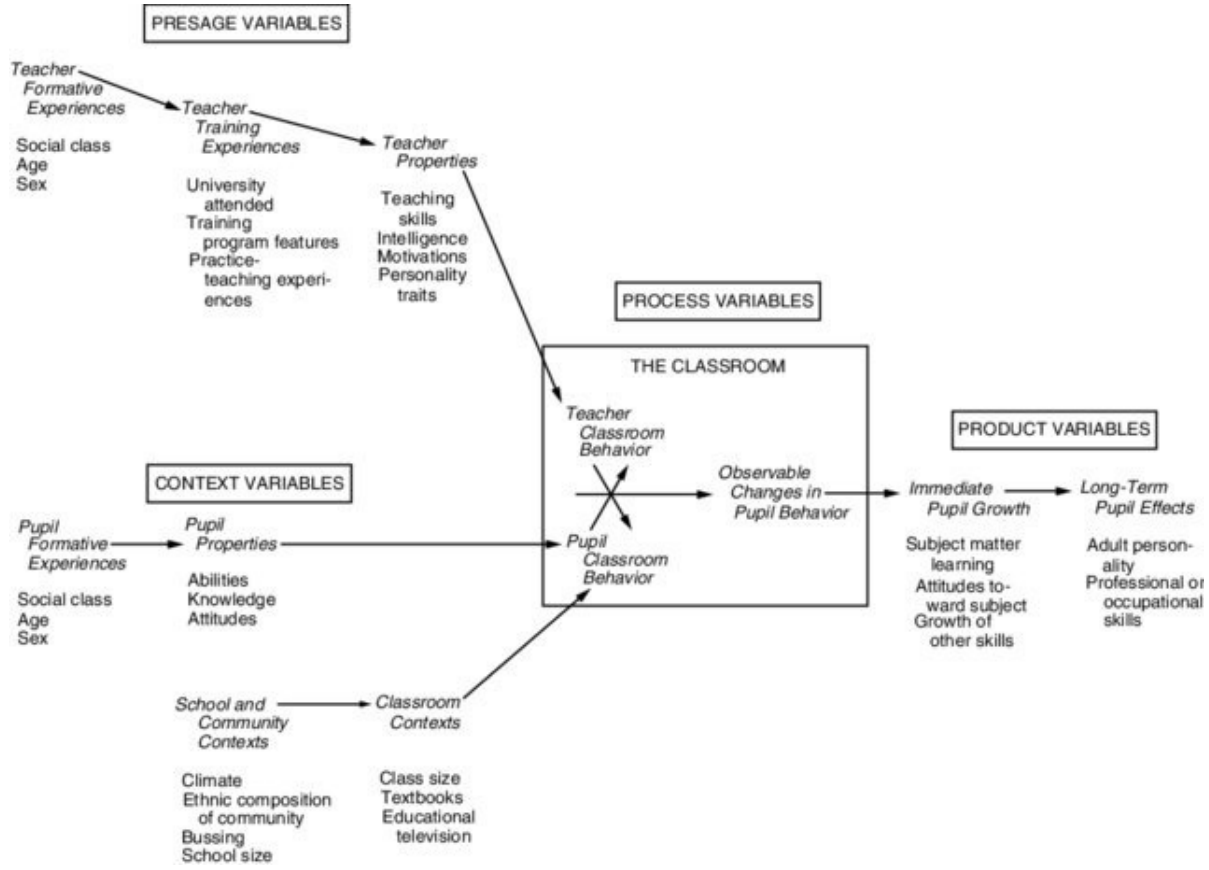
Pintrich and Zusho (2007) defined self-regulated learning as "[a]n active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (p. 741). Whereas the online educational environment requires more autonomy on the part of the learner, evidence has supported the notion that self-regulated learning improves students' academic success in online courses (Barnard et al., 2008; Bell, 2006; Hargis, 2000). Within agriculture, a paucity of literature regarding self-regulated learning exists. Chumbley et al. (2018) examined online students' levels of self-regulation in dual-credit agricultural courses and found that females possessed higher levels of self-regulation and a low positive association between prior online course experience and self-regulation. Additionally, Swafford (2018) reported a positive correlation between online agriculture students' motivation and their self-regulation. Estepp (2012) examined the relationships among professor-student rapport, motivation, and self-regulated learning in face-to-face classrooms. Results showed that students who perceived better rapport with their instructors had higher self-regulation. Nonetheless, no studies were found in the context of agriculture connecting self-regulated learning with student satisfaction in the online environment. Furthermore, very few studies have examined the relationship between self-regulated learning and student satisfaction in online courses, and results have varied indicating positive (Artino, 2007; Kuo, 2010; Lin et al., 2017; Puzziferro, 2006) and negative (Joo et al., 2014; Kuo, 2010; Yalcin, 2017) relationships between the two variables.

Theoretical Framework

The theoretical model guiding this study was the Model for the Study of Classroom Teaching (Dunkin & Biddle, 1974). The Dunkin and Biddle model (see Figure 1) outlines teaching according to four groups of variables: presage, context, process, and product. Presage variables are those "characteristics of teachers that may be examined for their effects on the teaching process—thus, teacher formative experiences, teacher-training experiences, and teacher properties" (Dunkin & Biddle, 1974, p. 39). In the context of this study, we examined the personal and dispositional characteristics of instructors contributing to professor-student rapport as a presage teacher variable. Context variables, according to Dunkin and Biddle, are those variables over which the teacher has little control, including student characteristics and classroom and social contexts. For the purpose of this study, technology was examined as an important context variable associated with the online learning environment, and only included technological components not controlled by the instructor such as the learning management system and students' internet connectivity. Additionally, student self-regulated

Figure 1.

Model for the Study of Classroom Teaching (Dunkin & Biddle, 1974)



learning was examined as a student characteristic, which contributes to satisfaction. For the purpose of this study, we did not explicitly examine process variables, however, it can be theorized that professor-student rapport, technology, and student self-regulated learning all affect the process of online education. According to the model, the interaction of the variables in the context of the online classroom should lead to the product of student satisfaction.

Purpose and Objectives

Student satisfaction is influenced by many factors and has been shown to be an important predictor of retention in online courses. Instructor characteristics, technology, and student self-regulation have been theorized as influencing student satisfaction, however, studies examining these variables in online agricultural courses, particularly horticulture, have not been well documented. Therefore, the purpose of this study was to determine predictors of student satisfaction in an online, multi-institutional, horticulture program. The purpose of this study was achieved using the following objectives:

1. Describe students enrolled in online ACCEPtS courses during spring and fall semesters of 2020.
2. Assess students' perceptions of technology resources, self-regulated learning, professor-student rapport, and student course satisfaction.
3. Examine relationships among students' perceptions of technology resources, self-regulated learning, professor-student rapport, and student course satisfaction.
4. Determine if a single or linear combination of student demographic variables, technology resources, self-regulated learning, and professor-student rapport explained a significant ($p < 0.05$) portion of variance in student course satisfaction.

Methods

Population

The population for this study consisted of all students enrolled in ACCEPtS courses during the spring and fall 2020 semesters (N = 144). During 2020, a total of eight courses were offered, four in the spring and four in the fall, and students in the ACCEPtS program were enrolled at one of four universities: Louisiana State University, Mississippi State University, Oklahoma State University, or the University of Arkansas. After this study was deemed exempt by the University of Arkansas IRB, initial invitation emails were sent prior to data collection. Email correspondence with potential participants was sent according to recommendations by Dillman et al. (2014). The survey instrument was administered via Qualtrics® midway during both the 2020 spring and fall semesters; 78 responses were received giving a response rate of 54.2%. To test for non-response error, chi-square tests were conducted to determine if the sample was significantly different than the population on three variables of interest: gender, classification (graduate vs. undergraduate), and university attended. Results revealed that the sample was not significantly different than the population for gender, $\chi^2(1, N = 215) = 1.53$, $p = 0.22$, classification $\chi^2(1, N = 218) = 0.94$, $p = 0.82$, or university attended, $\chi^2(1, N = 216) = 0.73$, $p = 0.39$.

Instrumentation

Data were collected using a five-part online instrument. Section one consisted of the Professor/Student Rapport Scale (Wilson et al., 2010), which contained 29 items measuring professor-student rapport. Internal consistency was calculated for the rapport scale using Cronbach's alpha and was found to be highly reliable ($\alpha = .98$). Section two of the instrument contained 17 items measuring self-regulated learning behaviors, which were taken from the Online Self-regulated Learning Questionnaire (OSLQ; Barnard-Brak et al., 2010). The OSLQ is an established instrument deemed valid and its internal consistency was found to be reliable ($\alpha = .92$). Section three contained eight researcher-created items assessing course technology ($\alpha = .88$), and section four contained eight researcher-created items evaluating student course satisfaction ($\alpha = .94$). Lastly, section five consisted of seven demographic items. Likert scales (1 = strongly disagree and 5 = strongly agree) were used for all items in sections one through four, and summated scale means are presented. Reliability was not assessed for section five because, according to Salant and Dillman (1994), asking questions about "personal attributes and behaviors produces very little measurement error" (p. 87).

Data Analysis

Data were analyzed utilizing descriptive statistics, correlations, and ordinary least-squares multiple regression using SAS (Version 9.4) software. Multiple imputation (PROC MI) was used to estimate responses for missing-at-random data for regression analysis. According to Manly and Wells (2015), multiple imputation is the "gold standard" (p. 398) for dealing with missing data in survey research and is superior to complete case regression analysis. Instead of substituting a single value for missing data, multiple imputation generates multiple output data sets where each data set contains a plausible estimated value for each missing value, thus, recognizing the uncertainty concerning any single imputed value (Yuan, 2011). Following recommendations by Schafer (1999), 10 imputations were conducted, and the imputed data sets were then analyzed with the PROC MIANALYZE regression procedure to produce "valid statistical inferences that properly reflect the uncertainty due to missing values" (Yuan, 2011, p. 2). As a check, complete case and imputed analysis results were compared and found to provide consistent results with regard to statistical significance, variance explained, and statistically significant predictor variables. Following recommendations by Mackinnon (2010) and Yuan (2011), imputed regression results were reported, allowing data for 74 students to be reported for the regression analysis.

Results

The typical student respondent had a median age of 23.0 years (*IQR* = 7.0) and was a white (76.9%) male (56.4%) attending Mississippi State University (51.3%). Students were almost evenly divided between juniors and seniors (48.6%) and graduate students (45.9%), with the remaining students being freshmen and sophomores (5.4%). Students were primarily from rural (43.8%) or suburban (43.8%) areas and fewer than one-half (47.3%) reported having an agricultural background. Participant enrollment across the ACCEPtS courses offered in 2020 was as follows: Sustainable Agroecology (10.3%), Athletic Field Management (6.4%), Plant Growth and Development (42.3%), Global Horticulture (21.8%), Sustainable Landscape Management (5.1%), and Greenhouse Management (14.1%).

As shown in Figure 2, students agreed they used self-regulated learning skills, had good professor-student rapport, and that course technology worked well. In addition, students agreed they were satisfied with the ACCEPtS courses they completed.

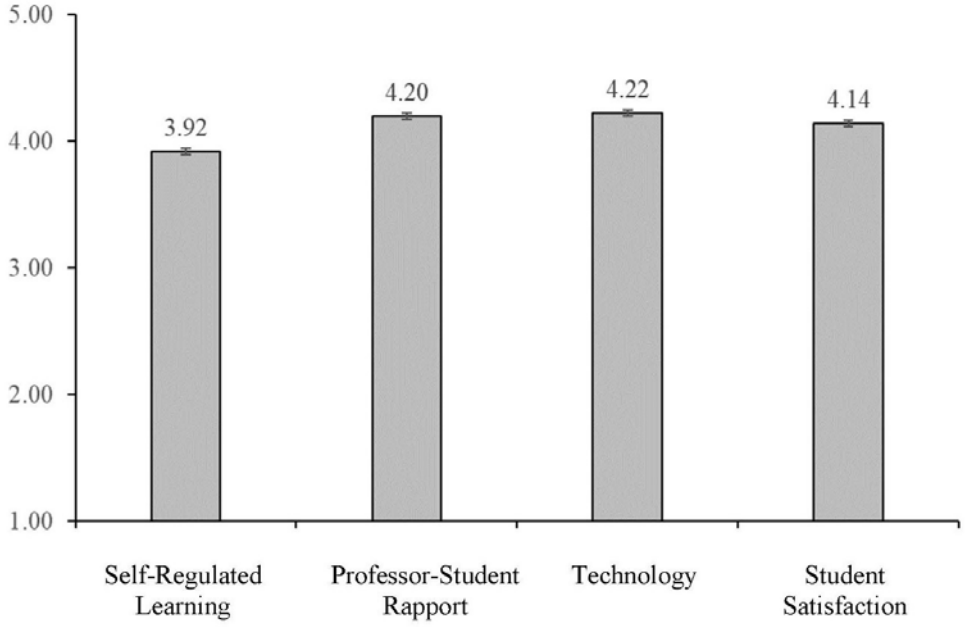
In accordance with objective three, bivariate correlations were calculated between selected demographic variables, self-regulated learning, professor-student rapport, technology, and student course satisfaction. As shown in Table 1, among the demographic variables, age, ethnic minority status, and being from a rural community all had significant ($p < .05$), low to moderate (Davis, 1971) positive correlations with being a graduate student. None of the demographic variables were significantly correlated with student course satisfaction.

Professor-student rapport and technology had significant ($p < .05$) and very strong positive correlations with student course satisfaction, while self-regulated learning had a significant, moderate correlation with student course satisfaction (Davis, 1971). The intercorrelations between rapport, technology, and self-regulated learning ranged from moderate to substantial (Davis, 1971). However, the variance inflation factors for all three variables were <2.0, indicating multicollinearity was not a threat to the regression model containing all three variables (Field & Miles, 2012).

For objective four, the results of the analysis regressing student course satisfaction on the three potential predictors (professor-student rapport, self-regulated learning, and technology) using imputed data were statistically significant, $F(4, 69) = 52.33$, $p < .001$. The regression model explained 75% of the variance in student course satisfaction (Adjusted $R^2 = .74$). According to Cohen (1988), this represents a large effect. As shown in Table 2, only the regression coefficients for professor-student rapport and technology were statistically significant ($p < .05$). The positive regression coefficients indicated more positive perceptions of professor-student rapport and course technology were significantly related to higher course satisfaction. The squared semi-partial correlation coefficients (ΔR^2) were consistent with the regression coefficients and indicated professor-student rapport explained 22.7% of the variance in course satisfaction when controlling for self-regulated learning and technology. Conversely, technology explained only 4.0% of the variance in course satisfaction when controlling for the other two predictors. Thus, professor-student rapport was the most robust predictor of course satisfaction.

Figure 2.

Means (+ 1.0 SE) for Summated Scales Measuring Self-Regulated Learning, Professor-Student Rapport, Technology, and Student Satisfaction



Note. Means (+ 1.0 SE) for Summated Scales Measuring Self-Regulated Learning, Professor-Student Rapport, Technology, and Student Satisfaction

Table 1.

Intercorrelations Between Predictor and Criterion Variables

Variable	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Age (X1)	1.0	.03	.13	-.15	.08	.41***	.11	.09	.12	.14
Gender (X2)[z]		1.0	-.03	.05	-.12	-.08	-.08	.16	-.05	.09
Minority (X3)[y]			1.0	.03	.07	.39***	.14	.15	.43	.20
Ag background (X4)[x]				1.0	-.12	.05	-.07	-.16	.05	-.18
Community type (X5)[w]					1.0	.24*	-.14	.04	.03	-.11
Classification (X6)[v]						1.0	.07	.06	.10	.13
Rapport (X7)							1.0	.65***	.22	.83***
Technology (X8)								1.0	.37**	.73***
Self-Reg. learning (X9)									1.0	.37**
Satisfaction (X10)										1.0

[z] Coded as female = 0 and male =1; no non-binary responses were recorded. [y] Coded as non-minority = 0 and minority = 1. [x] Coded as No = 0 and Yes = 1. [w] Coded as non-rural = 0 and rural = 1. [v] Coded as undergraduate = 0 and graduate = 1. *p < .05. **p < .01. ***p < .001.

Table 2.

Regression Analysis Predicting Student Course Satisfaction Scores

Predictor	β	*SE*	*95% CI*	*t*	ΔR^2
Intercept	-0.283	0.427	[-1.121, 0.555]	-0.66	--
Self-Regulated Learning	0.129	0.086	[-0.040, 0.298]	1.58	.009
Professor-Student Rapport	0.622	0.100	[0.443, 0.821]	7.13***	.227***
Technology	0.315	0.122	[0.073, 0.556]	3.17**	.040**

**p < .01. ***p < .001.

Discussion

Based on the results of this study, several conclusions can be drawn. First, respondents were primarily white males who were upperclassmen or graduate students. Just over half of students were enrolled at Mississippi State University, and almost all respondents were from rural or suburban areas, with about half reporting a background in agriculture. The two ACCEPtS courses with the highest enrollment were Plant Growth and Development and Global Horticulture. Correlation results showed that graduate students were more likely to be from an ethnic minority group and from rural areas.

Overall, students reported favorable perceptions of professor-student rapport and technology, and they were generally satisfied with their ACCEPtS courses. The results of this study regarding satisfaction were congruent with previous findings in horticulture (Sciarappa et al., 2016; Woline & VanDerZanden, 2010; VanDerZanden and Woline, 2008) and agriculture (Jayaratne & Moore, 2017; Neu et al., 2017; Roberts & Dyer, 2005). Moreover, students in this study scored higher in self-regulated learning than the agriculture students studied by Swafford (2018) or Chumbley et al. (2018). However, their populations were secondary, dual-credit students enrolled in online agriculture courses, whereas the sample in the current study consisted of mostly upper level and graduate students. Age, maturity, and experience with online learning likely contributed to ACCEPtS students scoring higher in self-regulated learning. Nonetheless, while respondents mostly agreed they utilized self-regulated learning practices in their ACCEPtS courses, there is still room to improve. Coordinators and instructors in online agriculture programs should provide students guidance on how to develop and utilize self-regulated learning strategies, such as creating an environment conducive to studying, goal setting, time management, self-evaluation of learning, and study skills.

Correlations revealed that technology was positively related to professor-student rapport and self-regulated learning. This finding raises the question: does better technology allow students to communicate more effectively with instructors, thus leading to greater perceptions of rapport, or does poor technology lead to frustrations in communication leading to lowered rapport? Similarly, does

better technology facilitate better self-regulation, or do self-regulated learners ensure they have adequate technology to be successful? Or, are other variables associated with technology, professor-student rapport, and self-regulated learning that might account for these findings? More research is needed in online agriculture programs to parse out the relationships among these variables. Nonetheless, online course technology should be easy for students to access, use, and navigate, and instructors should ensure their online courses are attractive, logically organized, consistent in design, properly maintained, and technical support should be provided (Bolliger & Martindale, 2004).

Further results showed that professor-student rapport, technology, and self-regulated learning all had positive relationships with satisfaction. This finding is important for agricultural education, as this helps fill a gap in the student satisfaction literature. Moreover, the combination of professor-student rapport, technology, and self-regulated learning explained about 75% of the variance in student satisfaction, but rapport and technology were the only significant predictors of satisfaction with rapport being the most robust. Professor-student rapport explained nearly a quarter of the unique variance in course satisfaction. The foremost conclusion is professor-student rapport is an important concept to which instructors should devote serious attention. Bolliger and Martindale (2004) suggested that instructor variables, such as availability, responsiveness, and quality and timeliness of feedback, best predict student satisfaction in online courses. These align with characteristics, such as encouragement, caring, accessibility, approachability, communication, fairness, and open-mindedness, of instructors who are adept at building rapport (Lammers & Gillaspy Jr., 2013; Lowman, 1995). Consequently, rapport should be included in Bolliger and Martindale's list of instructor variables that predict student satisfaction, and instructors should utilize rapport-building behaviors in their online courses.

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