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Article abstract

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Abstract

The Community of Inquiry framework has been widely supported by research to provide a model of online learning that informs the design and implementation of distance learning courses. However, the relationship between elements of the CoI framework and perceived learning warrants further examination as a predictive model for online graduate student success. A predictive correlational design and hierarchical multiple regression was used to investigate relationships between community of inquiry factors and perceived learning to determine the predictive validity of these variables for students' course points (N = 131), while controlling for demographic and course variables. The results of this study clearly supported the foundational constructs of Community of Inquiry (CoI) theory (Garrison et al., 2000) and the role of perceived learning to predict final course points. The entire predictive model explained 55.6% of the variance in course points. Implications, limitations, and recommendations are discussed.

Keywords: community, perceived learning, course points

Introduction

As the popularity of distance learning increases in the United States, a comprehensive understanding of the factors that contribute to an effective learning environment and student success is necessary. The focus in distance education research has remained on creating and sustaining the learning community, understanding the nature of the learning community, and fostering the development of communities of learners (Swan, Garrison, & Richardson, 2009). Much research has examined factors that foster opportunities for enhancing the online learning community, but there is much that has not been fully examined and is not fully understood (Rubin, Fernandes, & Avgerinou, 2013). While there is consensus that student success in the online learning environment is dependent on the collaborative construction of

knowledge and the building of a learning community (Swan et al., 2009), there exists some disparity among study results as well as documented areas in which further research is warranted (Rubin et al., 2013).

A specific area in need of further examination is that of student achievement outcomes and the creation of models to predict student achievement based on existing distance learning frameworks. Course grades and overall grade point averages (GPA) are widely considered the definitive measures of student learning and academic progress in higher education (e.g., Astin, 1985, 1993; Pascarella & Terenzini, 2005). These measures of student achievement outcomes have been associated with a number of factors. Self-reports of learning, or learning that the students themselves perceive is taking place (e.g., Richmond, Gorham, & McCroskey, 1987; Pace, 1990), is a factor that influences student achievement. Research also indicates a connection between students' sense of community and their learning outcomes (e.g., Akyol & Garrison, 2011; Arbaugh et al., 2008). Swan et al. (2009) argue that "constructivist approaches and community are necessary for creating and confirming meaning and are essential for achieving effective critical thinking" (p. 4) as critical thinking is an essential component of student achievement. Likewise, Garrison and Archer (2000) support that "construction of meaning may result from individual critical reflection but ideas are generated and knowledge constructed through the collaborative and confirmatory process of sustained dialogue within a critical community of learners" (p. 91), thus supporting the benefit of fostering a community among learners.

Although quantitative studies have examined the bivariate relationships between community, perceptions of learning, and online student achievement (Woods & Baker, 2004; Wighting, Nisbet, & Rockinson-Szapkiw, 2013), a comprehensive model considering the predictive validity of the three CoI constructs of teaching presence, social presence, and cognitive presence and perceptions of learning has yet to be examined. Considered together, they may be indicators of the final course points that students will earn, and, if identified as salient factors for success, the instructor may be able to target each factor and provide enriched learning. Thus, this study seeks to examine and provide support for the CoI framework while examining additional factors that predict successful student learning outcomes in the distance learning environment in an effort to create a predictive model for student course points.

Conceptual Framework

Sense of Community

McMillan and Chavis (1986) define sense of community as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9). Sense of community occurs when "members of online communities support common goals and a strong commitment to community goals…recognize boundaries that define who belongs and who does not, establish their own hierarchies of expertise and modes of interaction…and share a common history (Rovai, 2002, p. 199). Thus, the concept of sense of community is built upon constructivist views of learning and social learning theory (Swan et al., 2009) and is deemed an essential component to supporting social and intellectual learning goals (Rovai, 2002).

In an educational setting, community includes two underlying dimensions: social community and learning community. Social community, derived primarily from the work of McMillan and Chavis (1986) and McMillan (1996), represents the feelings of the community of students regarding their spirit, cohesion, trust, safety, interaction, interdependence, and sense of belonging. Learning community consists of the feelings of community members regarding the degree to which they share group norms and values and the extent to which their educational goals and expectations are satisfied by group membership. Learning community is closely related to the work of Glynn (1981) and Royal and Rossi (1997), who argue that common goals and values are essential elements of community, and Strike (2004), who theorizes that normation, or the willingness of students to internalize group-shared expectations, is an important aspect of a learning community. As such, learning has been recognized as a social activity, which is further supported by the Community of Inquiry (CoI) framework (Garrison, Anderson, & Archer, 2010).

Community of Inquiry

Taking into account the importance of interactions in online learning (Moore, 1989) and the social and cognitive nature of inquiry in a learning community (Garrison et al., 2010), Garrison et al., (2000) proposed the CoI framework as a model for the development and delivery of effective online education following a collaborative constructivist perspective. The CoI framework "assumes that effective online learning, especially higher order learning, requires the development of community" (Swan et al., 2009, p. 5). Garrison and Cleveland-Innes (2005) noted that "it is valuable and even necessary to create a community of inquiry where interaction and reflection are sustained; where ideas can be explored and critiqued; and where the processes of critical inquiry can be scaffolded and modeled" (p. 134). Thus, in order for students to achieve in their online classes, three elements must be present: social presence (SP), cognitive presence (CP), and teaching presence (TP). SP is defined as "the degree to which a person is perceived as a 'real person' in mediated communication" (Gunawardena & Zittle, 1997, p. 9); thus, an individual's perceptions of uniqueness as well as trust and identification with the group. CP is defined as the opportunity to collaboratively construct meaning through reflection and discourse (Garrison et al., 2000). TP consists of the presence of instructional design and organization, facilitation of discourse, and instruction (Garrison et al., 2000) and is considered the "binding element in creating a community of inquiry for educational purposes" (Garrison et al., 2000, p. 96).

Some researchers have criticized the CoI model (Shea et al., 2011). Shea et al. (2012) suggested that learning presence may serve as an additional construct that acts as a valid predictor of learning and, specifically course grades, when examining student self-regulatory behaviors in the distance learning environment. Although some research is beginning to support the investigation of a fourth factor within the CoI framework (learning presence; Arbaugh et al., 2008; Shea et al., 2012), qualitative and initial quantitative empirical evidence has supported the validity of the three factor model (Arbaugh et al., 2008; Arbaugh & Hwang, 2006; Stien, Wanstreet, Calvin, Overtoom, & Wheaton, 2005) and recognized the original CoI model as being a solid framework for examining the role of the learner and the instructor in overall learning outcomes (Arbaugh et al., 2008; Shea et al., 2012). Thus, as the construct of learning presence is still under investigation as a fourth factor; in this research, the three factor model is used.

Each of the three elements of the CoI framework (SP, CP, and TP) are considered to be multidimensional and interdependent (Swan et al., 2009) and have been hypothesized to have an influence on students' learning experiences. For instance, Akyol and Garrison (2011) suggest that collaborative development of cognitive presence in online discussions and students' perception of cognitive presence are associated with high perceptions of learning and grades. Likewise, research has supported that students' social presence corresponds with their performance in their online classes and their course grades earned (Kang, Liw, Kim, & Park, 2014; Russo & Benson, 2005). In the online learning environment, student perceptions of social presence have been shown to contribute to an environment that fosters students' attendance to one another, the sharing of ideas, the building of trust, and peer collaboration (Russo & Benson, 2005). Studies have consistently demonstrated that student group interaction and social presence are strongly associated with learning outcomes (Arbaugh & Hwang, 2006; Williams, Duray, & Reddy, 2006). As each of the three factors of the CoI have been independently associated with student achievement outcomes and collectively all three factors have been shown to have good predictive validity for perceived learning and satisfaction (Arbaugh et al., 2008), it is hypothesized that all three elements of the CoI framework will be positively associated with online students' course grades.

Perceived Learning

The construct of perceived learning is also important in higher education learning outcomes; it quantifies whether a student feels that learning is taking place and has been associated with student grades (Wighting, Nisbet, & Rockinson-Szapkiw, 2013). Bloom (1956), identified that learning occurs not only in the cognitive and affective realms, but also in psychomotor domains; thus, perceived learning is comprised of all three. According to Rodriguez, Plax, and Kearney (1996), affective learning subsumes student motivation and promotes greater student learning as "affective learning represents the attitudes students develop about the course, the topic, and the instructor" (Russo & Benson, 2005, p. 55).

Recent studies that have examined the construct of perceived learning have reported relationships with other aspects of learning. Baturay (2011) concluded that students' course satisfaction is highly related to their perceived cognitive learning, and that students' perceived cognitive learning was observed to have a very strong relationship with learner-to-content interaction. Russo and Benson (2005) found that student perceptions of the presence of others were related to both affective and cognitive learning outcomes and that the various dimensions of presence may predict different student learning outcomes (Kang et al., 2014), thus warranting further examination on the predictive power of each domain. According to Wighting, Nisbet & Rockinson-Szapkiw (2013), the higher the sense of both social and learning community that students have, the higher their perceived learning will be in all three subscales of the construct (cognitive, affective, and psychomotor perceived learning). Consequently, the online students who participated in this study are likely to have increased confidence if they perceive they are learning new and valuable information from their coursework. Students' perceived learning is measureable using the Cognitive, Affective, and Psychomotor (CAP) Perceived Learning Scale (Rovai, The Wighting, Baker, & Grooms, 2009). It is hypothesized that perceived learning will be associated with course grades.

Purpose and Purpose Statement

While several frameworks and models exist to explain effective online learning, the CoI framework has gained increased attention across disciplines in both graduate and undergraduate environments (Garrison, Anderson & Archer, 2000; Swan et al., 2009). While the CoI framework has been used as a theoretical grounding in numerous qualitative studies (Garrison & Cleveland-Innes, 2005; Stodel, Thompson, & MacDonald, 2006; Wanstreet & Stein, 2011; Whipp & Lorentz, 2009) and quantitative research, studies that examine the relationship among the framework's three elements collectively and student learning outcomes is limited (Ho & Swan, 2007; Kim et al., 2014). Collectively, the three elements of the model have been shown to have good predictive validity for perceived learning and satisfaction in online courses (Arbaugh, 2008); however, course outcomes such as grades still need to be examined (Akyol & Garrison, 2011; King & Witt, 2009) to further demonstrate that the CoI framework is a valid and useful theory to explain effective graduate distance education. Together with CoI, perceptions of learning maybe an important dimension of online graduate student achievement (Woods & Baker, 2004; Wighting, Nisbet, & Rockinson-Szapkiw, 2013). Thus, the purpose of this study was to determine the ability of cognitive presence, teaching presence, social presence, and perceptions of learning to predict online graduate students' end of course grades.

Methodology

Research Design and Analysis

A predictive correlational design and hierarchical multiple regression (HMR) was used to examine whether students' sense of community of inquiry and perceived learning predicted their course points, while controlling for demographic variables and online course format. For the HMR, variables were entered into the analysis in blocks as seen in Table 1. Consistent with the above discussed theory, it was hypothesized that the predictor variables would significantly describe variance within course points.

Sex and ethnicity were used as demographic, categorical control variables in order to consider whether sex acted as a cofounding variable in the relationship among teacher presence, social presence, cognitive presence, and perceived learning. Given that demographic variables temporally precede the constructs of CoI and perceived learning, demographic variables were considered as a potential control variable in the regression and, thus, were entered into Block 1 of the research model. The regression model follows similar educational research that places sex and race as covariate variables controlled for in prediction studies. Community is often seen in the literature as necessary for learning, thus CoI was added into the model next. Perceived learning was added into the model as a final variable (see Table 1).

Table 1

Blocks for the Hierarchical Multiple Regression

Block	Variable	Empirical Support
Block 1	Demographics	Arbaugh, 2008; Rockinson-

		Szapkiw, 2012
Block 2	Course format	Arbaugh, 2008; Rockinson-Szapkiw, 2012
Block 3	Community of Inquiry (cognitive, social, and teaching)	Arbaugh et al., 2008; Shea et al., 2012; Swan et al., 2009
Block 4	Perceived learning	Wighting et al., 2013; Kang et al., 2014

Participants and Setting

A convenience sample of 131 students enrolled in online, graduate level educational technology courses from Spring 2012 to Spring 2013 at a private institution in central Virginia served as the sample for this research study. All students who participated in the study were working toward a Master of Education (MEd) in Teaching and Learning with Educational Technology and Online Instruction concentration. The sample consisted of both males (n = 52) and females (n = 79), ranging in age from 18 to 59. Most of the participants were Caucasian (n = 99). However, the sample also included African American (n = 25), Hispanic (n = 5), and American Indian (n = 4) students. The participation rate for the survey was 95%.

The students participated in one of two educational technology courses; both were requirements for the MEd program. The courses were 8 weeks in length and delivered between Spring 2011 to Spring 2013. Students earned three semester hours of college credit for each course. One course focused on current trends and issues in educational technology and was delivered online using an asynchronous format. The other course focused on the use of educational technology in instruction and course design and was delivered online via a combination of asynchronous and synchronous technologies. The asynchronous only courses were delivered via the Internet using content management systems (CMSs) and learning management systems (LMSs) such as Blackboard™, Angel, and university-created sites. Using the available systems, students accessed and retrieved content, submitted assignments, retrieved grades, and completed quizzes and exams. Collaboration among the teachers and students took place through email, message boards, announcements, Wikis, blogs, and discussion forums.

In the synchronous and asynchronous combination courses, learning occurred via the Internet using two mediums: (a) CMSs or LMSs and (b) e-conferencing systems. Similar to the asynchronous courses, the courses were not limited to a particular courseware platform; Angel, and Blackboard ™, and university-created sites were used. The CMSs and LMSs were used by students for the same purposes in the synchronous and asynchronous combination courses as they were in the asynchronous only courses: access and retrieval of content and grades, submission of assignments, blogging, and completion of quizzes and exams. Communication and collaboration were done using email, message boards, announcements, Wikis, blogs, and discussion forums. In contrast to the asynchronous only group, the synchronous and asynchronous combination group utilized e-conferencing systems which allowed for synchronous communication and collaboration among peers and between the students and the instructor. Webex was used for two synchronous sessions between the students and the instructor. Additionally, three synchronous peer group sessions were held which were not limited to any particular e-conferencing

system; Adobe® Acrobat® Connect™, Skype™, and Google HangOut were used. Using the collaborative e-conferencing software, students—both with the instructor and independent of the instructor—in remote geographical locations worked collaboratively on course assignments, studied for exams and quizzes, presented class presentations, and listened to lectures. During the synchronous sessions with the instructor, text chat, application sharing, polling, video, and recording and archiving were used.

Procedures and Instrumentation

At the end of each educational technology course students were asked to complete a survey to assist with course and program improvement. They earned ten points for completing the survey; they were also provided an alternative writing assignment to earn the points if they chose not to complete the survey. A course assignment link was made available so that participants could read an informed consent statement outlining that the survey may be used for program improvement and to request that they assist in the research by completing a Web-based survey. The survey consisted of questions related to their demographics and type of course. The survey also consisted of the CAP Perceived Learning Scale (Rovai et al., 2009) and Community of Inquiry Framework survey (Arbaugh et al., 2008). The survey data were obtained as archival data after institutional review board approval was given. Grades were obtained from the Blackboard grade book.

The CAP Perceived Learning Scale (Rovai et al., 2009) served as a predictor variable and was used to measure perceived learning in three domains: cognitive, affective, and psychomotor. It consists of a 9-item self-report survey. On a 7-point Likert-type scale (0 to 6), participants chose a response that best reflected their experience with the learning activity. Scores on the total composite scale ranged from a 0 to 54, and scores on each subscale ranged from 0 to 18. Higher scores reflected higher perceptions of learning. The CAP Perceived Learning Scale has good construct validity as evidenced by factor analysis and reliability (Rovai et al., 2009). Cronbach's coefficient alpha is reported at .79 for the instrument (Rovai, et al., 2009).

The CoI framework survey (Arbaugh et al., 2008) served as a predictor variable and was used to assess participants' perceived sense of social presence, cognitive presence, and teacher presence on a 34-item self-report consisting of the three subscales of social presence, cognitive presence, and teacher presence. On a 5-point Likert scale (i.e., 4 = strongly agree, 3 = agree, 2 = neutral, 1 = disagree, and 0 = strongly disagree), participants indicated the response that best reflected their feelings about statements such as "Online or Web-based communication is an excellent medium for social interaction," "The instructor clearly communicated important course topics," and "Problems posed increased my interest in the course." Scores on the social presence scale ranged from 0 to 36, the cognitive presence scale ranged from 0 to 48, and the teacher presence scale ranged from 0 to 52. Higher scores reflected a stronger sense of social presence, cognitive presence, and teacher presence. Evidence supported good construct validity (Arbaugh et al., 2008). Cronbach's coefficient alpha for the social presence, cognitive presence, and teacher presence subscales were .91, .95, and .94, respectively (Arbaugh et al., 2008).

The researchers also collected data on the following control variables as previous research has demonstrated that these variables influence the criterion and predictor variables under study (Arbaugh, 2008; Rockinson-Szapkiw, 2012): Sex (0 = Female, 1 = Male); Ethnicity (0 = Caucasian, 1 = Other); and

type of online format (1= Synchronous, 0 = Asynchronous). The type of online format for delivery of instruction and discussion included both (a) asynchronous and (b) a combination of synchronous (including audio/visual) and asynchronous.

Course points served as the criterion variable. The maximum number of points earned in the graduate course was 1010. As recorded in the syllabus, the grading scale is as follows: A = 960–1010 A- = 940–959 B+ = 920–939 B = 890–919 B- = 870–889 C+ = 850–869 C = 820–849 C- = 800–819 D+ = 780–799 D = 750–779, D- = 730–749, F = 729 and below.

Results

A hierarchical multiple regression (HMR) was used to assess how graduate students' sense of community and perceived learning predict their course grades while controlling for demographic variables and the type of course format. Preliminary analyses showed no major violations of the assumption tests of normality, homoscedasticity, linearity, and extreme outliers. While course points were positively skewed, which is expected when examining graduate students, the residuals were examined using a use a histogram with superimposed normal curve and a P-P plot and found to be approximately normally distributed. As a regression analysis is fairly robust to deviations from normality (Warner, 2013), the finding that the residuals were approximately normally distributed provided rational to continue with the planned regression analysis. Correlation analyses demonstrated a significant relationship between the majority of the predictor and the criterion variables, with no correlation coefficient over .7. Further, a significant relationship among each pair of the predictor variables existed with no correlation coefficient over .7 (Table 2). Multicollinearity was not a concern. Descriptive statistics are reported in Table 3.

Table 2

Correlation Matrix for the Predictor Variables

	Course points	CP	SP	TP	AL	PL	CL
Cognitive Presence (CP)	.217*	-	-	-	-	-	-
Social Presence (SP)	.489**	.641**	-	-	-	-	-
Teaching Presence (TP)	.623**	.458**	.526**	-	-	-	-
Affective Learning (AL)	.097	.494**	.391**	.321**	-	-	-
Psy. Learning (PL)	.276**	.441**	.398**	.318**	.492**	-	-
Cognitive Learning (CL)	.407**	.123	.211*	.225**	.120	.504**	-

Note. * $p < .05$, ** $p < .001$

Table 3

Descriptive Statistics for the Criterion and Predictor Variables

Variables	*M*	*SD*
Course Points	957.69	55.39
Community of Inquiry (Block 3)		
Cognitive Presence	40.80	6.91
Teaching Presence	43.69	6.89
Social Presence	31.16	4.73
Perceived Learning (Block 4)		
Affective	13.48	3.45
Psychomotor	14.98	2.96
Cognitive	13.85	4.49

Frequency and descriptives for the type of online course format (Block 2) and demographic variables (Block 1) are discussed in the participant section and found in Table 3. Males had higher course points than females. Caucasians had higher course points than African Americans, American Indians, and Hispanics. Students who used both asynchronous and synchronous technologies in their course scored higher points in their course than those who used only asynchronous technologies (Table 4).

Table 4

*Descriptive Statistics for Course Points Disaggregated by Sex, Ethnicity, and Format of Online Course (*N = *131)*

Variable	*M*	*SD*	*n*
Ethnicity			
African-American	909.07	15.97	25

Caucasian	970.03	4.11	99
Hispanic	951.75	20.33	5
American Indian	963.37	20.03	4
Sex			
Male	962.07	7.49	52
Female	954.82	6.35	79
Type of format			
Asynchronous	952.49	7.21	65
Synchronous	962.81	6.46	66

The results of the HMR models for Blocks 1 and 2, which consisted of the control variables (i.e., sex, ethnicity, and type of program), reached statistical significance, F (2,128) = 4.74, p = .01 and F (3,127) =3.45, p = .019, p =.35. The model in Block 1 explained 6.9% of the variance in the course points, while the model in Block 2 explained 7.5% of the variance in the course points. While the overall model in Block 2 was significant, it is important to note that R^2 change was not significant; thus, the addition of type of online program did not result in a significant change in the explanation of the variance in the criterion, course points (see Table 3). After the entry of the social presence, cognitive presence, and teaching presence variables in Block 3, the model accounted for 49.6% of the variance in the course points; F (6,124) = 20.35, p < .001. Finally, after the three factors of perceived learning were added in Block 4, the entire model explained 55.5% of the variance of the course points, F(9,121) = 16.79, p <.001. The three factors of perceived learning added a variance of 5.9% to the model.

In the final model, teaching presence, social presence, and cognitive presence each made a significant individual contribution to the model, with teaching presence recording a higher beta value (β = .51) than social presence (β = .32) and cognitive presence (β = .19). Likewise, perceived cognitive learning made a significant individual contribution to the model (β = .26). A positive relationship existed between students' course points and these four variables. The higher students' sense of social presence, teaching presence, cognitive presence, and perceived cognitive learning, the higher their course points. The results of the change models and individual contributions of each variable in the final model for the hierarchical multiple regression are presented in Table 5.

Table 5

Hierarchical Regression Analysis Results for All Four Blocks

	R^2 Change	F Ratio for R^2 Change	B	SE	β	t	p
Block 1*	.069	4.74					.01
Block 2*	.006	.87					.35
Block 3*	.421	34.53					<.001
Block 4*	.555	5.37					.002
Sex			-.80	7.14	-.007	-.11	.91
Ethnicity			-10.82	5.68	-.13	-1.90	.06
Course Format			2.52	6.85	.02	.37	.71
Cognitive Presence*			1.55	.703	.19	2.20	.03
Social Presence*			3.85	1.02	.32	3.77	<.001
Teaching Presence*			4.07	.60	.51	6.78	<.001
Affective Learning			-1.26	1.30	-.08	-.99	.33
Psychomotor Learning			-.84	1.64	-.05	-.51	.61
Cognitive Learning*			3.22	.89	.26	3.60	<.001

Note. * $p < .05$

Discussion

The purpose of this study was to examine whether students' sense of community of inquiry and perceived learning predicted course points, while controlling for demographic variables and type of online course format. Consistent with the Community of Inquiry (CoI) theory and other research that formed the conceptual framework of this study, it was hypothesized that the predictor variables would significantly describe variance within course points. The results of this study clearly supported the foundational constructs of the community of inquiry (CoI) theory (Garrison et al., 2000) and the role of perceived learning to predict final course points. It is notable that the entire predictive model explained 55.6% of the variance in course points. Students with higher levels of perceived social presence, cognitive presence, and teaching presence had higher course scores. Likewise, perceived learning was also positively associated with students' course points.

While sequential modeling was not an element of design in this study, the findings do demonstrate that teaching presence was the strongest, individual predictor of course points. Thus, our study supported the findings of Shea and Bidjerano (2009) and Garrison and Cleveland-Innes (2005) that suggest social presence is not sufficient by itself to produce an effective online learning environment; teaching presence,

complimentary with cognitive and social presence, is necessary for student learning. Teaching presence serves as the major influence that sets the tone for the overall learning experience (Garrison et al, 2010). Direct instruction provided through media-rich communications such as those utilized in this study—responses to student questions and concerns via email, text messaging, discussion boards, blogs, Wikis, and video conferencing—is important for student learning. Given these results, the important role of the instructor is affirmed and the need for higher education institutions to develop well-structured online courses and train online faculty to instruct online learners using an approach that is personable, knowledgeable, and timely is suggested. Likewise, social presence may be enhanced through the facilitation of rich interaction among students, and cognitive presence may be supported by providing opportunities for collaboration and social construction of meaning (Swan et al., 2009).

Perceived learning was also determined to contribute significantly to the variance in students' course points when added to Model 3. Perceived cognitive learning was shown to individually contribute significantly to the variance among students' course points in the final model. This supports previous research that purports that student perceptions of learning and the course are positively related to learning outcomes (Kang et al., 2014; Russo & Benson, 2005). Thus, in tandem with the CoI, perceived learning also helps to provide a reliable model, with a sample large enough for good statistical power, for predicting student course points. The results of this study provide additional clarity regarding the nature of each of these variables and the importance of the role they play in online student success.

This study also considered individual and online delivery characteristics. While these characteristics only accounted for 7.5% of the variance in the course points, they suggest that individual demographics such as sex and ethnicity may have some influence on a student's success and experience in an online course. Further, consistent with inconclusive results about the influence of medium on online students' learning and community (Rockinson-Szapkiw, Baker, Neukrug, & Hanes 2012; Rubin et al., 2013), the addition of type of course to the model added variance, but not additional significant explanation of the variance in course points. This may be explained by the fact that at initial hiring, all faculty are trained to work with online learners using an approach that is personable, knowledgeable, and timely. There is a university-wide expectation and requirements for high levels of teacher presence. Specifically, in the MEd Teaching and Learning with Educational Technology and Online Instruction program, courses are designed to be highly interactive and are delivered using both synchronous and asynchronous technologies. These results and possible explanations suggest that the relationship between individual and online delivery characteristics and course points warrant further attention in future research.

Limitations

As with any study, there are limitations. The results may not be generalizable to other populations, including other subject areas, grade levels, or populations with different racial and ethnic representations. Likewise, the results may not be generalizable to students enrolled in courses that utilize different communication media. Thus, further research is needed to determine how applicable the model presented in this study is to other populations and, additionally, how reliable the model is with these different populations. To further current understanding, additional research could also explore interventions to enhance students' levels of sense of community and perceived learning as well as teacher

presence in online courses and the effects of such interventions on student outcomes. Further research may also include expanded outcomes such as authentic assessments.

Implications

Despite the limitations, the results provide several implications for online, graduate course designers and instructors. In initial design of online courses as well as online course redesign in graduate educational settings, the CoI framework may provide guidelines for the construction of the course. For specific guidelines and ideas on how to create and sustain CoI in online courses, course designers can consult Garrison's (2011) e-learning text. Each instrument used in this study is free and available to instructors; thus, course instructors may assess their students on elements in the model presented to determine areas where interventions are needed so that they can more appropriately tailor and offer opportunities to match student needs in regard to sense of community, teacher presence, and perceived learning; thus, providing opportunities to enhance students' opportunities for positive course outcomes.

Likewise, given that higher levels of CoI and higher levels of perceived learning lead to increased course grades in online courses, such as the courses utilized in this study, instructors can capitalize on the relationship by employing strategies that enhance teaching presence, social presence, cognitive presence, and students' perceptions of their own learning. For instance, deNoyelles, Zydney, and Chen (2014) recommend that instructors model social presence cues in order to enhance students' perceptions of social presence. Modeling social presence can include utilization of students' names and explicit student encouragement. Instructors can enhance teaching presence by providing "prompt, but modest instructor feedback" (deNoyelles et al., 2014, p. 159) or by integrating a peer facilitator. Cognitive presence can be enhanced the use of discussion prompts that require critical thinking (deNoyelles et al., 2014). Additionally, students' perceptions of their own learning can be increased by offering multiple opportunities for interactions among students (Richardson & Swan, 2003).

Conclusion

While approximately half of the variance in course points were explained by the CoI factors and perceived learning, a large portion of the variance is left unexplained. Thus, researchers desiring to further study student learning outcomes in relation to the CoI framework and the other variables in this study, should consider building a more robust model and include other predictor or moderation variables such as learner and instructor variables (Hiltz & Shea, 2005), integration variables (Tinto, 1997), other forms of presence (Kang, et al., 2014), or online course variables. Given the limitation of the use of two courses and one program at a single university, this study should be replicated across universities in various disciplines to further empirically validate or add to the CoI model.

This study provided evidence that the CoI factors (cognitive presence, teaching presence, and social presence) and perceived learning significantly predicted online graduate students' course points. These findings provide further support that the CoI framework as well as perceived learning may provide a useful conceptual framework for both evaluating and explaining an effective online learning environment. The results add to the limited body of literature examining the relationship between the linear

combination of the elements of the study and student learning outcomes (Ho & Swan, 2007; Kim et al., 2014). It moved beyond the study of the predictive validity for the three CoI factors on perceived learning and satisfaction in online courses (Arbaugh, 2008) to actual learning outcomes (course points). These results provide implications for course designers and instructors who desire to provide a better online learning experience for their graduate students.

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