2014

A model for measuring student persistence through collaborative learning

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by

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A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Human Computer Interaction

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Ames, Iowa

2014

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ACKNOWLEDGEMENTS

I would like to thank my committee chair, Brian Mennecke, for his support and direction. His encouragement was always present, and I appreciate that he willingly took the time to guide me through this journey. I would also like to thank my committee members, Anthony Townsend, Stephen Gilbert, Ana-Paula Correia, James McElroy, and Andrew Luse, for their guidance and support with my research.

In addition, I would also like to thank Pamela Shill and Debbie Johnson for helping me with scheduling, deadlines, and my constant stream of emails. I would like to thank my colleagues at Purdue for encouraging me to push forward and achieve my goal even when some days it felt impossible.

Finally, I want to thank to my family for their support, especially my husband and three children. My husband is my rock, and without his encouragement and belief in my abilities to persist, I would not have been successful in pursuing this degree.

ABSTRACT

Institutions of higher education are being called upon to provide a more robust pathway to a college degree and improve upon the advanced workforce for the needs of the 21st century. As 21st century skills call for an employee to successfully work collaboratively in groups, an increase in technology adoption, globalization and increased competition are among the factors that make collaboration one of the most important skills that employers insist that individuals obtain today. An active learning environment through collaborative learning techniques has been encouraged in higher education as a means of improving student engagement (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, 2014; Slavich & Zimbardo, 2012; Prince, 2004), but there is a gap in the literature when it comes to connecting the two research areas of collaborative learning and student intention to persist. Continued research is warranted to further understand the factors that may contribute to improving the situation of attrition, and to suggest ways that institutions can enhance engagement and ultimately improve student success. The purpose of this study is to create a model that will measure the factors that significantly influence a student's persistence in a computer supported collaborative learning environment. Based on prior theoretical research, the model is developed to analyze how collaborative learning is mediated by campus connectedness and a sense of community, and subsequently how it impacts student persistence utilizing affective organizational commitment and turnover intention measures. A survey instrument was developed based on the factors of the research model, and was tailored to the terminology used for communities and academia. To test the model, a cohort of students across multiple institutions was invited to participate in a virtual learning community, and a total of 103 students participated. To test the entire model, partial least

squares structural equation modeling (PLS-SEM) was used. In testing the design of the overall model utilizing structural equation modeling, the relationship between all factors but one were found to be statistically significant. In further analysis, the model design was also able to discern between two separate groups, adding to its versatility. Implications for research in this area include an expansion of student attrition research through turnover intention, scalability with the addition of more constructs, and ultimately a new model that contributes to future research that is not limited to a higher education domain.

CHAPTER 1. INTRODUCTION

Institutions of higher education are being called upon to provide a more robust pathway to a college degree and improve upon the advanced workforce for the needs of the 21st century. However, in higher education today the demographic makeup of the student population is increasingly varied in the areas of age, enrollment status (full-time versus part-time), and institution type (2 year or 4 year) (U.S. Department of Education, National Center for Education Statistics, 2013). To compound the situation, there is a lower degree attainment rate in those students that do not fit the younger, full-time student demographic (Ross, Kena, Rathbun, Kewal Ramani, Zhang, Kristapovich, & Manning, 2012), and despite prior research (Bean & Metzner, 1985), the trend has not improved in recent years (Snyder & Dillow, 2012). To meet the needs of the advanced workforce, and recognizing that the demographics of the United States are resulting in a more varied, diverse population, a commitment to a more highly educated workforce requires a more supportive environment for student success.

As 21st century skills call for an employee to successfully work collaboratively in groups, an increase in technology adoption, globalization and increased competition are among the factors that make collaboration one of the most important skills that employers insist that individuals obtain today. The modern workplace incorporates technology usage, predominately information technology, to support an organization in developing what has been called the *learning organization* (Senge & Suzuki, 1994). Structuring the workplace in this manner recognizes that while individual skills and knowledge are important, working

with others to create new understanding in increasingly complicated workplace environments is greater when utilizing a combination of multiple skillsets and knowledge domains.

As a result, successful businesses require much higher skills and knowledge than previously required, but the path to a degree in higher education has become more challenging because students are bearing a much higher percentage of the cost of education. This is partially due to state governments shifting resources and support away from higher education. A response to these challenges has included increased financial aid and fiscal support. This type of student support does not, however, recognize the condition in which students are enrolling into degreed programs. Time and distance are now important factors as students seek out a degree in non-traditional settings, such as from a distance or while working full time. Traditionally, the academic response has been to focus on programming exclusively: better curriculum will result in higher graduation rates. But this idea is based upon the assumption that, in part, a higher quality program attracts higher quality students. While colleges and universities can, and should, attract the best students, institutions are grounded in the environments they serve, to the populations they educate, and the constituents they serve. To be sustainable, this means that the higher education environment must encourage a sense of community and connectedness that recognizes student diversity of thought and opinion, and of qualified merit.

In order to retain these students through graduation, Vincent Tinto (2005) makes the following recommendations to an institution seeking to improve student persistence:

1. A commitment to success must include monetary resources and not just words.
2. A high expectation of student performance begins with the first year.
3. Develop support programs for navigating the new college environment.

4. Utilize student feedback and assessments of the learning environment.
5. Foster student involvement both academically and socially.
6. Focus on the development of a setting that encourages learning.

These conditions are all attainable based on the characteristics of community and are not discipline specific. With a strong community, the results will be increased involvement in learning, promotion of social and academic involvement, and academic support for the student's motivation to persist (Tinto, 1997, 1998, 2003; Stefanou & Salisbury-Glennon, 2002; Zhao & Kuh, 2004).

In the mission for student persistence through active involvement, the availability of computer supported collaborative learning brings together technology, interaction and learning (Stahl, Koschmann, & Suthers, 2006) much like a learning community. Utilizing online technology in the course for group work, and augmenting with a virtual learning community, offers a vehicle for collaborative learning beyond the limited time in the classroom. An active learning environment through collaborative learning techniques has been encouraged in higher education as a means of improving student engagement (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, 2014; Slavich & Zimbardo, 2012; Prince, 2004), but there is a gap in the literature when it comes to connecting the two areas of research. The proposed model in this study can be utilized to measure the impact of community and connectedness found in collaborative learning activities on student intentions to persist.

The purpose of this study is to create a model that will measure the factors that significantly influence a student's persistence in higher education based on feelings of community and connectedness experienced while participating in a computer supported

collaborative learning environment. Tinto (2005) explains that the conditions in which institutions place their students may be designed, controlled, and modified for the goal of greater student persistence across the academic life of the college student. Based on these conditions of success, continued research is warranted to further understand factors that can contribute to improving the unrelenting situation.

This paper begins with a review of literature over prior research relevant to this study. This includes areas such as collaborative learning, community, connectedness, commitment and turnover intention. Following this, the proposed research methods and procedures for facilitating this study are discussed and this is followed with the analysis and results of the study. The paper concludes with a summary and discussion of the study.

CHAPTER 2. REVIEW OF LITERATURE

The purpose of this study is to research factors that can impact student persistence. The foundations of research for this literature review are based on collaborative learning, learning communities, sense of community, connectedness, usability and commitment.

Usability

Gerhard Fischer (2001, p.65) states "A fundamental objective of human-computer interaction research is to make system more usable, more useful, and to provide users with experiences fitting their specific background knowledge and objectives." Usability is a core concept in the study of human-computer interaction, and it is the measurement of how easy an interface is to use (Nielsen, 1993). Nielsen defines usability into five main components:

1. Learnability – measured by how easy it is to complete basic tasks in an initial encounter with the system.
2. Efficiency – measured by how quickly tasks can be performed
3. Memorability – After returning to the system, how easily can proficiency be retained
4. Errors – Based on the number of errors that a user makes and how the errors are recovered
5. Satisfaction – how the system is received by the user

Usability is also measured against the context in which it is currently being used (Phang, Kankanhalli, & Sabherwal, 2009; Brooke, 1996). In the case of this study, students utilize a course management system to collaborate inside and outside of the classroom. The virtual learning community also ties these students together by utilizing the same course management system.

The System Usability Scale (SUS) developed by John Brooke (1996) is a means for easily assessing the usability of a tool or system. The scale produces a single number that is considered the overall usability of the item being studied. Bangor, Kortum, and Miller (2008) evaluated Brooke's scale by reviewing over 200 studies in the previous 10 years that have utilized SUS in research. Based on their review, Bangor, Kortum, and Miller (2008) identified six ways that the SUS can be effectively used when evaluating usability in a study. First, the scale allows a practitioner to determine if the researched system is usable or not based on a single score. The flexibility of the scale also provides an opportunity to compare multiple user tasks within a complex system and/or revisit the same system each time a revision is made. Additionally, alternative designs of the same system can be compared as well as similar designs of competing systems. For example, Unal and Unal (2011) conducted a usability study that compared two course management systems to determine which system the students in a particular course found to be more usable. Finally, because the SUS does not discriminate when it comes to what technology is utilized, the scale can be used to compare multiple technology platforms.

An important factor for students when using course management systems is ease of use. Previous studies have evaluated the usability of course and learning management systems (Blecken, Bruggemann, & Marx, 2010; Oztekin, Kong, & Uysal, 2010; Unal & Unal, 2011). The importance of these studies is such that if a student does not find the system to be adequately usable, the effectiveness of the course will be diminished.

Blecken, Bruggemann, and Marx (2010) conducted a usability test on a learning management system with ten testers, a set of tasks to perform on the system, and a subsequent questionnaire. A survey was then administered to a larger set of registered users

that included a standardized version of the SUS, and an overall score of 64 was reported out of 100. According to Bangor, Kortum, and Miller (2008), a score of 64 would be above the threshold of certain usability difficulties (under 50), but below the promising acceptability score (above 70). Blecken, Bruggemann, and Marx (2010) also included open-ended questions about the usability of the system in their survey which in turn were beneficial when discussing the results of the overall SUS score.

An alternative to the SUS is UseLearn, a usability evaluation checklist developed by Oztekin, Kong, and Uysal (2010). The UseLearn checklist is a way of integrating both metrics quality and usability into one evaluation tool. While UseLearn measures for the basic usability factors of efficiency, effectiveness, and satisfaction, it also measures additional factors for a more detailed analysis that can be broken out into separate dimensions. For example, flexibility may score high, but aesthetics may score low, so for a practical purpose a developer would concentrate on correcting the look of the system but not the functionality. While the study was directed toward the development of UseLearn for the identification of usability issues in learning systems, it did not study why participants identified particular usability issues in the system being evaluated.

Collaborative Learning

The National Research Council (2011, p. 1) refers to 21st century skills as "being able to solve complex problems, to think critically about tasks, to effectively communicate with people from a variety of different cultures and using a variety of different techniques, to work in collaboration with others, to adapt to rapidly changing environments and conditions for performing tasks, to effectively manage one's work, and to acquire new skills and

information on one's own." The expectation of the workplace is that every employee must be able to adapt to change, use critical thinking skills and collaborate professionally (Jerald, 2009). Collaborative teams produce better work due to the diversity of interdisciplinary ideas, and the work itself is becoming too multifarious for just one person to complete efficiently. Just as the workplace in the 21st century depends on teamwork, higher education is moving to active learning techniques (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, 2014).

While higher education is engaging in active learning techniques, such as collaborative learning teams, for the benefit of the workplace, it is also found to improve student persistence in college. Research in undergraduate student persistence has encouraged this shift in instructional delivery as collaborative learning is found to play a significant role in retention of first-year students (Freeman et al., 2014; Tinto, 1997; Tinto, 1998).

Collaborative learning

Collaborative learning is achieved when individual strengths are combined so that all members of the group participate in the collaborative construction of knowledge (Stahl, Koschmann, & Suthers, 2006). Collaborative learning fosters a diversity of thought and allows for others to experience differing ideas for discussion. Each member brings an individual perspective to the group, which can collectively add to the knowledge gained. Individual perspectives are unique to each member based on prior experiences. An exercise in collaborative learning allows an individual to learn how to accomplish a task with a combined effort of shared ideas instead of dividing up the work and assimilating it for final submission. Collaborative learning also involves a community of learners and teachers that

share experiences or knowledge through social interaction (Zhu, 2012). The focus of learning is not limited to the knowledge of just the instructor, but rather the instructor acts as a facilitator of the interaction among all involved parties. Members of the group control the collaboration process with input from the instructor, and it is the responsibility of the entire group to participate in all aspects of the process including the diffusion of conflicts, contribution of ideas, and the achievement of learning goals (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007).

There is a long history of research pertaining to the benefits of collaborative work in the traditional educational settings as well as distance education. One simple benefit is the realization, transfer, and convergence of knowledge among participants in a collaborative learning team. Some of the widely cited advantages of collaborative learning include the encouragement of active and constructive learning, an improved processing of information, critical thinking, and reasoned learning (Bernard, Rojo de Rubalcava, St. Pierre, 2000; Brown & Palincsar, 1989).

The premise of active learning is to involve students in the learning process through engaging activities and foster an environment that encourages students to communicate ideas rather than passively acquire knowledge from an instructor in a lecture driven atmosphere (Freeman, et al., 2014; Slavich & Zimbardo, 2012; Prince, 2004). Freeman et al. (2014) analyzed student performance in courses that delivered material in a traditional lecture environment versus an active learning environment. While it was found that students were 1.5 times more likely to fail in the lecture driven environment than those in the active learning environment, it was noted in the article that the current trend is moving away from traditional lectures. Consequently, Freeman, et al. (2014) suggest that future research should

focus on what they call "second-generation research" pertaining to types of active learning, consequences of active learning, and what active learning techniques are more beneficial. Slavich and Zimbardo (2012) contend that collaborative learning is a method for teaching the principles of active learning, and that these approaches have theoretical similarities. Additionally, collaborative techniques of learning have been influenced by the educational concept of constructivism, where an individual gains knowledge more effectively when there is a realization of how new information may conflict with his/her experiential understanding of a concept (Slavich & Zimbardo, 2012) as well as the theory of social constructivism which is based on the idea that an individual can enhance his or her own construction of knowledge by negotiating meanings with other individuals (Bernard, Rojo de Rubalcava, St. Pierre, 2000; So & Brush, 2008; Zhu, 2012). The connection occurs in the method. The active learning occurs in the group collaboration activity, which is engaging rather than passive. With each task, the members of the group should be able to develop ideas, compare individual perspectives, and understand multiple viewpoints of an argument, and articulate their observations to the group (Karagiorgi & Symeou, 2005).

Nelson (1994) presents a structured approach to fostering critical thinking via collaboration learning methods that involves preparation, cognitive structuring, and role structuring. First, an instructor should select a topic that the majority of students can relate to or efficiently acquire knowledge about the topic. Second, apply cognitive structuring to the topic by invoking a task that requires deeper thought beyond a cursory discussion. Finally, the role-structuring process is meant to get all members of the group to participate with interest. Nelson's (1994) approach gives the students enough material at the beginning of the project that they can relate it back to prior personal experiences and individually acquired

knowledge. Then, he gives the students a task that relies on the input from everyone in the group to think critically on the topic. The final part of the process requires that all students participate in order to complete the task without hindering progress. Nelson (1994) notes that convincing students to embrace a different viewpoint on a topic can be challenging and sometimes sensitive due to upbringing or past experiences, so a structured approach to collaborative learning and critical thinking is essential for participation and engagement.

Computer-supported collaborative learning

Computer-supported collaborative learning (CSCL) emerged as a research field in the 1990s in response to new software innovations that were meant to bring students together to learn (Stahl, Koschmann, & Suthers, 2006). According to a historical perspective written by Stahl, Koschmann and Suthers (2006), the CSCL emerged from three early projects researching the use of technology to improve learning through organized social activity with instruction: the ENFI Project at Gallaudet University, the CSILE project at the University of Toronto, and the Fifth Dimension Project at the University of California San Diego. The ENFI Project enabled students and their instructor to use computers as a medium for textual communication discussions. The CSILE (Computer Supported Intentional Learning Environment) Project developed computing technologies to transform classrooms into *knowledge-building communities*. The Fifth Dimension Project focused on computer-based activities for the enhancement of student skills in reading and problem solving. Stahl, Koschmann, and Suthers (2006) comment that all three of these early projects introduced organized social activity with the use of technology within the instructional design.

Kirschner and Erkens (2013) developed a framework for CSCL research that is divided into three main elements: pedagogical, social and technological. This framework is meant to provide structure for future research in the CSCL domain by identifying the varying qualities of the environment and areas that are lacking in research and a visual representation of the 3 x 3 x 3 cube can be found in Figure 1. The *pedagogical* element pertains to the learning portion of the collaborative learning environment, and the tools used to support and guide the individual, team, and/or community through a set of learning goals.

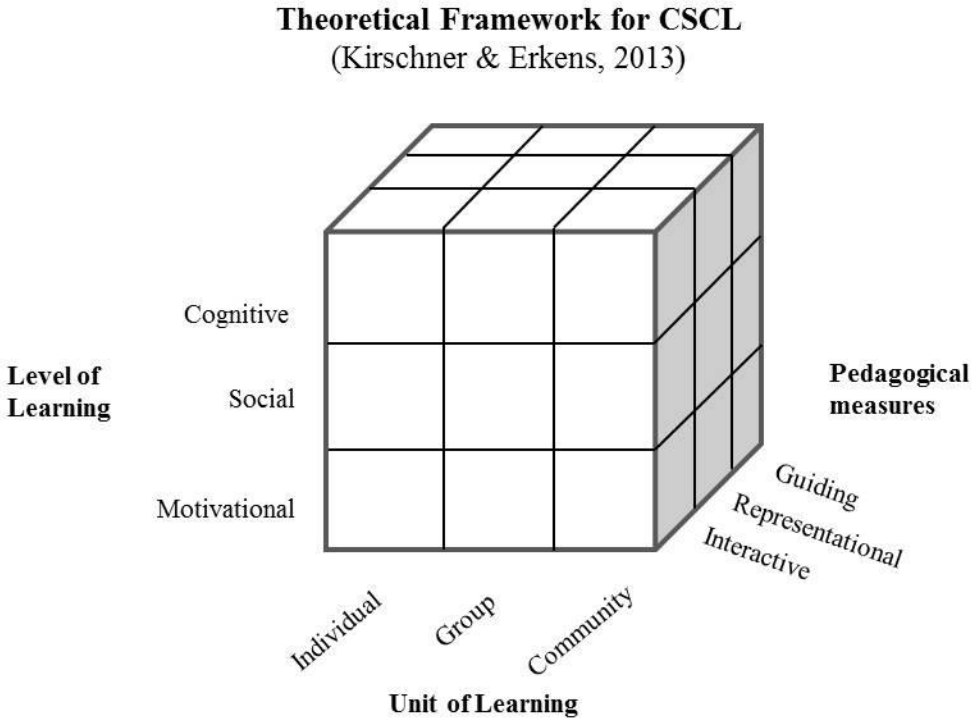

Figure 1. Theoretical framework for CSCL

The *level of learning* element pertains to the skills that students use to work collaboratively in a team. This element includes the communication process that students navigate when working on a team task, and the level of motivation that a student puts forth to be successful

and engaged in a task. Finally, the social aspect involves not only the student to student interaction, but also the level of student/teacher interaction. The third element, the *unit of learning* element, pertains to the technological needs of the activity depending on the makeup of the environment. Most CSCL environments have the basic communication tools, productivity tools and support tools for individual, group and/or community use, but how the CSCL tools are presented and encouraged for use will determine the utilization of the technology and effectiveness of the activity.

The developers of the multidimensional framework provide a structure to CSCL research, and the identified factors can be constructed in multiple combinations. For example, a study could focus on just one cube of factors, one complete slice, or a combination of multiple cubes. The framework also helps to identify gaps in CSCL research. Kirschner and Erkens (2013) conclude with recommendations on future research based on gaps in the 3 x 3 x 3 cube. They suggest that more research is needed concerning the social aspects of CSCL, which is consequently addressed in a separate article with an additional research framework specific to sociability, social space, and social presence (Kreijns, Kirschner, & Vermeulen, 2013). Kreijns, Kirschner, and Vermeulen (2013) note that social space is a network of relationships among group members, and a strong social space that is based on a solid group structure. Notably, the authors include sense of community and feelings of belonging as two important elements of a solid group structure.

When it comes to distance learning, CSCL can help to overcome the feeling of isolation that can occur when students feel disconnected from their fellow classmates and instructor with the proper tasks, such as requiring activities with a large amount of collaboration effort (Dewiyanti et al., 2007). Kreijns, Kirschner, Jochems, and van Buuren

(2007) contend that CSCL environments with both educational functionality and social functionality fulfill the learning needs of the students. It allows for a complete learning experience, called a *sociable* CSCL environment. Such an environment can reduce feelings of isolation and reduce attrition as students develop a sense of community through interchanges of information and a commitment to participate in the community (Rovai, 2001). Abedin, Daneshgar, and D'Ambra (2011) studied the difference between on-task and non-task social interactions with a focus on the factors that affect non-task sociability of CSCL environments. On-task social interactions include group learning and instructional activities whereas non-task social interactions include exchanges that are not directly related to learning. It was concluded that the students who can alter their communicative behaviors to adapt to a course CSCL environment will enjoy the educational experience more and will participate more with a greater sense of community, but the effect of the sense of community on student intention is not addressed.

Beyond the social aspect of CSCL, this research domain also investigates how collaborative learning, when supported by technology, can enhance how students work in groups interactively, and how technology can facilitate shared knowledge among the members of a group (Wang, 2009; Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007). Wang (2009) conducts a research study on three aspects of CSCL: individual accountability, positive interdependence, and the quality of the collaborative learning process. While collaborative learning involves working as a group to collectively complete a task, each individual is expected to participate, and is accountable for his or her share. The presence of individual accountability encourages ownership of the learning task, and special attention to the meaningfulness of the task, equality among group members, and added instructional

strategies can help to foster this atmosphere of learning (Wang, 2009; Brandon & Hollingshead, 1999). While each member is expected to provide individual effort, members of a team work as a collective unit and depend on each other for the success of the project (Brandon & Hollingshead, 1999). One person cannot do it all on his or her own. The level of a group's sense of community can affect the positive interdependence among the team members. Wang (2009) also suggests that both individual accountability and positive interdependence require coordination if a collaborative learning environment is to be successful. Guidance and organization from external support can keep the learning task on track.

The use of CSCL technologies also makes online collaborative learning more effective if implemented with the needs of the student in mind based on the task at hand. Collaborative techniques of online learning have been influenced by the theory of social constructivism which is based on the idea that an individual can enhance his or her own construction of knowledge by negotiating meanings with other individuals (Bernard, Rojo de Rubalcava, St. Pierre, 2000; So & Brush, 2008; Zhu, 2012). Bernard, Rojo de Rubalcava, and St. Pierre (2000) suggest some design considerations for collaborative online learning: proper assessment of student needs, communication of expectations, create a positive social environment, set collaborative small group projects, promote the sharing of information, and determine what level of technology is available to participants as well as the technology readiness of the participants. Brandon and Hollingshead (1999) remind readers that the role that CSCL plays in a course is based on an instructor's setup and design of the course, not just adding technology to a course.

Prior research pertaining specifically to CSCL environments are varied, but generally interested in the satisfaction of the CSCL environment as it pertains to the collaborative task of the learner (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007). Zhu (2012) researched online collaborative learning by analyzing student satisfaction, performance and knowledge construction from a cross-cultural perspective. Students from a Flemish university and a Chinese university were divided up into collaborative groups for a CSCL task. Flemish students liked working at their own pace, but found that working on the tasks online was too time-consuming. Chinese students liked that they could work with others on assignments, but they were dissatisfied with the level of interaction between the students and instructor. Both sets of students did agree that the collaborative learning process assisted with understanding the learning content. Zhu (2012) contends that regardless of cultural backgrounds, student perceived satisfaction and performance are important factors to analyze before implementing a collaborative learning environment. Additionally, an assessment of individual differences ahead of a CSCL task is useful for mitigating any issues before they arise.

There is also discussion on how to appropriately measure CSCL environments (Vatrapu, Suthers, & Medina, 2008; Gress, Fior, Hadwin, & Winne, 2010; Summers, Beretvas, Svinicki, & Gorin, 2005; Wang, 2009). Wang (2009) studied the importance of an instructor supported collaborative learning environment that fosters group collaboration. The research study involved four classes participating in projects in pairs of students with a focus on friendship and meaningful learning tasks to promote individual accountability and positive interdependence. Varying strategies were applied and analyzed for effectiveness. The results found that friendships allowed for a closer working relationship, and that by

making the learning tasks meaningful, it resulted in the groups taking ownership for the task. Alternatively, coordinating and monitoring the learning process was a challenge for CSCL as some groups chose not to work collectively in the CSCL environment. Wang (2009) concluded that an effective CSCL environment requires varying communication tools that appeal to more members of the groups and are easy to use as a text only communication medium may be lacking.

Cho, Gay, Davidson, and Ingraffea (2007) investigated the relationship between communication styles, social networks, and learning performance utilizing a CSCL community. They found that communication styles and pre-existing friendships significantly affected the way learners developed social networks for the purposed of collaborative learning, but also acknowledged that more research is warranted in the areas of social structures, learner behaviors and the collaborative learning activities.

Based on review of the literature, the following hypothesis can be anticipated:

H1*: The perceived usability of a CSCL system will influence collaborative learning involvement.*

Connectedness

In research pertaining to the measurement of belonging, Lee and Robbins (1995) propose that the notion of belongingness is composed of three main constructs – companionship, affiliation and connectedness. While companionship is the act of bonding with another human being and affiliation is the establishment of peer relations of similar values, connectedness is a feeling of relatedness and identification of differences. Townsend and McWhirter (2005) conducted a literature review specifically on the construct of

connectedness to identify a common definition of the construct as well as an appraisal of the many dimensions of connectedness. Townsend and McWhirter (2005) selected a definition by Hagerty, Lynch-Sauer, Patusky, and Bouwsema (1993, p. 293) who defined the occurrence of connectedness as "when a person is actively involved with another person, object, group, or environment, and that involvement promotes a sense of comfort, well-being, and anxiety-reduction."

Within the construct of connectedness, Lee and Robbins (1995, 1998, 2000) define *social connectedness* as "an aspect of the self that reflects subjective awareness of interpersonal closeness with the social world *in toto*." Positive social connectedness is described by Lee and Robbins (1995) as a feeling of confidence and comfort, without threat to one's self-esteem, within a larger social setting than just the familiar confines of family or friends. Alternatively, if a positive level of connectedness is not achieved, Lee and Robbins (1995) postulate that an individual will disconnect from other people and become isolated due to the frustration felt when attempts to be understood fail. In a study to measure belongingness among undergraduate students, Lee and Robbins (1995) developed two self-reporting scales, the Social Connectedness Scale and the Social Assurance Scale. Lee, Draper, and Lee (2001) later revised the Social Connectedness Scale to correct for psychometric limitations as the scale originally contained only negatively worded items which may potentially result in a response bias. The scale also lacked the ability to capture an individual's perception of a sense of closeness with others as well as maintaining and seeking connections (Lee, Draper, & Lee, 2001). Lee, Draper, and Lee (2001) contend that the revisions still maintain the scale's original theoretical foundation for an "independent sense of self", or social connectedness.

Campus connectedness

As stated earlier, Tinto (2005) stresses the responsibility of an institution to develop an environment of success if improved student persistence is to be obtained. The conditions of success include institutional level student support, commitment to both academic and social involvement, and programs for navigating the college environment. These conditions are beyond a collaborative learning group, beyond the confines of the classroom, but rather, they reside at a broader campus level of association. In a college collaborative learning environment, if a student feels that he or she is not able to overcome a lack of connection with the group, that student may become distant and not participate effectively in the group activity. This situation may ultimately lead a student to attrition from the university due to a low sense of connectedness on a campus level.

Campus connectedness is the study of social connectedness in the context of a college environment (Lee, Keough, & Sexton, 2002). In a study of the social connectedness in college women and men, Lee, Keough, and Sexton (2002) modified the original Social Connectedness Scale (Lee & Robbins, 1995) to study one's self reported degree of interpersonal closeness and the difficulty in maintaining said sense of closeness. The study found that women who experience low connectedness report a negative campus climate and higher level of stress. The college men did not experience the same relationship, as their negative view of climate did not result in significant greater stress as it would be perceived as a loss of power. Lee, Keough, and Sexton (2002) conclude that their findings will assist university staff in how to improve perceptions of campus climate in relation to an individual's level of connectedness.

Freeman, Anderman, and Jensen (2007) conducted a study to examine the association between the sense of belonging in a single class and belonging at the university level using two variables, faculty-student interaction and sense of social acceptance, that are meant to cultivate a sense of belonging. The results of the hypothesis that the sense of belonging in a single class contributes to an overall sense of belonging at the university level was not supported. Freeman, Anderman, and Jensen (2007) suggest that a student's sense of social acceptance by peers and instructors might be the most importance factor in an overall sense of belonging, but they concur that more research is needed in the area of university-level belonging.

Pym, Goodman, and Patsika (2011) focused on how social connectedness can impact a student's transition to higher education. The study utilized a modified version of the campus connectedness scale developed by Lee and Robbins (2000), qualitative data collected from various mediums over a six year period, and student GPA as an academic performance identifier. While Pym, Goodman, and Patsika (2011) identified a strong sense of connect among peers, the relationship between connectedness and academic performance was not as strong as expected. It was suggested that a student's GPA may not have been an adequate measure of academic performance due to the length of the study and the diversity of courses.

Summers, et al. (2005) evaluated collaborative learning methods based on feelings of campus connectedness, academic classroom community, and effective group processing. An important task of this study was to develop a survey that would quantitatively capture outcomes of instructional methods for the development of learning communities. Summers, et al. (2005) deliberate in their analysis that classroom community may influence campus

connectedness based on their research findings, and consequently, call for further study on the subject.

After an examination of prior research and the call for more research by Freeman, Anderman, and Jensen (2007) on university-level belonging, the following hypothesis will be analyzed pertaining to connectedness:

H2: *Students with greater involvement in collaborative learning will have a greater sense of campus connectedness.*

Sense of Community

McMillan and Chavis (1986, page 9) define the theory of a 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." Based on this definition, they expound on the theory with four elements: membership, influence, integration, and shared emotional connection. The element of *membership* pertains to the boundaries of belonging to the group. One may or may not belong to the group, and if there is acceptance, a personal investment is made. *Influence* occurs on two levels. A member of the group may be attracted to participation if there is an opportunity to influence others. On the other hand, the community will seek to influence conformity among members. The third element is *integration* (also referred to as reinforcement (McMillan & Chavis, 1986). Members will ultimately participate when it serves their needs. Finally, the element of *shared emotional connection* is based on the bond that occurs from shared events by the membership.

A commonly used scale for measuring sense of community was developed by Chavis, Hogge, McMillan, and Wandersman (1986) called the Sense of Community Index (SCI). Recently, Chavis, Lee and Acosta (2008) developed a new instrument called the SCI2 as a better representation of the original four-dimensions found in the sense of community theory by McMillan and Chavis, and to address the criticisms found in the original index (Abfalter, Zaglia, & Mueller, 2012). According to the researchers of the SCI2, the SCI experienced inconsistent reliability among the subscales, the structure of the scale only allowed for limited variance, and it was not easily adaptable across other environments. Unlike the original SCI, the revised scale has shown greater reliability and validity across different cultures, and is able to cover all of the attributes found in the original theory.

Abfalter, Zaglia, and Mueller (2012) utilized the SCI2 to better understand the dynamics of virtual communities and to improve the measurement of a sense of virtual community (SOVC). A comparison of the original SCI to measure a virtual community was performed against the revised SCI2. The results found that the revised scale had a better measurement result than the original, but only by a marginal amount. In order to use the SCI2 in a virtual environment study, the researchers recommend that certain items be eliminated based on the structure of the virtual community. For example, if the community is large, it would be difficult for a member of the community to state that he/she recognizes everyone in the community. Instead, a participant may be a member of a smaller subgroup inside the larger virtual community, so addressing subgroups may be more helpful in the research and refinement of SOVC measurements (Abfalter, Zaglia, & Mueller, 2012).

In addition to the topic of online communities, Brown (2001) describes three stages in the development of community. First, acquaintances are made online. Second, stakeholders

feel as if they are part of a community based on the result of a community based on the result of an exchange of ideas. Finally, after a length of time in which personal communication occurs, a feeling of fellowship is solidified. This explanation of community corresponds with the social presence construct (Garrison & Arbaugh, 2007). Social presence includes open communication, group cohesion and affective expression, as described in the community of inquire framework (Garrison, Anderson, & Archer, 2000). Previous research sometimes uses these two terms interchangeably, but Rovai (2001, 2002) explains that social presence is just one variable among many that impact a sense of community, specifically an online community. These factors are not related to the type of medium that is utilized to develop the online community because prior research has noted that the medium characteristics are not as important as the types of activities and experiences the students are engaged (So & Brush, 2008).

Learning community

The term "learning community" is used to describe a variety of programs, not only in academia but also in the professional realm. A learning community is generally defined as a group of people with shared interests who come together for the purpose of learning (Cross, 1998). Another simple description of a learning community consists of a group of students taking two or more classes together (Tinto, 1997). This ensures that the students spend a significant amount of time together on common activities in and out of the classroom (Zhao & Kuh, 2004; Brower & Dettinger, 1998). Table 1 identifies the broad learning community types.

Table 1. Types of learning communities (Lenning & Ebbers, 1999; Zhao & Kuh, 2004).

Learning Community Delivery	Description
Curricular	Students are enrolled in two or more courses together, bound by a common theme.
Classroom	The classroom is the foundation when fostering cooperative learning activities.
Residential	Students taking two or more of the same courses live in close proximity.
Student-type	Designed for targeted groups.

Each delivery method may be facilitated independently or in combination. The curricular focuses on the common subject matter that all participants in the learning community will learn about. The benefit to this method is that the students may be in a face to face setting or an online setting since it is driven by the curriculum. The classroom method allows for activities to be administered during designated classroom time when students are expected to be in attendance. The residential method utilizes a common living area such as a residence hall. These students have the advantage of not only being in class together, but also the opportunity to collaborate and socialize while living in close quarters. The student-type method focuses on the common bond between the students. This could be a particular student organization such as Women in Technology. When it comes to combining these delivery methods, a learning community made up of a particular student type may also live in the same residence hall. Similarly, students taking similar courses in different locations may participation in an online learning community. Regardless of the chosen method, students participating in a learning community are found to possess higher levels of achievement, learning, and success (Taylor, Moore, MacGregor, & Lindblad, 2004; Tinto, 2003; Tinto & Russo, 1994).

There are direct and indirect benefits when it comes to learning community participation. Much effort has gone into the direct benefits of learning community research. As an intervention, prior research has analyzed direct benefits to improve student retention and graduation to meet the wider demographic needs and quality assurance needs of higher education. These direct benefits include student retention, higher grades, and ultimately improved graduation rate, to name a few. However, an emerging, and important trend has focused on the indirect benefits of learning communities. Where direct benefits are more program and discipline specific, how learning communities may be applied more generally are required. The recent research on the indirect benefits of learning community includes participation, and how participation is a product of student engagement, regardless of pedagogy.

The indirect benefits of learning community warrant deeper investigation. The broader impacts that are a result of the indirect benefits of a learning community require wider identification to meet these higher educational goals, beyond specific disciplines. The indirect benefits will inform the wider, non-specific goals that are programmatic and may be implemented, regardless of specific academic units. Student focused research engages in indirect learning community benefits. For example, student engagement is described by Kuh (2003) as the level of time and energy a college student spends on learning. Further, when reviewing the common characteristics of a learning community, prior research has suggested a positive relationship with this form of engagement. Zhao and Kuh (2004) studied engagement as a mediator, and found that participating in a learning community was related more to student engagement than learning outcomes, and that student engagement was more closely related to the learning outcomes. Some other important characteristics of a learning

community include the collaboration of peers in active learning experiences, sharing of knowledge, and academic and social engagement (Brower & Dettinger, 1998; Tinto & Russo, 1994; Zhao & Kuh, 2004).

Building upon prior work, this research study has developed a model that is cognizant of a learning community foundation. There are some characteristics that most learning communities share. One common characteristic is the encouragement of learning among students. Learning community participation has been found to be positively related to time spent on academics (Inkelas, Daver, Vogt, & Leonard, 2007; Zhao & Kuh, 2004) and higher-order thinking (Inkelas & Weisman, 2003; Pike, 1999; Zhao & Kuh, 2004). Another important characteristic that has been found to be positive is the interaction among students and faculty (Ancar, Freeman & Field, 2006; Tinto, 2006; Tinto, Russo, & Kadel-Taras, 1994; Inkelas et al., 2007; Inkelas & Weisman, 2003; Pike, 1999; Pike, Schroeder, & Berry, 1997; Zhao & Kuh, 2004). The interaction between faculty and student is a strong predictor of student success in the classroom.

The characteristic of social integration allows for the sharing of knowledge and the involvement of students both socially and intellectually (Tinto, 2003). This is also an indirect benefit as suggested by prior research in peer collaboration activities (Inkelas et al., 2007; Inkelas & Weisman, 2003; Zhao & Kuh, 2004). As with faculty and student interaction, the social aspect of the learning community is important to improved student persistence. Students that get to know their peers on a personal level allows for improved collaboration efforts.

There is added complexity when it comes to social interaction due to the fact that not all learning communities are residential based. As the demographics of the student are

becoming more varied, the path to higher education is responding in increasing trends. The traditional college student path is becoming part of a broader higher educational route. Students are increasingly attending college and the university and increasing their travel to and from classes without taking advantage of the traditional campus resources available to the residential college student. The commuter student may only learn and interact with peers and faculty when in the classroom (Tinto 1997, 2003; Tinto, Russo & Kadel-Taras, 1996). Tinto and Russo (1994) studied the effects of learning community activities facilitated on a commuter campus. The learning community experience served to bridge academia and social life rather than force a non-residential student to choose just one. Furthermore, the learning community experience resulted in a higher level of student persistence than a traditional commuter environment.

A common institutional goal is to promote student success, particularly during the first year, but institutional commitment wanes and can be found lacking. The impact of reduced student focus after the initial introduction to higher education results in a limited impact of the learning community (Tinto, 2005). Tinto argues that the conditions in which institutions place their students may be designed, controlled and modified for the goal of greater student persistence across the academic life of the college student. This is accomplished with six conditions of success: commitment, expectations, support, feedback, involvement, and learning. Tinto (2005) justifies these conditions with the following recommendations to an institution wanting to improve student persistence:

1. A commitment to success must include monetary resources and not just words.
2. A high expectation of student performance begins with the first year.
3. Develop support programs for navigating the new college environment.

4. Utilize student feedback and assessments of the learning environment.
5. Foster student involvement both academically and socially.
6. Focus on the development of a setting that encourages learning.

These conditions are all attainable with the characteristics of a learning community and are not discipline specific. They actively involve students in learning, promote social and academic involvement, and offer academic support for the motivation to persist, however indirectly (Tinto, 1997, 1998, 2003; Stefanou & Salisbury-Glennon, 2002; Zhao & Kuh, 2004).

Based on research pertaining to sense of community, two additional hypotheses are proposed:

H3: *Students with greater involvement in collaborative learning will have a greater sense of community.*

H4: *Students with a greater sense of community will have a greater sense of campus connectedness.*

Commitment

Meyer and Allen (1991) identify three general themes when researching commitment, specifically organizational commitment. First, commitment can be described as affective where an individual has an emotional attachment to an organization. The more that the individual connects with the organization, a stronger commitment is experienced. In other research studies, the perceived cost of leaving an organization is weighed by an individual. The greater the cost, the less likely the individual will leave. The third approach is based on the obligation that an individual feels toward an organization to stay committed. Based on

these themes, Allen and Meyer (1990) developed a three-component model to analyze affective, continuance and normative commitment levels.

Allen and Meyer (1990) explain that the three components are linked together in such a way that the model decreases turnover rates, but each has individual roles to play in the act of commitment toward an organization. Individuals who stay in an organization because they want to stay experience a level of affective commitment. Those who stay because they need to stay experience a level of continuance commitment, and normative commitment is when individuals stay because they feel obligated to the organization.

In one particular component of commitment, Meyer and Allen (1991) explain that the antecedents of affective commitment fall into three categories – demographics, structure and work experiences. These categories are meant to explain why individuals would want to stay at an organization. The first category pertains to personal characteristics, which include demographics and personalities. In the case of students, this may include normal demographic information such as gender, race and age. As for personality, it pertains to the desire to succeed, academic honesty and ethics, and desire for belonging. Another category is described as *organizational structure* which is a relationship between commitment and the preference of how an organization operates. In the case of a student, it may be how the classes are offered, the length of each semester, and the plan of study. In the case of work experiences, Meyer and Allen (1991) point out that a larger number of studies have been performed on the link between affective commitment and work experience. As for students, work experience in this situation may include course work and study experience in prior learning environments.

Few research studies have explored the use of organizational commitment to measure student retention. Meyer, Allen, and Smith (1993) performed a research study utilizing the three-component commitment model (Meyer & Allen, 1991). There were two samples of participants, one being nursing students. The students were surveyed on the satisfaction of the program and the level of commitment to continue. The study found that satisfaction with the nursing program correlated with affective commitment early on in the program, but lost its significance later in the program.

In another research study, Larkin, Brasel and Pines (2013) conducted a study in organizational commitment across domains to investigate student retention factors. The purpose was to investigate how organizational commitment and embeddedness are related to an intention to persist. Based on the results of the study, the authors suggested that their findings could be utilized as a case study in how to take an interdisciplinary approach to retention. As hypothesized, an individual's level of commitment predicted graduation.

McNally and Irving (2010) also sought to extend organizational commitment research into the study of student behavior. A portion of their study utilized prior research in workplace commitment to analyze the effects of affective, normative, and continuance commitment on a student's commitment to his/her university. The results of the study supported prior research that affective commitment leads to lower turnover intention. McNally and Irving (2010) suggest that future research could identify antecedents of commitment so that higher education administration can improve student retention programs.

Based on a review of affective organizational research, two hypotheses are added to research model:

H5: *Campus connectedness will positively influence affective organizational commitment.*

H6: *Sense of community will positively influence affective organizational commitment.*

Turnover intention

Just as Tinto's work is committed to student persistence, John Bean (1980) dedicated his research efforts to the issue of student attrition. Bean (1980) proposed an alternative approach to the research of student attrition. He notes the prior work of Price (1977) in employee turnover in work organizations as the foundational basis of his research model. Bean's (1980, p. 157) definition of student attrition is "the cessation of individual student membership in an institution of higher education." Just as employees may be unhappy or dissatisfied with their place of employment, students may have similar reasons for leaving their chosen institution of higher education. The model of student attrition involved a selection of organizational determinants that related to two intervening variables, satisfaction and institutional commitment, before reaching the dependent variable measuring dropout intention. While Bean's study was unable to explain a large percentage of the variance, he encourages the identification of missing determinants with further research to improve the model of student attrition and identify the unexplained variance.

In a subsequent study, Bean and Metzner (1985) proposed a model for researching attrition among the non-traditional student population. To achieve a better understanding of its high dropout rate, the authors proposed four main variables to predict an intent to leave:

background demographics, academic environment, environmental factors, and psychological outcomes. The variables are based on the obstacles that non-traditional students face when attempting to persist through a higher education degree. Instead of utilizing an institutional commitment measurement, intent to leave was suggested as a more appropriate predictor of student dropout. While the model proposed was not tested in the article, the intent is to encourage more research in this domain.

Meyer, Allen, and Smith (1993) and Kelloway, Gottlieb, and Barham (1999) utilized similar intention to leave scales that included four items. The measures of turnover included items about how likely an individual is going to leave his or her current profession, and the level of effort that has gone into this decision. In the Meyer, Allen, and Smith (1993) study, the participants where nursing students. The study of Kelloway, Gottlieb, and Barham (1999) included employees that may or may not be experiencing work-family conflict. In both studies, the level of commitment determined the level of turnover regardless of the domain.

The final hypothesis of this research model is based on a review of turnover intention:

H7: *Affective organizational commitment will positively influence turnover intention*

Research Model

The following research model is offered to frame the discussion by outlining the factors that are significant for student persistence. Continued research is warranted to further understand the factors that may contribute to improving the situation of attrition, and to suggest ways that institutions can enhance engagement and ultimately improve student success. Based on prior theoretical research, the model is developed to analyze how

collaborative learning influences campus connectedness and a sense of community, and subsequently how it impacts student persistence.

The model found in Figure 2 presents each theoretical construct and how each one contributes to student persistence.

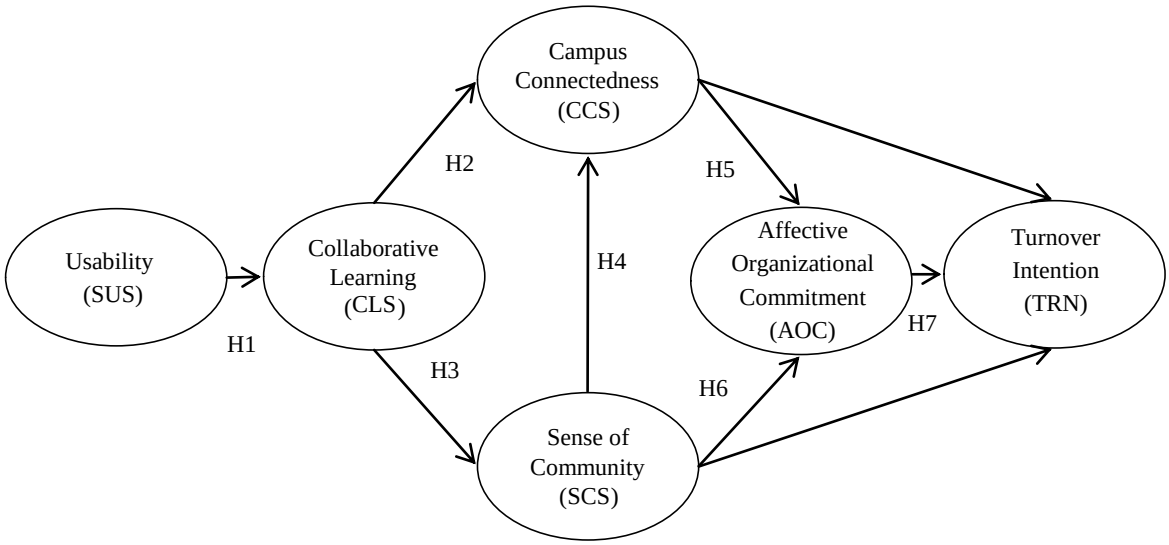

Figure 2. Collaborative Learning Commitment Model

CHAPTER 3. METHODS AND PROCEDURES

The following section details the process in which the research model has progressed into a survey instrument. Prior to data collection, the consent form and survey instrument were approved by the Institutional Review Board (IRB) on the use of human subjects for data collection purposes. Upon approval from the IRB, the responses were collected via a voluntary online survey via Qualtrics, and subsequently analyzed. The participants were allowed to opt out at any time as stated in the consent form. In addition to the collected survey data, participation data were gathered based on voluntary involvement in a virtual learning community.

Instrument Development

The survey instrument was developed based on the factors of the research model, and was tailored to the terminology used for communities and academia. Most questions used a 5 point Likert-type scale with the following possible responses: *strongly disagree, disagree, neutral, agree, and strongly agree*. Each segment of the survey instrument is broken down and further detailed in the sections below.

Collaborative learning scale

The collaborative learning environment may affect a sense of belonging felt by a student. In order to measure this perception, So and Brush (2008) adapted a 10 item scale based on prior research in online collaborative learning (Driver, 2002; Kitchen & McDougall, 1998) to measure collaborative learning in their study. After an exploratory

factor analysis, two items were removed for improved refinement. Of the 8 items in the scale, only one item is negatively worded in Table 2. Analyzing student perceptions of online collaborative learning with peers across institutions provides feedback for future course design.

Table 2. Collaborative Learning Scale

1.	Collaborative learning experiences in the virtual learning community are better than in a face-to-face learning environment.
2.	I felt part of a learning community in my group.
3.	I actively exchanged my ideas with group members.
4.	I was able to develop new skills and knowledge from other members of my group.
5.	I was able to develop problem solving skills through peer collaboration.
6.	Collaborative learning in my group was effective.
7.	Collaborative learning in my group was time-consuming. (Reverse coded)
8.	Overall, I am satisfied with my collaborative learning experience in this course.

Campus connectedness scale

Summers, et al. (2005) adapted a scale to measure social connectedness to peers on campus. The scale was administered in pre and post surveys, and adequately validated in the study. For the purpose of this research study, the participants are commuter students from multiple institutions. Assessing students' sense of belonging to their campus at the beginning of their first year can then be reassessed at the end of the semester for comparison. The comparison over time may be a measure of the success or failure of the methods being used

to encourage community. The scale in Table 3 consists of 12 items, 8 of which are negatively worded.

Table 3. Campus Connectedness Scale

1.	I feel disconnected from campus life. (Reverse coded)
2.	There are people on campus with whom I feel a close bond.
3.	I don't feel that I really belong around the people that I know. (Reverse coded)
4.	I feel that I can share personal concerns with other students.
5.	I feel so distant from the other students. (Reverse coded)
6.	I have no sense of togetherness with my peers. (Reverse coded)
7.	I catch myself losing all sense of connectedness with college life. (Reverse coded)
8.	I feel that I fit right in on campus.
9.	There is no sense of brotherhood/sisterhood with my college friends. (Reverse coded)
10.	I don't feel related to anyone on campus. (Reverse coded)
11.	Other students make me feel at home on campus.
12.	I don't feel I participate with anyone or any group. (Reverse coded)

Summers, et al. (2005) speculate that classroom community and campus connectedness are related in that one's feelings of classroom community influences campus connectedness.

Sense of community scale

A commonly used scale for measuring sense of community was developed by Chavis, Hogge, McMillan and Wandersman (1986) called the Sense of Community Index (SCI). Recently, Chavis, Lee and Acosta (2008) developed a new instrument called the SCI2 as a

better representation of the original four-dimensions found in the sense of community theory by McMillan and Chavis, and to address the criticisms found in the original index (Abfalter, Zaglia, & Mueller, 2012). The SCI2 scale in Table 4 consists of 24 items and utilizes a Likert-type scale unlike the original SCI which used a true-false format. Chavis, Lee and Acosta (2008) piloted the new scale with strong reliability, and then surveyed a larger group of participants to further validate the scale. The analysis produced a strong coefficient alpha score of .94. The SCI2 has been designed to work with many different types of communities, and it consists of four subscales: Reinforcement of Needs, Membership, Influence, and Shared Emotional Connection. The total sense of community index is a sum of the questions.

Table 4. Sense of Community Scale

	Fulfillment of Needs
1.	I get important needs of mine met because I am part of this community.
2.	Community members and I value the same things.
3.	This community has been successful in getting the needs of its members met.
4.	Being a member of this community makes me feel good.
5.	When I have a problem, I can talk about it with members of this community.
6.	People in this community have similar needs, priorities, and goals.
	Membership
7.	I can trust people in this community.
8.	I can recognize most of the members of this community.
9.	Most community members know me.

Table 4 (continued). Sense of Community Scale

10.	This community has symbols and expressions of membership such as clothes, signs, art, architecture, logos, landmarks, and flags that people can recognize.
11.	I put a lot of time and effort into being part of this community.
12.	Being a member of this community is a part of my identity.
	Influence
13.	Fitting into this community is important to me.
14.	This community can influence other communities.
15.	I care about what other community members think of me.
16.	I have influence over what this community is like.
17.	If there is a problem in this community, members can get it solved.
18.	This community has good leaders.
	Shared Emotional Connection
19.	It is very important to me to be a part of this community.
20.	I am with other community members a lot and enjoy being with them.
21.	I expect to be a part of this community for a long time.
22.	Members of this community have shared important events together, such as holidays, celebrations, or disasters.
23.	I feel hopeful about the future of this community.
24.	Members of this community care about each other.

Affective organizational commitment

Meyer, Allen and Smith (1993) discuss the flexibility of the commitment model and how it can be applied to multiple domains. They further explain that the use of the term occupation is preferred because of one's tie to an organization through his or her job role at

the time. In relation to academia, the occupation would be that of a student role. The affective organizational commitment scale in Table 5 contains six items utilizing a 7 point Likert scale. The items were modified to reflect academic terms for the participants of the survey.

Table 5. Affective Organizational Commitment Scale

1.	I would be happy to spend the rest of my academic career at this institution.
2.	I feel that my academic institution's problems are my own.
3.	I feel like "part of the family" at my academic institution.
4.	I feel emotionally attached to my academic institution.
5.	Taking classes at my academic institution has a great deal of personal meaning for me.
6.	I feel a strong sense of belonging to my academic institution.

Turnover intention

In addition to affective organizational commitment, a turnover intention scale was adapted for this survey instrument using an educational adaptation. The four item scale in Table 6 is from a study by Kelloway, Gottlieb, and Barham (1999) that analyzed work-family conflict. The scale is based on a five point Likert scale. The reason for this scale is to find out the intent of the students to persist to graduation.

Table 6. Turnover Intention Scale

1.	I am seriously thinking about leaving this academic institution. (Reverse coded)
2.	I am planning to look for a new academic institution to attend. (Reverse coded)
3.	I intend to ask people about new academic majors. (Reverse coded)
4.	I don't plan on being at this academic institution much longer. (Reverse coded)

System usability scale

In order to measure the usability of the course management system in this study, the system usability scale developed by John Brooke (1996) is utilized due to its simplicity. The scale in Table 7 is made up of ten items on a five point Likert scale from Strongly Disagree to Strongly Agree, with a high score indicative of greater usability. This scale results in a single number representing an overall level of usability perceived by the end user.

Table 7. System Usability Scale

1.	I think that I would like to use this system frequently.
2.	I found the system unnecessarily complex. (Reverse coded)
3.	I thought the system was easy to use.
4.	I think that I would need the support of a technical person to be able to use this system. (Reverse coded)
5.	I found the various functions in this system were well integrated.
6.	I thought there was too much inconsistency in this system. (Reverse coded)
7.	I would imagine that most people would learn to use this system very quickly.
8.	I found the system very cumbersome to use. (Reverse coded)
9.	I felt very confident using the system.
10.	I needed to learn a lot of things before I could get going with this system. (Reverse coded)

Participants

The participants of this study include primarily first year college students attending commuter campuses within the state of Indiana from two different academic institutions: a community college and a 4-year university. The ten participating campuses are

geographically dispersed across the state, but are bound by a partnered pathway curriculum. The pathway concept is based upon an articulated college curriculum in the field of technology. The articulation relationship is based upon the ability of an Associate Degree Engineering Technology graduate completing a Bachelor Degree in Engineering Technology in four subsequent semesters. Together, the Associate Degree and the Bachelor Degree program combined in a 2+2 program. The pathway has significant milestones in enrollment and graduation across the partnership in recognition that the college student has multiple entry and advancement options to account for the increased demographic variety and expectations of today's college student.

As part of the partnership, a virtual learning community between the institutions was implemented as an intervention method for student success. A cohort of students across the partnering institutions were invited to participate in this learning community based upon enrollment in an affiliated course within the pathway curriculum. A total of 223 students voluntarily enrolled into the learning community although not all participated.

The foundation of the common learning environment is the articulated curriculum. More specifically, the virtual learning community students take mutual coursework related to their technology program. Not only does the learning community foster social interaction, it also incorporates group learning/projects related to coursework in the classroom. The learning community students have had the opportunity to work on course activities across institutions.

Procedure

The cohort of students participating in the partnering pathway program used a course management system called Blackboard Learn™ for regular course activities, including collaborative group assignments and individual assignments. The online learning community space that was made available to the same students was also housed within Blackboard Learn™. As for the learning community, activities were based upon the ideas of socialization among students, and selected class coursework. The participants in the learning community were part of a common first year experience based upon an introduction to the major and discipline. These students were located across a broad geographic region within Indiana from two partnering academic institutions. While they may know their immediate peers, the total summary of participants would have been unknown to any particular student.

To support the student through peer understanding, the students' initial learning community activity was to get to know their peers across the VLC by posting biographies and initial discussion of common interests, background, and general understanding. The rest of the activities were based upon common coursework. While the specific Associate's degree and Bachelor's degree students differed, the overall learning objectives were the same: an introduction to Engineering Technology and the program. The main student learning experience for the introduction course was a common design project. Students were expected to utilize the ideation process and come up with a solution to a problem of student design and effort. A subsequent activity was to support the teaching of the problem solving and design process where students would watch a number of subject matter expert (SME) videos on the topic and collaborate on the problem design process. Students were asked to reflect on the process and respond to other posts in other student groups also working on the design

process. The third activity was later in the semester and timed to class progression: the students were asked to post their design project and gather feedback from other students in the discussion boards. The final activity was to bring the students face to face at an Engineering Technology summit. Industry advisors, faculty, and the VLC students were invited to attend the summit to socialize and discuss the discipline, their learning experiences, and industry career pathways.

Within 2 weeks of the conclusion of the semester, students were asked to complete an online survey which included the collaborative learning scale, sense of community scale, campus connectedness scale, commitment scale, turnover scale and usability scale. Participation data from the virtual learning community was also gathered, as well as demographic and context information such as major, classification, academic institution, and academic status. The participation data includes time spent in the system and how often it was accessed.

CHAPTER 4. RESULTS

Preliminary Data Examination

To test the entire model, partial least squares structural equation modeling (PLS-SEM) was used. PLS was chosen for several reasons. First, the primary purpose of this research is to predict and explain the endogenous variables in the model as opposed to testing a theoretical model (Hair, Hult, Ringle, & Sarstedt, 2014). Second, the small sample size as compared to the large number of indicators per construct makes PLS-SEM a good choice as compared to the more traditional covariance-based structural equation modeling (CB-SEM) (Reinartz, Haenlein, & Henseler, 2009), with the large number of indicators and complexity of the model actually helping to lessen the effects of PLS-SEM bias (Lohmoller, 1989; Reinartz et al., 2009; Ringle, Gotz, Wetzels, & Wilson, 2009).

Preliminary data examination found no missing values. Furthermore, no outliers were found and skewness and kurtosis measures for all indicator variables were within the -1 to 1 range, indicating good data properties for use in the model. A power analysis for the entire model shows that the sample size of n = 103 is well above the 10-indicator rule (Barclay, Higgins, & Thompson, 1995), which says the sample size should be 10 times the maximum arrowheads pointing to any one construct in the model. In the case of our model, this maximum number of arrows is 3, which indicates the sample size should be above 30. Using Cohen's more differentiated sample size recommendations (Cohen, 1992), our sample is above the 59 subjects needed to achieve a statistical power of 80% for detecting R^2 values of at least 0.25 at p = 0.05. For the group-based analyses, the subjects are split into two groups according to the amount of time spent in the online virtual learning community. A split was

made at 5 hours of usage based on the activities presented to the subjects, and the amount of time that the subjects voluntarily spent online in the system. For the group-based analyses, group1 (n = 58) and group2 (n = 45) both meet the requirements of the 10-indicator rule which indicates the sample size should be above 30. Group1 is also close to the 59 subjects needed to achieve a statistical power of 80% for detecting R^2 values of at least 0.25 at p = 0.05. Group2, while not above the 59 sample size needed to achieve a statistical power of 80% for detection R^2 values of at least 0.25 at p = 0.05, is above the 38 subjects needed to achieve a statistical power of 80% for detecting R^2 values of at least 0.5 at p = 0.05.

Measurement Model

The measurement model was first evaluated to assess the psychometric properties of the constructs used in the model (see Table 8. for a listing of the measurement model statistics). All constructs in the model were specified reflectively, as per previous research in the area for each construct, with the SCS construct specified as a second-order construct with four lower order factors. Reliability/internal consistency was assessed using both Cronbach's alpha and composite reliability. Both the first order factors as well as the second order factor of SCS were evaluated. The values for the latent constructs for both Cronbach's alpha and composite reliability were above the 0.7 cutoff and below 0.95, as is satisfactory (Nunnally & Vernstein, 1994). The second-order factor of SCS was slightly above the 0.95 cutoff, but given the correlated nature of the error terms of the lower-order factors, this was deemed acceptable (Drolet & Morrison, 2001; Hayduk & Littvay, 2012). Indicator reliability was assessed by evaluating the outer loadings of each indicator on its respective construct (see Table 9. for the loadings and cross loadings of each item on its respective construct). All

loadings were above the 0.7 cutoff (Hair et al., 2014), except for one item in AOC (0.60), but the removal of this item did not produce a noticeable increase in composite reliability or average variance extracted (Hair, Ringle, & Sarstedt, 2011).

Table 8. Cronbach's alpha, composite reliability, average variance extracted, and correlations of the latent constructs, with the square root of the AVE along the diagonal (square root of the AVE not included for lower order factors)

				Correlations and Square Root AVE									
	Cronbach	CR	AVE	SUS	CLS	CCS	SCS	SCSFN	SCSINF	SCSMEM	SCSSEC	AOC	TRN
Usability (SUS)	0.92	0.94	0.76	0.87									
Collaborative Learning (CLS)	0.94	0.95	0.72	0.53	0.85								
Connectedness (CCS)	0.84	0.89	0.68	0.28	0.36	0.82							
Sense of Community (SCS)	0.97	0.98	0.64	0.50	0.73	0.40	0.80						
SCS Fulfillment of Needs	0.94	0.96	0.78	0.55	0.73	0.35	0.92	LOF					
SCS Influence	0.90	0.93	0.68	0.51	0.69	0.41	0.96	0.83	LOF				
SCS Membership	0.90	0.93	0.68	0.39	0.63	0.32	0.94	0.81	0.89	LOF			
SCS Shared Emotional Connection	0.93	0.95	0.74	0.45	0.70	0.41	0.94	0.80	0.90	0.84	LOF		
Affective Organizational Commitment (A	0.89	0.92	0.65	0.32	0.48	0.34	0.49	0.45	0.52	0.44	0.44	0.81	
Turnover Intention (TRN)	0.88	0.91	0.72	0.14	0.25	0.13	0.29	0.25	0.26	0.27	0.29	-0.05	0.85

Both convergent and discriminant validity were assessed for the measurement model. Convergent validity was assessed using the average variance extracted (AVE). All latent constructs had an AVE well above the recommended cutoff of 0.5 (Bagozzi & Yi, 1988; Bearden, Netemeyer, & Mobley, 1993; Fornell & Larcker, 1981), indicating good convergent validity. Discriminant validity was assessed using both the cross loadings and the square root of the AVE. No loading of an item on a construct was found to be greater than the indicator's loading on its associated construct, providing evidence of discriminant validity (Hair, Ringle, & Sarstedt, 2011). Also, the square root of the AVE for each latent construct, was higher than its correlation with any other construct, again providing evidence of discriminant validity (Chin, 1998; Gefen & Straub, 2005; Majchrzak, Beath, Lim, & Chin, 2005). This does not apply to the lower-order factors belonging to the second-order construct of SCS.

Table 9. Loadings and cross loadings of items on constructs

	SUS	CLS	CCS	SCS	SCSFN	SCSMEM	SCSINF	SCSSEC	AOC	TRN
SUS1	0.72	0.48	0.47	0.59	0.54	0.47	0.57	0.62	0.41	0.25
SUS2	0.93	0.43	0.39	0.41	0.41	0.31	0.45	0.35	0.42	-0.19
SUS3	0.93	0.44	0.37	0.46	0.50	0.35	0.47	0.41	0.45	-0.08
SUS4	0.91	0.47	0.33	0.38	0.40	0.27	0.43	0.31	0.42	-0.06
SUS5	0.92	0.40	0.34	0.39	0.41	0.31	0.43	0.32	0.35	-0.15
CLS1	0.23	0.78	0.39	0.61	0.52	0.53	0.53	0.69	0.44	0.23
CLS2	0.40	0.93	0.56	0.72	0.71	0.64	0.64	0.70	0.55	0.24
CLS3	0.43	0.84	0.41	0.57	0.57	0.48	0.57	0.51	0.46	0.22
CLS4	0.51	0.92	0.67	0.75	0.71	0.64	0.77	0.69	0.69	0.18
CLS5	0.45	0.89	0.57	0.73	0.74	0.62	0.66	0.70	0.54	0.17
CLS6	0.46	0.95	0.60	0.75	0.74	0.63	0.71	0.71	0.65	0.20
CLS7	0.37	0.82	0.41	0.62	0.63	0.57	0.52	0.58	0.52	0.31
CLS8	0.61	0.91	0.61	0.71	0.68	0.63	0.72	0.63	0.64	0.07
CCS1	0.25	0.30	0.82	0.38	0.31	0.31	0.37	0.42	0.55	0.24
CCS2	0.50	0.55	0.79	0.61	0.50	0.51	0.61	0.65	0.64	0.10
CCS3	0.30	0.55	0.86	0.47	0.50	0.36	0.43	0.45	0.75	0.21
CCS4	0.40	0.62	0.92	0.49	0.48	0.37	0.48	0.49	0.76	0.29
SCSFN1	0.30	0.66	0.45	0.82	0.90	0.74	0.70	0.74	0.42	0.23
SCSFN2	0.47	0.56	0.48	0.77	0.87	0.68	0.71	0.61	0.50	0.15
SCSFN3	0.52	0.72	0.50	0.89	0.94	0.86	0.79	0.74	0.55	0.10
SCSFN4	0.38	0.68	0.55	0.81	0.90	0.75	0.74	0.65	0.51	0.21
SCSFN5	0.45	0.69	0.43	0.82	0.82	0.80	0.70	0.74	0.39	0.10
SCSFN6	0.59	0.66	0.42	0.77	0.83	0.71	0.71	0.63	0.51	0.07
SCSMEM7	0.46	0.73	0.51	0.86	0.86	0.87	0.75	0.74	0.50	0.20
SCSMEM8	0.32	0.61	0.40	0.86	0.82	0.92	0.78	0.72	0.46	0.20
SCSMEM9	0.25	0.54	0.35	0.83	0.75	0.92	0.78	0.69	0.47	0.15
SCSMEM10	0.34	0.48	0.40	0.76	0.70	0.80	0.65	0.72	0.27	0.30
SCSMEM11	0.29	0.50	0.38	0.72	0.65	0.80	0.68	0.56	0.48	0.28
SCSMEM12	0.33	0.59	0.31	0.81	0.65	0.83	0.81	0.75	0.42	0.20
SCSINF13	0.29	0.49	0.37	0.79	0.63	0.78	0.84	0.73	0.52	0.28
SCSINF14	0.51	0.53	0.42	0.77	0.74	0.73	0.81	0.63	0.48	0.16
SCSINF15	0.34	0.55	0.46	0.81	0.65	0.79	0.83	0.78	0.50	0.27
SCSINF16	0.47	0.50	0.49	0.70	0.55	0.65	0.82	0.62	0.49	0.08
SCSINF17	0.42	0.81	0.50	0.76	0.72	0.66	0.81	0.66	0.62	0.14
SCSINF18	0.61	0.73	0.52	0.80	0.78	0.64	0.80	0.78	0.57	-0.09
SCSSEC19	0.39	0.64	0.44	0.76	0.58	0.66	0.77	0.87	0.47	0.20
SCSSEC20	0.27	0.58	0.46	0.68	0.55	0.57	0.65	0.78	0.38	0.29
SCSSEC21	0.39	0.64	0.52	0.83	0.67	0.74	0.79	0.90	0.53	0.19
SCSSEC22	0.29	0.61	0.48	0.75	0.66	0.65	0.63	0.87	0.40	0.24
SCSSEC23	0.50	0.64	0.60	0.83	0.74	0.76	0.75	0.85	0.41	0.35
SCSSEC24	0.52	0.72	0.58	0.92	0.84	0.82	0.85	0.93	0.59	0.14
AOC1	0.43	0.46	0.57	0.38	0.38	0.30	0.42	0.33	0.77	-0.20
AOC2	0.52	0.35	0.33	0.41	0.37	0.32	0.45	0.40	0.60	0.01
AOC3	0.44	0.64	0.77	0.57	0.54	0.48	0.60	0.51	0.91	0.11
AOC4	0.28	0.57	0.72	0.51	0.41	0.42	0.59	0.49	0.88	0.22
AOC5	0.48	0.53	0.72	0.52	0.51	0.45	0.57	0.43	0.86	0.09
AOC6	0.31	0.61	0.78	0.57	0.51	0.52	0.59	0.51	0.92	0.21
TRN1	-0.04	0.17	0.19	0.16	0.11	0.15	0.12	0.22	0.03	0.94
TRN2	0.02	0.19	0.19	0.27	0.22	0.32	0.21	0.26	0.07	0.94
TRN3	-0.13	0.28	0.32	0.26	0.16	0.28	0.21	0.32	0.21	0.85
TRN4	0.04	0.08	0.14	0.05	0.03	0.09	-0.01	0.08	0.04	0.82

Structural Models

For this research, the hypothesized model was analyzed. First, one model was analyzed for all subjects. Next, two separate models were analyzed using samples of individuals who highly utilized the virtual learning community environment (greater than 5 hours of usage) and those who underutilized the virtual learning community environment (less than 5 hours of usage). The following frequency table provides a representation of how many hours were spent in the VLC (Table 10).

Table 10. Hours of participant usage in the VLC.

Number of hours	Frequency
Less than 1 hour	30
1-2 hours	8
2-3 hours	6
3-4 hours	6
4-5 hours	8
5-6 hours	8
6-7 hours	3
7-8 hours	2
8-9 hours	4
9-10 hours	5
Greater than 10 hours	23

Each separate model and its results are described below. The means and standard deviations for the entire sample as well as those for the two separate groups can be seen in Table 11.

Table 11. Means and standard deviations for the entire sample, as well as the two groups separated by the amount of hours in the VLC.

	combined		Group 1: VLC < 5		Group 2: VLC > 5	
	mean	std	mean	std	mean	std
SUS	3.38	0.91	3.47	0.93	3.27	0.89
CLS	3.33	0.93	3.41	0.90	3.24	0.96
CCS	3.22	0.88	3.28	0.92	3.14	0.84
SCS	2.30	0.73	2.34	0.75	2.24	0.70
AOC	4.63	1.22	4.73	1.18	4.51	1.27
TRN	2.42	0.99	2.56	1.00	2.24	0.95

Before beginning, given that multiple indicators were used to predict CCS (CLS and SCS), AOC (CCS and SCS), and TRN (CCS, SCS, and AOC) a collinearity assessment was run. Results did not indicate collinearity with variance inflation factor (VIF) scores below the suggested cutoff of 5 (Hair, Ringle, & Sarstedt, 2011) for CLS/SCS (VIF = 2.22), CCS/SCS (VIF = 1.19), and CCS/SCS/AOC (VIF = 1.77, 1.36, 2.01).

Combined model

The first model included all subjects. Structural path coefficients were first evaluated (see Figure 3 and Table 12). The model showed significant ($p < 0.01$) path loadings of SUS on CLS ($\beta = 0.54$) – supporting H1, CLS on SCS ($\beta = 0.74$) – supporting H3, CCS on AOC ($\beta = 0.54$) – supporting H5, SCS on AOC ($\beta = 0.29$) – supporting H6, and SCS on TRN ($\beta = 0.39$); significant ($p < 0.05$) path loadings of SCS on CCS ($\beta = 0.29$) – supporting H4 and AOC on TRN ($\beta = -0.36$) – supporting H7; and a significant ($p < 0.1$) path loading of CCS on TRN ($\beta = 0.21$). Further examination of indirect effects found that an indirect effect of SCS on AOC ($\beta = 0.16$) produces a significant ($p < 0.01$) total effect of 0.45, and an indirect effect of SCS on TRN ($\beta = -0.10$) produces a significant ($p < 0.05$) total effect of 0.29. Also, while the direct effect of CLS on CCS is not significant ($\beta = 0.15$), when combined with the indirect effect ($\beta = 0.22$) of CLS on CCS via SCS this produces a significant ($p < 0.01$) total effect of 0.37.

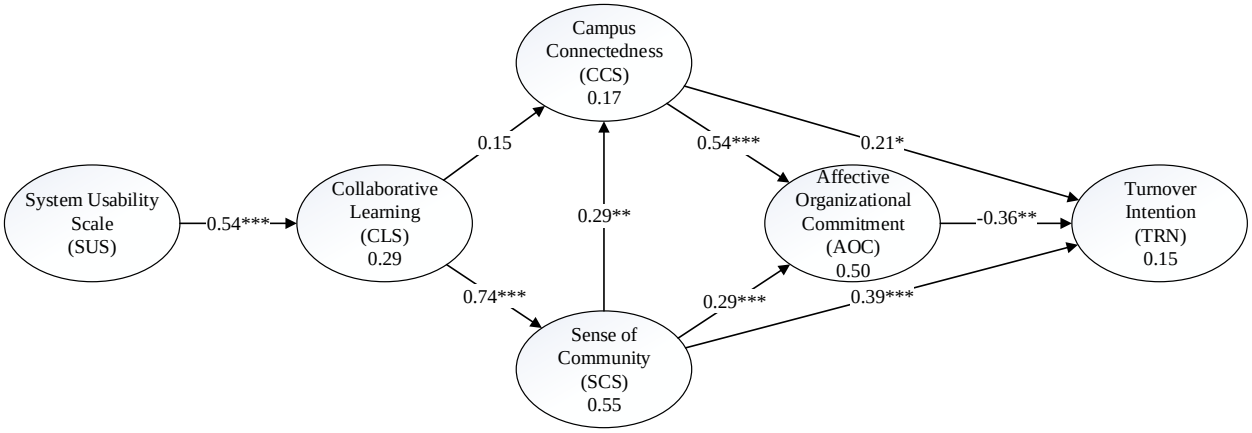

Figure 3. Combined structural model with standardized path loadings (*p < 0.1, **p < 0.05, ***p < 0.01)

Table 12. Path loadings of combined structural model, including effects.

	β	SE(β)	t-value	indirect	total	SE(total)	t-value
SUS -> CLS	0.54	0.10	5.19 ***	-	0.54	0.10	5.19 ***
CLS -> SCS	0.74	0.04	16.70 ***	-	0.74	0.04	16.70 ***
CLS -> CCS	0.15	0.15	1.06	0.22	0.37	0.12	2.96 ***
SCS -> CCS	0.29	0.14	2.01 **	-	0.29	0.14	2.01 **
CCS -> AOC	0.54	0.07	7.18 ***	-	0.54	0.07	7.18 ***
SCS -> AOC	0.29	0.08	3.71 ***	0.16	0.45	0.10	4.67 ***
CCS -> TRN	0.21	0.13	1.65 *	-0.19	0.02	0.12	0.14
SCS -> TRN	0.39	0.11	3.63 ***	-0.10	0.29	0.12	2.42 **
AOC -> TRN	-0.36	0.15	2.37 **	-	-0.36	0.15	2.37 **

Further assessment of the model used R^2 values, f^2 effect size measures, and q^2 predictive relevance measures (see Table 13). To evaluate the model's predictive accuracy, R^2 values were examined. The analysis showed the proportion of variance explained was 0.29 for CLS, 0.55 for SCS, 0.17 for CCS, 0.50 for AOC, and 0.15 for TRN. The f^2 effect size measure was used to assess the contribution of the exogenous constructs on their respective endogenous latent variable's R^2 value. The effect of CLS on CCS (0.01), SCS on CCS (0.04), CCS on TRN (0.04), and AOC on TRN (0.04) were found to be small, SCS on AOC (0.14) and SCS on TRN (0.12) to be medium, and CCS on AOC (0.44) to be large (Cohen, 1988). The q^2

effect size measure was used to assess the predictive relevance of the exogenous constructs on their respective endogenous construct. The effect of CLS on CCS (0.01), SCS on CCS (0.03), SCS on AOC (0.07), CCS on TRN (0.03), SCS on TRN (0.08), and AOC on TRN (0.06) were found to be small while the effect of CCS on AOC (0.22) was found to have a medium effect.

Table 13. R^2, f^2, and q^2 values for the AOC structural model

	R^2	R^2 excluded	f^2 effect	Q^2	Q^2 excluded	q^2 effect
SUS -> CLS	0.29	-	-	0.21		
CLS -> SCS	0.55	-	-	0.35	-	-
CLS -> CCS	0.17	0.16	0.01	0.12	0.11	0.01
SCS -> CCS		0.14	0.04		0.09	0.03
CCS -> AOC	0.50	0.28	0.44	0.31	0.16	0.22
SCS -> AOC		0.43	0.14		0.26	0.07
CCS -> TRN	0.15	0.12	0.04	0.11	0.08	0.03
SCS -> TRN		0.05	0.12		0.04	0.08
AOC -> TRN		0.12	0.04		0.06	0.06

Group-based models

To gain a greater understanding of the effectiveness of the model, two separate sub-models were estimated by separating individuals based on low (less than 5 hours) and high (greater than 5 hours) levels of virtual learning community use throughout the semester. This provides evidence that the model can differentiate between heterogeneous groups (Hair et al., 2014), thereby providing greater credence to the effectiveness of the model overall. Differences in structural path coefficients are shown in Figure 4, Figure 5, Table 14, and Table 15. A significant ($p < 0.1$) difference is seen between groups (Sarstedt, Henseler, & Ringle, 2011) with the relationship of CLS on CCS where the impact of CLS on CCS is very significant ($\beta = 0.42$) for the high VLC use group and not significant ($\beta = -0.04$) for the low VLC use group, with a total effect that is also significantly different ($p < 0.05$) between the

high and low VLC groups (β = 0.61 vs. β = 0.19 respectively). This shows that while the path from CLS to CCS is not significant in the combined model, there is actually a significant interaction effect present for this relationship, providing partial support for H2. Another noticeable difference is seen with regard to the effects on TRN between the two groups. In the low VLC group both AOC (β = -0.48) and SCS (β = 0.45) have a significant relationship on TRN whereas none of the three variables leading to TRN in the high VLC group have a significant relationship with TRN.

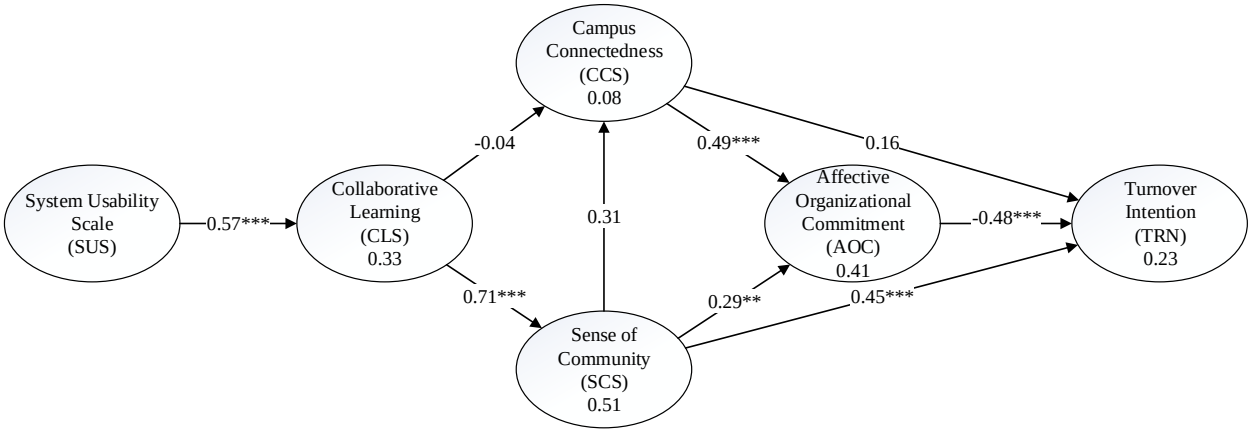

Figure 4. Structural model with standardized path loadings (*p < 0.1, **p < 0.05, ***p < 0.01) for low VLC group

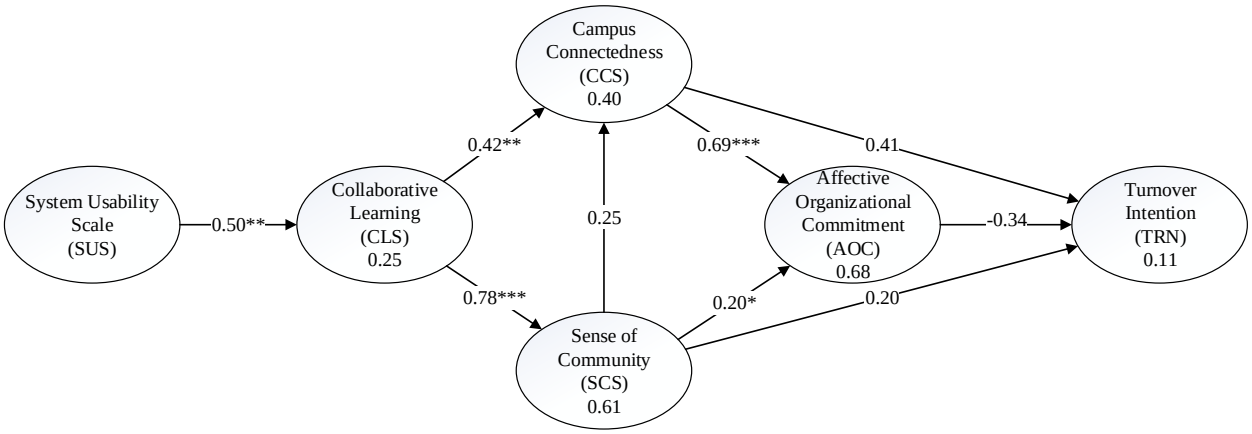

Figure 5. Structural model with standardized path loadings (*p < 0.1, **p < 0.05, ***p < 0.01) for high VLC group

Table 14. Path loadings of structural model for low VLC group, including effects.

	Group 1: VLC < 5						
	β	SE(β)	t-value	indirect	total	SE(total)	t-value
SUS -> CLS	0.57	0.11	5.15 ***	-	0.57	0.11	5.15 ***
CLS -> SCS	0.71	0.06	11.65 ***	-	0.71	0.06	11.65 ***
CLS -> CCS	-0.04	0.21	0.18	0.23	0.19	0.19	0.99
SCS -> CCS	0.31	0.21	1.49	-	0.31	0.21	1.49
CCS -> AOC	0.49	0.12	4.14 ***	-	0.49	0.12	4.14 ***
SCS -> AOC	0.29	0.14	2.05 **	0.15	0.44	0.18	2.52 **
CCS -> TRN	0.16	0.15	1.02	-0.24	-0.08	0.17	0.47
SCS -> TRN	0.45	0.14	3.16 ***	-0.16	0.29	0.19	1.49
AOC -> TRN	-0.48	0.19	2.59 ***	-	-0.48	0.19	2.59 ***

Table 15. Path loadings of structural model for high VLC group, including effects.

	Group 2: VLC > 5						
	β	SE(β)	t-value	indirect	total	SE(total)	t-value
SUS -> CLS	0.50	0.21	2.44 **	-	0.50	0.21	2.44 **
CLS -> SCS	0.78	0.07	11.90 ***	-	0.78	0.07	11.90 ***
CLS -> CCS	0.42	0.18	2.34 **	0.19	0.61	0.10	6.29 ***
SCS -> CCS	0.25	0.18	1.41	-	0.25	0.18	1.41
CCS -> AOC	0.69	0.10	6.73 ***	-	0.69	0.10	6.73 ***
SCS -> AOC	0.20	0.10	1.93 *	0.17	0.37	0.14	2.60 ***
CCS -> TRN	0.41	0.27	1.53	-0.24	0.17	0.20	0.85
SCS -> TRN	0.20	0.20	1.00	-0.03	0.17	0.17	1.00
AOC -> TRN	-0.34	0.27	1.25	-	-0.34	0.27	1.25

Differences are also seen with regard to effect sizes of the model between the two groups (see Table 16 and Table 17). First, the R^2 value of CCS in the low VLC group (0.08) is much lower than the same R^2 value in the high VLC group (0.40). Also, the R^2 value of AOC in the low VLC group (0.41) is lower than the same R^2 value in the high VLC group (0.68). Conversely, the R^2 value of TRN in the low VLC group (0.23) is double the same R^2 value in the high VLC group (0.11). Second, the f^2 effect size is larger for CLS on CCS in the high VLC group (0.12) as compared to the low VLC group (0.00), is substantially larger for CCS on AOC in the high VLC group (0.98) as compared to the low VLC group (0.34),

and is larger for SCS on AOC in the low VLC group (0.14) as compared to the high VLC group (0.05). Third, the q^2 effect size is again substantially larger for CCS on AOC in the high VLC group (0.34) as compared to the low VLC group (0.15) and is larger for SCS on TRN in the low VLC group (0.13) as compared to the high VLC group (0.00).

Table 16. R^2, f^2, and q^2 values for the structural model for the low VLC group.

	Group 1: VLC < 5					
	R^2	R^2 excluded	f^2 effect	Q^2	Q^2 excluded	q^2 effect
SUS -> CLS	0.33	-	-	0.23	-	-
CLS -> SCS	0.51	-	-	0.32	-	-
CLS -> CCS	0.08	0.08	0.00	0.04	0.04	0.00
SCS -> CCS		0.03	0.05		0.01	0.03
CCS -> AOC	0.41	0.21	0.34	0.21	0.09	0.15
SCS -> AOC		0.33	0.14		0.17	0.05
CCS -> TRN	0.23	0.22	0.01	0.16	0.15	0.01
SCS -> TRN		0.15	0.10		0.05	0.13
AOC -> TRN		0.16	0.09		0.09	0.08

Table 17. R^2, f^2, and q^2 values for the structural model for the high VLC group.

	Group 2: VLC > 5					
	R^2	R^2 excluded	f^2 effect	Q^2	Q^2 excluded	q^2 effect
SUS -> CLS	0.25	-	-	0.20	-	-
CLS -> SCS	0.61	-	-	0.38	-	-
CLS -> CCS	0.40	0.33	0.12	0.28	0.24	0.06
SCS -> CCS		0.38	0.04		0.26	0.03
CCS -> AOC	0.68	0.36	0.98	0.42	0.22	0.34
SCS -> AOC		0.66	0.05		0.41	0.02
CCS -> TRN	0.11	0.07	0.04	0.07	0.04	0.03
SCS -> TRN		0.09	0.02		0.07	0.00
AOC -> TRN		0.08	0.03		0.05	0.02

CHAPTER 5. DISCUSSION AND SUMMARY

Discussion

The purpose of this study was, in part, to develop and test a model of collaborative learning commitment. Specifically, this collaborative learning commitment model was developed to measure the effectiveness of an institution's collaborative learning environment, based on prior research in community and organizational commitment. The study set about to evaluate this model in an online educational setting where it was expected that factors such as sense of community, perceptions of campus connectedness, and organizational commitment would influence turnover intention. In testing the design of the overall model utilizing structural equation modeling, the relationship between most factors was found to be statistically significant. In further analysis, the model design was also able to discern between two separate groups, adding to its versatility.

While Tinto (2005) concentrated on community as a mechanism for student persistence, Bean (1980) analyzed lack of commitment as a deterrent concerning student attrition. Achieving a sense of community and commitment can materialize from a number of situations, but this model focuses on the impact of collaborative learning on these factors. 21st century skills call for an employee to effectively work collaboratively in groups. Since organizations are facing challenges such as an increase in technology adoption, globalization, and increased competition, skills in collaboration have become one of the most important qualities that employers require today. Workplaces recognize that while individual skills and knowledge are important, working with others to create new understanding is greater when utilizing a combination of multiple skillsets and knowledge domains. This model is founded

on prior research in usability, collaborative learning, community and organizational commitment. Each factor in the model has been independently analyzed for validity in prior studies, yet they have not been combined into one model to measure the effect of collaborative learning on student turnover intention.

The System Usability Scale (SUS) was developed as a means for assessing how easy a system or tool is to use (Brooke, 1996). In this study, the usability of the computer supported collaborative learning system is first analyzed for impact, and the results suggest that the level of usability that students perceived about the online system had a significant influence on their collaborative learning experience. The ease of use in a system can set the tone for the outcome of the collaborative learning activity. If the system is perceived as usable, there will be an increased likelihood of a positive collaborative learning experience. As for the collaborative learning environment, it not only encourages active learning, but also involves a convergence of knowledge among participants. In its origins, collaborative learning has been influenced by the theory of social constructivism which is based on the premise that individual knowledge can be acquired through the negotiation of meanings with others (Bernard, Rojo de Rubalcava, St. Pierre, 2000; So & Brush, 2008; Zhu, 2012). These interchanges of information and participation within a group reduce feelings of isolation and foster a sense of community (Rovai, 2001).

Based on Tinto's research in community as a factor affecting student persistence, the theory of a sense of community is an integral factor in this model (McMillan & Chavis, 1986; Chavis, Lee & Acosta, 2008). The factor measures the sense of community experienced in the collaborative learning environment. Additionally, this research model includes a factor on campus connectedness in order to examine not only the sense of

community in the classroom, but all the social connectedness that one experiences in the context of a college-wide environment (Lee, Keough, & Sexton, 2002). The level of community and connectedness is important when it comes to a student's decision to stay or leave his or her academic institution. In this study, the collaborative learning environment significantly impacted a student's sense of community, but not campus connectedness directly. This may be due to the learning environment placing more emphasis on the community among group members versus a direct connection to the academic institution in the collaborative learning activities. It should also be noted that sense of community significantly influenced connectedness. The results suggest an interaction between community and campus connectedness. This is similar to results found in a study by Summers et al. (2005). It would seem that the two factors complement each other. A student will likely experience community within the classroom and then a connection to the academic institution as a whole.

The use of affective organizational commitment in an educational domain is influenced by the work of Bean (1980) pertaining to student attrition. Bean's theory of student attrition is also founded on employee turnover research. Individuals who stay in an organization because they want to stay experience a level of affective commitment (Allen & Meyer, 1990). The same could be said for student commitment. If collaborative learning is a means for preparing students for the workplace environment, it is appropriate to measure a student's commitment to an institution much like an employee would measure his or her workplace commitment and subsequent turnover intention. The level of connectedness and community had a significant impact on commitment for the students in this study. While the collaborative learning activities did not impact connectedness, the results suggest a strong

relationship between connectedness and commitment. If a student feels connected to the university, it would suggest a commitment to persist out of loyalty. If a student has a lower level of connectedness, the level of commitment is not strong due to apathy toward the university. As with connectedness, if a sense of community is not acquired, there is less likelihood of commitment toward the attending university. A student is not bound to an academic institution much like an employee is not bound to an organization, and a choice can be made to stay or leave.

Finally, an analysis of the impact that community, connectedness, and commitment have on turnover intention, or dropout intention, in the context of student attrition completes the model. The use of intention is based on the prior research of Meyer, Allen, and Smith (1993) and Kelloway, Gottlieb, and Barham (1999). In both of their studies, the level of commitment determined the level of turnover independent of the research domain. As with prior research, commitment significantly impacted turnover intention in this study. The higher the commitment, the lower the turnover intention in students and a lower likelihood of dropping out.

The results of the VLC study used to test the model demonstrate that the model can provide insight on what changes must be made in a VLC environment in order to increase student persistence and lessen student attrition concerns. A better understanding of where the VLC needs improvement was obtained through the use of this new model. All of the relationships suggested significance except one (collaborative learning did not have a significant effect on campus connectedness), and all items were in the right direction. The non-significant relationship between collaborative learning and connectedness may imply that more emphasis should be put on adding curriculum to the collaborative learning

environment that foster a feeling of relatedness to the institution, and not just a feeling of belonging to a group.

When comparing the two groups, low VLC usage versus high VLC usage, the low VLC usage group reported means of higher community, connectedness, and commitment. It also resulted in a statistically significant impact of affective organizational commitment on turnover intention, which was not found in the high VLC group. One possible explanation is that since the VLC was voluntary, the students that didn't utilize it felt that the VLC was not necessary in their academic experience yet they are not secure in their intentions to persist. In a study by Dewiyanti et al. (2007), the results concluded that structured group processes were a negative influence on satisfaction. The authors noted that the students in the study were non-traditional students and it was speculated that this demographic of students didn't like the rigid group process regulations of the course due to external obligations of family and work. Dewiyanti et al. (2007) acknowledge the negative result, but contend that the regulation is there to keep the group from losing control of its goal and thus creating larger issues. The participants of this study are also non-traditional students, and the added work of the VLC may have also been viewed as a negative for participation. As stated before, the activities in the VLC included an area for virtual community development, coursework driven collaboration of a common design process based on supplied learning materials and instructor driven participation, feedback from peers on group design projects, and a final activity that included attendance at a summit to interact with fellow members of the online learning community such as peers, faculty, and industry partners. The assignments and group projects in the course utilized Blackboard Learn™ for collaboration, so the added VLC

content requires a review of the strategies for improved positive participation at noted by Tinto (2005).

Usage is a behavior defined characteristic: students displayed their intensions to engage with their peers in a collaborative manner resulting in usage in the VLC. In the same manner, students' intention to leave their institution (turnover), are displaying behaviors they intend to act upon. In review of this display, students whom do not plan to stay in higher rates were engaged substantially less with their peers via the learning community. Their behavior was defined through the fact they spent substantially less time engaged with other students in a community defined by their curriculum. It may be reasoned that these students behaved in this way through low usage and student peer engagement, regardless of planned intervention, such as a learning community idea. These specific results, while interesting, demonstrate the wider goal of the model's usefulness in measuring collaborative learning and the model's ability to discern differences between groups.

In looking at the high usage group (higher than 5 hours time spent in the VLC), students intention to leave was lower than those less engaged. The students with higher VLC usage made a conscious effort to participate in the virtual community. While the outcome (leaving) was not fulfilled, these students were more engaged with their peers. Perhaps these students' intentions were to find peer support through the VLC to persist to degree completion. However, the behavior (usage) of these more engaged students is confounded with the type of students: perhaps these students would be engaged in higher rates, regardless of ultimate intentions (turnover), due to either novelty, curiosity, or some other innate characteristics beyond the measures of this model. Finally, these students simply may have engaged in the VLC based upon low expectations: these students may expect less of a

community platform, like the VLC, than those that self-selected out of using the VLC when presented with the opportunity.

A further difference was found in the effect of collaborative learning on campus connectedness, with this relationship showing a significant difference between the two groups. A more detailed look found that collaborative learning has a significant impact on campus connectedness in the high VLC group, but that this relationship is not significant in the low VLC group. This adds even more validation of the effectiveness of the model, as the only relationship in the overarching model found to be non-significant is actually dependent on the type of group, resulting in a moderated relationship. With more emphasis on the appropriate collaborative learning curriculum and encouragement of faculty to participate, students who are willing to participate may be more influenced in their relatedness to the institution.

Implications for research

The proposed model developed in this research study has bridged the gap between collaborative learning and turnover intention research. Implications for research in this area include an expansion of student persistence research through turnover intention, scalability with the addition of more constructs such as motivation and self-efficacy, and ultimately a new model that contributes to future research that is not limited to a higher education domain. Through this study, the findings suggest that the model tested here is effective for measuring turnover intention from a collaborative learning environment in an educational context. As the trend in higher education is to increase collaborative learning in the classroom, more research on the impact it can make on student persistence is warranted.

While collaborative learning is an important 21st century skill, there is a need for assessing its impact on students beyond the acquisition of new knowledge. Despite prior research in student attrition, the issue of dropout still remains high as tuition costs rise and technical skills are required for employment. Understanding the impact community and connectedness has on commitment in a collaborative learning environment is important to student attrition research.

When considering the implications of this study on virtual learning community research, this model approaches student persistence from a different perspective. The students who participate in a VLC are encouraged to participate in community driven activities and ultimately find a connection to the institution in the process. This study looks at that process through participation in collaborative learning activities. The model in this study measures the impact of those collaborative learning activities meant to foster community and consequently student persistence. As collaborative learning activities are tested and implemented in a virtual learning community in an attempt to encourage participation, this model contributes to research in how well the activities impact a student's feelings toward persistence.

While the model produced strong results, there is still a percentage of variance that is unexplained. The model is versatile and can be scalable to include additional measurements. The model is designed to allow for additional constructs that can be evaluated and thus provide an explanation for the variance experienced in this initial study. This study has provided many questions for future research, and related work in student engagement and persistence merits further investigation.

Finally, the model is adaptable for research in other learning environments, such as traditional classrooms, flipped courses, and executive education programs. Collaborative learning activities are prevalent in various learning environments where student persistence is just as important. The model in this study is not limited to one learning environment, but can be adapted and expanded. The implication of this model on the research of first year classes to improve persistence to graduation adds to an active body of knowledge.

Implications for practice

As a means of continuous improvement in an active learning experience, this model can assist an institution with the effectiveness of the environment that a student is experiencing within a collaborative learning based course. When institutions invoke collaborative learning activities into the first year experience, as students are new to the institution and have not had a chance to develop relationships, the concept of community and connectedness should be explicit within collaborative learning activities. By asking participants of a collaborative learning program to take the survey associated with the model, one can use the results practically to provide guidance on what areas need to be strengthened as well as make changes for future student benefit. Collaborative learning activities are designed to engage student participation if applied effectively (Nelson, 1994). Any environment that is invoking collaborative learning techniques for enriching the student learning experience would benefit from feedback.

As for the initial study of the research model utilizing a VLC environment, the practical implication is awareness. The result of the overall model provides an awareness of weaknesses or strengths in the activities presented to the group. For example, collaborative

learning did not have a direct impact on connectedness for the students in the VLC. Practically, this provides feedback for how the activities are perceived and internalized by the students. A review of the activities and environment are justified as connectedness impacts commitment which impacts turnover intention.

A virtual learning community is just one example of where this model could be utilized to uncover strengths and weaknesses in the program as it relates to attrition. There are many other learning environments that measure student persistence. As diverse learning environments may be used to improve student engagement and consequently, student persistence, an assessment instrument is needed to measure effectiveness. In the case of collaborative learning activities, they can be found in a number of environments. For example, this model can assess the impact that a flipped classroom's group activities have on a student's intention to persist where active learning and student engagement is the basis of the flipped model. Flipped classrooms group activities may be online or in the regular classroom. The online education experience is increasing with sometimes substantial additional investment in preparation. Understanding how to design an educational experience where online interaction limits understanding of the student mindset with regard to engagement could be a goal with use of this model. The model may assess weaknesses in the online program with the use of this model and adjustments may be made for the students' benefit in mind. The overall basis being continuous improvements would be made to the course. Beyond classroom content and pedagogy, both areas guiding the flipped concept are the singular goal of connecting students to their higher education institution. Online learning communities have been part of professional preparation. This research studied students however. It is expected to be used again in a similar program with the intention of

connecting students to their campus, rather than focus exclusively on classroom content. Finally, part of this model came from organizational research. Another potential use of this model could be executive education programs where the students bring a certain level of experience and diverse educational backgrounds to the program. This model could serve as an instrument to test the students' intent to continue with the organization that has invested in the students' executive preparedness. The organization could use this model to assess the student's intent to stay and expect a return on investment from the student's additional education, perhaps even with the overall goal of reducing employee turnover.

Limitations and Future Research

This study presents a number of limitations that should be mentioned to acknowledge how the generalizability of the overall results should be understood. These limitations should be noted as they provide a basis upon which future research could be conducted to reproduce and/or extend further to increase the impact, and general nature of the findings here.

When testing the model, choices were made that were based upon resources available and had bearing on the research questions. This study was conducted in the Midwestern United States with only two institutions. The sample that was utilized was geographically bound to the Midwest due to a need to focus resources and thus, convenient to the research team. A convenience sample of higher education students located in the Midwest is also closely aligned with limitations due to demographics. The student population from which the study sample draws upon is predominately white, male, non-traditional, and rural. While self-

selecting, the small sample size and predominance of these demographic characteristics may likely be the predominate classes of category in the sample as well.

As described earlier, the VLC program consisted of a small number of activities to engage the participating students. Several limitations of the program contributed to the results of this study. A small number of students participated in the program. As stated by Nelson (1994), a structured approach to fostering critical thinking via collaboration learning methods involves preparation, cognitive structuring, and role structuring. An instructor should select a topic that the majority of students can relate to or efficiently acquire knowledge about the topic (Nelson, 1994). An open dialog was initiated with all instructors that participated in the VLC program, but not all instructors encouraged their students to participate in the learning community. The topics may not have been defined well, and the instructors may not have felt that their students could acquire knowledge from each activity. Nelson's second strategic approach involves applying cognitive structuring to the topic by invoking a task that requires deeper thought beyond a cursory discussion. The VLC program was developed to be a collaborative supplement to the coursework assignments. Based on participation data, the content did not go beyond initial discussions. Finally Nelson recommends that the role-structuring process is meant to get all members of the group to participate with interest. Participation was limited and a limitation to this study. While the content of the VLC program is not within the scope of this study, it impacts the results and should be mentioned accordingly.

The proposed model suggested significance in every relationship except one: the effect of collaborative learning on campus connectedness. In further analysis of the model on two groups, the results did suggest significance in one of the groups. While there is an

indication of an interaction between the two factors, more research is needed to better explain the moderating effect that is occurring within that particular interaction. A qualitative study may provide insight on common themes among participants when it relates to connectedness to the campus through collaborative learning. As stated before, the content of the activity should be considered when measuring connectedness. While the overall model performed well in the VLC study, there is still variance to explain with additional factors such as motivation and self-efficacy as possibilities.

Another limitation of the study involves turnover intention measures. The following items were presented in the survey instrument:

1. I am seriously thinking about leaving this academic institution. (Reverse coded)
2. I am planning to look for a new academic institution to attend. (Reverse coded)
3. I intend to ask people about new academic majors. (Reverse coded)
4. I don't plan on being at this academic institution much longer. (Reverse coded)

Upon review of the results, there may be a limitation in the way that each item is worded. The turnover intention scale is traditionally utilized in an organizational setting. When reviewing the items, questions 1, 2, and 4 may be misinterpreted. A student is at an academic institution for a finite period time. Leaving the academic institution is inevitable, so future research would benefit from a clarification of these items. Finally, while turnover intention is reported by the participants, this study does not take into account if the student does in fact persist or not. In future research, it would be beneficial to follow the student through his or her academic career to compare intention with persistence to graduation.

While the sample sizes of the usage groups were small in this initial test of the model, it provided enough power to show significant results in the analysis of the new model. There are many possibilities with the proposed model when it comes to future research, including group comparisons. This study had a notable limitation as it was not contrasted with a group that did not participate in the virtual learning community, so future research would benefit from a comparison group. Further research in learning domains, demographics, delivery techniques in the classroom, and graduate courses are all appropriate research paths. The impact of collaborative learning on student turnover intention may be different based on demographics. As for delivery methods in the classroom, the flipped classroom can entail a sizable amount of collaborative group work. It would be beneficial to measure the impact it has on community, connectedness, and commitment among the participants in the course. While this study focuses on undergraduate education, it would be of interest to measure the impact of collaborative learning in graduate student persistence. Further research in student persistence is still important as the problem continues to plague academic institutions, and this model is an appropriate contribution to the research domain.

Conclusion

Institutions of higher education are being called upon to provide a more robust pathway to a college degree and improve upon the advanced workforce for the needs of the 21st century. As 21st century skills call for an employee to successfully work collaboratively in groups, an increase in technology adoption, globalization and increased competition are among the factors that make collaboration one of the most important skills that employers insist that individuals obtain today. An active learning environment through collaborative

learning techniques has been encouraged in higher education as a means of improving student engagement (Freeman, et al., 2014; Slavich & Zimbardo, 2012; Prince, 2004), but there is a gap in the literature when it comes to connecting the two research areas of collaborative learning and student intention to persist. Based on a review of the literature, continued research is warranted to further understand the factors that may contribute to improving the situation of attrition, and to suggest ways that institutions can enhance engagement and ultimately improve student success.

The purpose of this study was to create a model that will measure the factors that significantly influence a student's persistence in a computer supported collaborative learning environment. Utilizing prior theoretical research as a foundation, a model was developed to analyze how collaborative learning is mediated by campus connectedness and a sense of community, and subsequently how it impacts student persistence utilizing affective organizational commitment and turnover intention measures. In testing the design of the overall model utilizing structural equation modeling, the relationships between all factors but one were found to be statistically significant, with this final relationship affected by an interaction. In further analysis, the model design was also able to discern between two separate groups, adding to the model's versatility.

The outcome of this research study has produced an effective model for researching the impact of collaborative learning on turnover intention based on the influential factors of connectedness, community and commitment. Implications for research in this area include an expansion of student attrition research through turnover intention, scalability with the addition of more constructs, and ultimately a new model that contributes to future research that is not limited to a higher education domain.

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