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Sense of Community in Graduate Online Education: Contribution of Interaction

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SENSE OF COMMUNITY IN GRADUATE ONLINE EDUCATION: CONTRIBUTION OF INTERACTION

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Directed by: Margaret Maxwell, Jim Berger, Lauren Bland, and Nedra Atwell

Educational Leadership Doctoral Program Western Kentucky University

This non-experimental quantitative descriptive study was designed to determine which types of learner-learner and learner-instructor interaction are most predictive of student sense of community in online graduate courses at a regional comprehensive university. Surveys were used to measure sense of community and to collect perceptions of frequency and importance of nine learner-learner interactions and seven learner-instructor interactions from participating students (N = 381) within online courses in which they were enrolled. Student demographic information included age, gender, experience with online learning, number of face-to-face class meetings, and employment status.

Results indicated that learner–learner interactions that were most predictive of sense of community were introductions, collaborative group projects, contributing personal experiences, entire class online discussions, and exchanging resources. Learner-instructor interactions that were most predictive of sense of community were instructor modeling, support and encouragement, facilitating discussions, multiple modes of communication, and required participation. Experience with online learning was contributive to sense of community.

Additional analyses identified which interaction types offer the highest yield to

the instructor who seeks to efficiently facilitate sense of community. Results were presented using a matrix that placed interaction types into low frequency/low importance, low frequency/high importance, high frequency/low importance, or high frequency/high importance quadrants. The interaction items offering the highest yield were exchanging resources and instructor modeling. Implications for practice were provided to guide online instructors in facilitating the development of sense of community in online courses.

CHAPTER I: INTRODUCTION

Online learning has enjoyed rapid growth in the past two decades, and has been enthusiastically adopted by many post-secondary education institutions. Allen, Seaman, and Garrett (2007) reported that by the fall of 2005, online enrollments in United States colleges and universities had reached 3.18 million students. Online learning is not without its challenges, however. It has experienced student retention rates lower than those for face-to-face learning. The dropout rate for distance learning has been reported to be 10-20% higher than for face-to-face programs (Carr, 2000). While multiple factors must be considered in retention of online students, physical isolation of learners may play an important role (Exter, Korkmaz, Harlin, & Bichelmeyer, 2009; Rovai, 2002a). Learners who are separated from the instructor and classmates by geographic distance and time can feel disconnected and alone (Kerka, 1996).

Social isolation of learners is minimized when students become part of a supportive community of learners (Eastmond, 1995). Purposeful development of a sense of community among learners has been identified as important in online learning. A growing body of literature supports a positive relationship between sense of community and student engagement, persistence, satisfaction with coursework, and perceived learning (Liu, Magjuka, Bonk, & Lee, 2007; Ouzts, 2006; Rovai, 2002a). Just as in face-to-face educational settings, online educators have come to realize that delivering content is necessary, but not sufficient, to create a quality educational experience.

In an online learning environment, however, a sense of community does not occur by chance. Interactions must be designed into a course in order to establish and maintain

a sense of community (Nicholson, 2005; Stepich & Ertmer, 2003). While educators must actively stimulate a sense of community in online classrooms (Rovai, 2002a), not all online educators are aware of the importance of building community, nor do they necessarily possess the knowledge and skills to do so. With the appropriate knowledge, educators can act as facilitators to build community for the purpose of supporting student learning (Wallace, 2003).

Significance of the Problem

In the past two decades technological innovations have dramatically changed the delivery of distance learning. Distance educators have embraced the Internet, developed in 1991, as a way to reach students who are geographically removed from a physical campus. Distance learning that makes use of online technology is growing at a rate that far exceeds that of traditional education methods (Allen & Seaman, 2004). Enrollment in online courses has expanded rapidly. The *Chronicle of Higher Education* reported that in the fall of 2008 the 17% growth rate for online enrollments exceeded the 1.2% growth rate for overall post-secondary enrollment (Parry, 2010).

Online learning technology innovations have allowed teachers and students to interact from a distance in new and educationally rich ways, and there is no indication that enrollment growth has begun to plateau. This has been a boon to universities, which benefit financially and are able to offer services to new student markets. Distance learning is beneficial to students who, with the availability of distance technology, are able to access courses and programs outside their geographic area. This convenient, flexible learning format provides access to education for a wide range of learners,

including professionals in need of continuing education, young technology-savvy students who need course content not offered at their university, and non-traditional career changers who have responsibilities which prevent relocation to a college campus.

While the broader category of distance learning includes correspondence courses, interactive television, and videoconferencing, online learning makes use of World Wide Web resources, including multimedia, web-based applications, and collaboration technologies to connect instructors and learners who are geographically and/or temporally removed from each other. Post-secondary institutions have enthusiastically adopted online learning because of its ability to provide convenient and flexible access to content and instruction "at any time, from any place" (United States Department Of Education, 2010, p. 1).

Online learning courses typically make use of a combination of technologies and methods. Asynchronous communication tools, which allow participants to choose the specific time of access, include electronic mail, threaded discussion boards, posted announcements, electronic posting of documents, submission of assignments, and viewing of video and audio clips. Synchronous communication tools, which require participants to be logged onto the Internet at an agreed-upon time, include technologies such as desktop video and audio conferencing, webcasting, chat rooms, virtual office hours, and Skype. These tools have expanded the options available to instructors and learners to interact with each other in the learning process. No longer restricted to one-way delivery of content, instructors can interact with their students and can facilitate interaction between students as they engage in learning (Rovai, 2002a).

Availability of these expanding options does not automatically create quality learning experiences. Instructors must leverage technologies and delivery formats to create satisfying and high quality educational experiences for students. Research supports the development of community in online learning as an important factor in maximizing student satisfaction (Liu et al., 2007; Ouzts, 2006; Rovai, 2002a).

Over the past two decades, researchers have investigated multiple aspects of sense of community using primarily qualitative and case study research designs to identify and explore issues. Brown (2001) described the process by which sense of community is developed in online courses, and numerous researchers have contributed to a description of the types of interactions between instructor, student, and content that contribute to sense of community (McElrath & McDowell, 2008; Stallings & Koellner-Clark, 2003; Wolcott, 1996). A number of studies have investigated the relationship between interaction and sense of community in online learning (Exter et al., 2009; Nicholson, 2005; Rovai, 2004; Stepich & Ertmer, 2003; Wallace, 2003; Wegerif, 1998). These studies have largely been qualitative in nature and represent attempts to identify important elements.

Few studies have sought to quantitatively examine the relationship between interactions and development of sense of community (Baab, 2004; Dawson, 2006; Lear, Ansorge, & Steckelberg, 2010; Misanchuk & Anderson, 2001; O'Hara, 2008; Stepich & Ertmer, 2003). As instructors consider the many interactions suggested in the literature for building community, they need information beyond expert opinion to guide them in designing courses that take advantage of the many options available to them. They

require empirical evidence to support their course design choices as they purposefully build into courses the interactive experiences that can create a community of learners.

Theoretical Basis

The theoretical framework for this study is social constructivism. Social constructivism is a theory that views learning as a process in which a learner constructs new meaning through active involvement. Arising from the work of Vygotsky (1978), social constructivism places an emphasis on the importance of social encounters in constructing meaning from content. The learner engages in communication with the instructor, peers, and content to refine understanding. Learning does not take place solely within a learner's mind, but requires interaction and testing of information against the knowledge of others (Vygotsky, 1978). This need for social interaction to construct knowledge relates directly to the importance of developing a sense of community through interaction to support student satisfaction, retention, and learning.

Sense of community is defined by McMillan and Chavis (1986) as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9). The role of interaction in sense of community was suggested by Westheimer and Kahne (1993), who add that sense of community is a result of interaction and deliberation by people brought together by similar interests and common goals.

Interaction is defined as "reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another" (Wagner, 1994, p. 8). Interaction is one of four components of community

described by Rovai (2002b), along with spirit, trust, and learning. In an online learning environment, interactions between and among learners and the instructor contribute to the formation of a learning community.

Moore (1989) described three types of interaction that occur in learning: learner-content, learner-learner, and learner-instructor. Learner-content involves an intellectual interaction between the student and the subject of study. Learner-learner interaction occurs when a student interacts with another student or group of students (Moore, 1989). Learner-instructor interaction occurs when a content expert interacts with the student to create or enhance motivation to learn, as well as to counsel, guide, and encourage the student in the learning process. This study will consider the types of interaction which involve human to human interaction, namely learner-learner and learner-instructor, as these forms of interaction are most relevant to the process of community building.

Problem Statement

The problem that will be addressed in this study is that online learners who are physically and temporally distanced from their instructor and classmates can experience isolation (Kerka, 1996). As a result, the convenience and access that bring students to online learning are not necessarily sufficient to keep them there. The dropout rate for distance learning has been reported to be 10-20% higher than for face-to-face programs (Carr, 2000). Multiple factors play a role in retention of online students, including demographic characteristics of typical online learners, their conflicting life responsibilities, socioeconomic factors, and course quality (Diaz, 2002). Physical isolation of learners has also been identified as a factor which may play an important role

(Exter et al., 2009; Rovai, 2002a). Learners who are geographically and temporally separated from their instructor and classmates can feel disconnected and alone (Kerka, 1996). The technology-mediated communication used in online learning has been called a lean medium (Garrison, Anderson, & Archer, 2000), referring to a lack of nonverbal cues and the absence of much of the pacing and spontaneity that contribute to a group dynamic in oral communication (Baab, 2004; Garrison et al., 2000; Kerka, 1996).

Research literature indicates that this isolation can be tempered by development of a sense of community and that community contributes to student retention and success (Dawson, 2006; Shea, Li, & Pickett, 2006). A number of studies have supported the importance of interaction in building a sense of community in online learning (Exter et al., 2009; Nicholson, 2005; Palloff & Pratt, 1999; Rovai, 2004; Stepich & Ertmer, 2003; Wallace, 2003; Wegerif, 1998). Interaction factored heavily into Rovai's (2004) discussion of key online course design elements and pedagogy. Working from a constructivist philosophy, Rovai presented methods for presentation of content, instructor-student and student-student interaction, individual and group activities, and student assessment. Each of these elements depends upon interaction for successful implementation.

A review of the literature reveals a vast array of suggested interactions for building community, many based primarily on expert opinion (Drouin, 2008; McInnerney & Roberts, 2004; Nicholson, 2005; Rovai, 2004; Wallace, 2003; Wolcott, 1996). In order to make evidence-based choices, instructors need to know what works and what does not work. Empirical evidence supporting community-building strategies is necessary for

instructors to make efficient and effective course design decisions as they attempt to build community.

The purpose of this study is to contribute to the evidence base through quantitatively examining which types of interaction contribute most to the development of students' sense of community in online learning. Faculty and administrators in post-secondary educational institutions that engage in online learning may consider the reported findings and stated conclusions to have relevance. Faculty members will find the results useful in making choices between multiple time consuming elements of online course design as they strive to create a supportive learning experience for students. Administrators will find the results informative in terms of where financial resources might best be committed. Administrators who oversee distance education will have additional information as they make choices regarding support for professional development for faculty who teach online.

Research Questions

The following research questions guided the study.

RQ1: What learner-learner interactions in online learning are most predictive of sense of community?

RQ2: What learner-instructor interactions in online learning are most predictive of sense of community?

Definition of Terms

Asynchronous learning activities: learning activities that are "not simultaneous or real-time" (Parsad & Lewis, 2008, p. 3).

Distance education or distance learning: "a formal education process in which the student and instructor are not in the same place. Instruction may be synchronous or asynchronous" (Parsad & Lewis, 2008, p. 1).

Interaction: "reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another. An instructional interaction is an event that takes place between a learner and the learner's environment. Its purpose is to respond to the learner in a way intended to change his or her behavior toward an educational goal" (Wagner, 1994, p. 8).

Learner-instructor interaction: "interaction between the learner and the expert on the subject material" (Moore, 1989, p.1).

Learner-learner interaction: "interaction between one learner and other learners, alone or in group settings, with or without the real-time presence of an instructor" (Moore, 1989, p. 2).

Learning community: a virtual space for sharing knowledge and constructing meaning for the purpose of learning (Palloff & Pratt, 1999).

Online learning: learning which makes use of "a wide range of Web resources, including not only multimedia but also Web-based applications and new collaboration technologies" to connect instructors and learners who are geographically and/or temporally removed from each other (USDOE, 2010, p. xi).

Persistence: instructional intensity and duration throughout a learning process which allows one to meet educational goals (Comings, 1999).

Retention: “retaining students within a course, program of study, or degree” (Drouin, 2008, p. 269); “intention to take more online courses” (Drouin, 2008, p. 271).

Sense of community: “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” (McMillan & Chavis, 1986, p. 9).

Synchronous learning activities: learning activities that are “simultaneous or real-time” (Parsad & Lewis, 2008, p.3).

CHAPTER II: REVIEW OF THE LITERATURE

The problem addressed in this study is that online learners who are separated physically and temporally from their instructor and other learners can experience isolation (Kerka, 1996). This isolation is one contributor to the higher dropout rate for distance learning, which has been reported to be 10-20% higher than for face-to-face programs (Carr, 2000).

This study is significant because distance learning that makes use of online technology is growing at a rapid rate that exceeds that of traditional education delivery (Allen & Seaman, 2004). Enrollment in online courses has expanded steadily over the past two decades in higher education institutions in the United States (Parry, 2010). Availability of the educational delivery options made available by the Internet does not, however, automatically create quality learning experiences. Instructors must leverage technologies and delivery formats to create satisfying and high quality educational experiences for students.

Research supports the development of community in online learning as an important factor in maximizing student satisfaction (Liu et al., 2007; Ouzts, 2006; Rovai, 2002a). As instructors consider the many course design options suggested in the literature for creating positive student experiences, they need information beyond expert opinion to guide them. They require empirical evidence to guide their course design choices as they build into courses the interactive experiences that can create a community of learners.

The purpose of this study is to contribute to the evidence base through examining which types of interaction contribute most to the development of students' sense of

community (SoC) in online learning. Faculty members may find the results beneficial as they make choices between multiple time consuming elements of online course design in an effort to create supportive learning experiences for students. This study surveyed graduate level students in online courses to answer the following research questions:

RQ1: What learner-learner interactions in online learning are most predictive of sense of community?

RQ2: What learner-instructor interactions in online learning are most predictive of sense of community?

This chapter presents a review of the existing literature relevant to SoC and interpersonal interaction in online learning. Over the course of approximately 20 years, a number of qualitative and quantitative studies have investigated elements of these constructs and have shed light on relationships between the constructs as well as associations between the SoC, interaction, and student outcomes.

This review is organized by discussion of the following elements: theoretical foundations for the study, development of and contributors to SoC in online learning, the importance of interaction in online learning, and the relationships between SoC and interaction.

Theoretical Foundations

The way we view knowledge and the process of learning is the basis for our approach to the practice of education. Whether knowledge exists independently to be acquired by the learner or whether the learner must actively process and engage with information to learn has implications related to how instructors plan, implement, and

evaluate learning experiences. The following section reviews the constructivist theory of learning and considers competing learning theories as they apply to online education.

Constructivism

Social constructivism views learning as a process in which a learner works to construct new meaning through active involvement. Arising from the work of Vygotsky (1978) and Dewey (1938), social constructivism emphasizes the importance of social encounters in constructing meaning from content. As the learner engages in communication with instructors and peers and content, he refines understanding. Learning does not take place in isolation but requires questioning, clarifying, and testing of information against the knowledge of others. Social constructivism also views learners as unique, with unique experiences, background, and needs (Merriam, Caffarella, & Baumgartner, 2007).

Social constructivism arose from the constructivist movement of cognitive psychology. Cognitive psychologists believe that people build understanding over time through accumulation of experience and through maturation and interaction with the environment. The learner is, in this view, an active processor of information. The locus of learning is in relationships between people and the environment.

Characteristics of Constructivist Teaching and Learning

A number of researchers have attempted to bridge the gap between constructivist theory and educational practice (Ernest, 1995; Jonassen, 1991; Wilson & Cole, 1991). In making recommendations for creation of a learning environment true to constructivist views, these researchers touch on several principles on which they have common ground:

1. Use of a real-world environment which offers learners an authentic context for learning is critical to making learning relevant.
2. It is important to present multiple representations of knowledge and to allow learners to create their own perspective on what is being learned.
3. The role of the teacher is that of a facilitator and guide, not an expert transmitter of knowledge.
4. The student must be allowed some autonomy in the learning process and must acquire skills in self-regulation and self-awareness. Learning goals should be negotiated rather than dictated.
5. Learners should have the opportunity to assess their own learning and construction of knowledge.
6. Negotiation of understanding should be supported through opportunities for collaboration and social experience.
7. The knowledge constructions, attitudes, and beliefs that learners bring to the learning process should be considered.
8. Misconceptions or errors should be viewed as opportunities to glimpse the students' understanding and provide guiding feedback.
9. Students should be engaged in construction of knowledge rather than replication of knowledge.
10. Assessment should be authentic and not entirely separate from teaching.

Additionally, constructivist approaches view scaffolding as an important concept (Murphy, 1997). Scaffolding, based on Vygotsky's (1978) Zone of Proximal

Development, is a process by which a learner is guided from his present level of knowledge of performance to the next level. Assistance or support from a teacher allows the learner to work at the leading edge of his development, progressing to a level slightly above his current ability to know or perform. According to Vygotsky (1978), the Zone of Proximal Development is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86).

In this description the importance of interaction between the learner and instructor and between the learner and other learners becomes apparent. When students collaborate with peers who are at a slightly higher level of understanding or ability, they are able to reach a higher developmental level.

Brooks and Brooks (1999) believe education that incorporates a constructivist philosophy is more than a collection of activities. It is based on a respect for the uniqueness of the student. Constructivism sees the student as a human being in need of specific learning experiences to move to a higher level of learning.

The Role of the Instructor From a Constructivist View

The purpose of education, from the constructivist point of view, is to enable learners to participate in communities of practice and use resources to construct knowledge together. The ideal role of the educator is, therefore, to establish an environment in which active participation and conversation between and among learners and instructor can occur. This interaction allows students to test ideas, clarify

understanding, and develop a new way of perceiving the world. An effective constructivist instructor understands the multiple perspectives that can develop from individual student experience and recognizes that not all learners will learn exactly the same thing.

The instructor, then, becomes a facilitator and guide who provides opportunities for knowledge construction. Because it is considered important for students to also develop autonomy and skills in self-management, the teacher must support their efforts to manage their own learning. The principles of constructivism are found in such learning practices as self-directed learning, experiential learning, and reflective practice.

The Role of the Learner From a Constructivist View

From the constructivist view, then, the learner is an active participant in learning. Learners must engage in interaction with their instructor, peers, and content, and attempt to make sense of what they encounter. They must take advantage of the opportunities provided by the instructor and participate in the authentic activities designed to push their understanding to a higher level.

Students accustomed to a passive learning style may find it necessary to step outside their comfort zone to adopt new roles (Bostock, 1998). They may contribute ideas for goals and objectives for learning and may suggest topics for study and projects. Students involved in collaborative learning will find they need to be open to others' perspectives and must accept, if not agree with, differing opinions and ways of doing things. They must begin to manage their own learning, relying on the structure that has

been provided by the instructor as a starting point, and requesting clarification when confusion arises (Vrasidas, 2000).

The constructivist views of teaching and learning contrast with the philosophical frameworks and learning theory associated with behaviorism and cognitivism. The views of these competing theories as well as their complementary elements are presented in the following section.

Comparison of Social Constructivism With Competing Learning Theories

Constructivism has been discussed extensively in the online learning literature. It does not reflect, however, the philosophy of all educators, nor is it sufficient on its own to explain all factors involved in the learning process. A review of competing theories of learning is, therefore, appropriate.

Behaviorism.

Behaviorism is based on an objectivist philosophy that states there is objective truth that exists in the world independently of the human mind (Vrasidas, 2000). Objectivists believe that there is one true reality and that the learner must identify and acquire that truth or knowledge. Learning is viewed as the transmission of knowledge from the teacher to the learner (Jonassen, 1991).

To a behaviorist, the learner's mind is an empty vessel which the teacher must fill with specific and systematically delivered knowledge. Behaviorism focuses on observable, measurable elements of learning. Arising from the work of Thorndike, Pavlov, and Skinner (in Merriam et al., 2007), it views learning as a change in behavior rather than transformation of mental processes and places the locus of learning in an

external stimulus and an internal response. Learning is the acquisition of new behavior through conditioning. The behaviorist views the purpose of education as the production of a change in behavior in a certain direction. The role of the educator is to arrange the environment to elicit the desired response from the learner (Merriamet al., 2007). The instructor selects learning objectives, identifies learning activities designed to achieve those objectives, and conducts assessment to measure student attainment of those objectives. Learning practices such as Applied Behavior Analysis and directed instruction are based upon behaviorist principles.

A useful element of the behaviorist approach is the creation of learning objectives and assessment aligned with those objectives. A criticism of the constructivist approach is that the relatively unstructured negotiation of learning objectives, while it works well for many academic subjects, may not work as well for subjects in which specific knowledge and skills must be attained for accurate and safe work performance (Vrasidas, 2000). In the health care sciences, for example, there are many perspectives that can be taken on how to make clinical decisions related to end-of-life care. There is, however, only one way to correctly perform a number of complex clinical procedures, and an educator has a responsibility to ensure that students master the correct method.

It would make sense, then, to view these learning theories as complementary in many cases. A behaviorist approach may be an appropriate choice for training detailed, complex procedures with infusion of a more constructivist approach as students engage in case studies to explore topics such as decision making and ethics.

Cognitivism.

Cognitivism concerns itself less with observable behaviors than does behaviorism and stresses instead the brain processes involved in learning. This theory, which evolved from the work of Koffka, Piaget, and Bruner (in Merriam et al., 2007), views learning as a process that occurs within the learner. It concerns itself with internal mental operations such as information processing, perception, and memory.

Piaget (1970) built on behaviorist and Gestalt perspectives and proposed that interaction with the environment and exposure to varied experiences were factors in the changes that occur in a learner's internal cognitive structure. His work, while focused on the cognitive development of children, described developmental stages that extended through early adulthood and have provided a foundation for theories of adult learning (Merriam et al., 2007).

The cognitivist educator sees the purpose of education as developing a learner's capacity and skills to continue to learn more effectively. Within this framework, the educator's role is to structure content of learning activities to support learning. The cognitivist approach, therefore, has elements that overlap constructivism. Principles of cognitivism underlie the concept of learning how to learn, which resonates with constructivist principles of self-regulation, self-awareness, and self-assessment. According to Smith (1982), "learning how to learn involves possessing, or acquiring, the knowledge and skill to learn effectively in whatever learning situation one encounters" (p. 19). Cognitivism, however, remains largely focused on the individual learner without consideration of the social context of learning.

Constructivism in Online Education

The theory of constructivism is foundational to the pedagogy of online education. A paradigm shift has been taking place in education in the United States in which the focus has begun to move from a teacher-centered approach to a learner-centered approach (Rovai, 2004). This shift is characterized by less focus on the role of the teacher as expert, where information is provided to a passive learner who subsequently acquires the knowledge that has been passed on. In the learner-centered approach, the teacher often serves as a facilitator who provides opportunities for actively engaged learners to make sense of information through authentic activities. The technologies and learning opportunities afforded by distance technologies make online learning an ideal arena for implementing this new paradigm.

This learner-centered approach holds that, for many students and for many subjects of study, the one-way flow of information from expert to student that makes up some forms of distance education is less than ideal to create learning. Most students benefit from the mediation of an instructor as they attempt to make sense of complex content (Wallace, 2003). Interaction between the learner and instructor, as well as between the learner and other learners, is important to support the construction of knowledge (Rovai, 2004).

In an online education setting, this flow of information is constrained by technology, equipment, and the asynchronous nature of much distance learning. Information flow, therefore, requires attention and planning beyond that needed in a face-to-face educational setting. The instructor has the additional task of selecting

technologies and tasks that will allow for the communication and exchange of information needed to support construction of knowledge over a distance (Vrasidas, 2000).

In keeping with the principles espoused by Ernest (1995), Jonassen (1991), and Wilson and Cole (1991), Rovai (2004) suggests that the implications of a constructivist approach to online learning include "using curricula customized to the students' prior knowledge, the tailoring of teaching strategies to student backgrounds and responses, and employing open-ended questions that promote extensive dialogue among learners" (p. 81).

Jonassen, Davidson, Collins, Campbell, and Haag (1995) contend that distance learning technologies should be used to provide students with opportunities to work together to become a community of scholars. Rather than using interactive technologies to deliver lectures in a replication of ineffective face-to-face teaching methods, distance educators should create ways for students to interact and collaborate (Jonassen et.al.). The availability of increasing bandwidth supports educators in designing courses which allow for enhanced communication and interaction (Lefoe, 1998). Technologies can, therefore, be used to facilitate quality learning rather than traditional teaching which is in alignment with the paradigm shift to learner-centered approaches taking place in education across the country.

Studies Investigating Constructivism in Online Education

Several researchers have investigated the impact of online course design based on constructivist learning principles. Bostock (1998) examined the application of the

constructivist approach to mass higher education. He designed a single web course for approximately 300 students and examined how successful the design was in creating a constructivist environment. Course design was based on the constructivist principles of authentic assessment, student self-regulation, generative learning (creation of a product), authentic activities, and collaborative work. Participants were 133 undergraduate students who completed both an initial and final questionnaire. Fifty-six students were randomly selected for structured interviews.

Bostock (1998) reported that diversity of the course participants in terms of age, major, and previous experience with online coursework and group work resulted in a wide range of responses to the questionnaire and the interview. He suggests that the constructivist framework for this course was beneficial in accommodating the various abilities and styles of learning found within this group. He found that some students enjoyed the challenges of a learning environment built from a constructivist approach, while others found it uncomfortable. He suggests that a partial implementation of this model might be optimal for most students.

In a similar study, Alderman and Fletcher (2005) designed and taught a single online course using principles of communication and collaboration put forward by Roblyer and Wiencke (2003) and examined the level and quality of the interaction that occurred. Students were allowed to choose between a number of course activities. Several discussion forums were mandatory and encouraged peer critique, authentic inquiry, and teamwork. Twelve of the thirteen enrolled students participated in the study.

Level and quality of the interaction were measured using the Rubric for Assessing

Interactive Qualities in Distance Courses (RAIQDC) (Roblyer & Wiencke, 2003). The RAIQDC asks students or faculty to rate their class on five levels for five elements — social/rapport-building designs, instructional designs, interactivity of technology resources, evidence of learner engagement, and evidence of instructor engagement — ranging from low interactivity to high interactivity. Alderman and Fletcher (2005) used all but the interactivity of technology resources element, as their course did not make use of the synchronous communication measured by this element. A focus group was used to elicit verbal evaluative feedback.

The authors reported that, for the element of social/rapport-building, course activities encouraged students to develop a sense of trust and community. Related to the instructional design element, the majority of students reported that course activities had improved their ability to critique their peers' work but had reservations about the required workload. Some students also expressed reservations about division of labor in small group work and preferred large group interaction. In the area of learner engagement, the number of student postings of online messages varied widely, and some students desired more guidance regarding how much interaction was required. Finally, for the element of instructor engagement, students rated instructor feedback highly and valued the guidance they received.

The authors concluded that this course designed on constructivist principles met the highest level of interaction as measured by the interactivity rubric. Similarly to Bostock's results, students in this study had much positive feedback about the course but found it labor intensive. The authors reflected on the upper limits of course interaction

and the need to provide students with guidance on time management and workload management.

Implications of Constructivism for Interaction and Sense of Community

If learners construct meaning from interactions with others, then the online learning environment must be designed in a manner that supports such interaction. For the online learner who is sitting alone at a computer, opportunities for interaction to support learning must be planned and provided (Nicholson, 2005). As students engage with each other through discussion and learning experiences, they begin to make sense of course content and learn from each other (Shea, 2006).

In addition, students begin to forge connections with each other through interaction. Over time, this creates a community of trust, interdependence, and mutual support. This sense of belonging, of community, supports ongoing and enhanced interactions between and among students as well as between students and their instructor (Rovai, 2002a). Students who sense that they belong to a trusted community of learners are emboldened to ask questions, clarify misconceptions, support each other, and admit to gaps in their learning. This cyclical process in which interaction contributes to community, which in turn enables enhanced interaction, sets the stage for a social constructivist learning process.

Sense of Community

Early views of community were drawn from studies of physical neighborhoods and dealt with communicative behaviors and attitudes, social bonding, safety, and length of residency (McMillan & Chavis, 1986). The concept of community was applied to

education in the 1990s and centered on the elements of a shared sense of purpose; establishing membership boundaries; enforcing rules and policies regarding behavior; interaction among members; and a level of trust, respect, and support among community members (McMillan & Chavis, 1986).

Sense of Community Defined

McMillan and Chavis (1986) defined a sense of community (SoC) as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9). Their definition contains four elements: membership, influence, integration and fulfillment of needs, and shared emotional connection. Membership refers to a feeling of belonging and personal relatedness. Influence refers to having a sense that one makes a difference to the group and that the group matters to its members. Integration and fulfillment of needs concerns itself with the reinforcers that tie members of a community together and make community a rewarding experience. Lastly, shared emotional connection is based on community members having a shared history and shared events with which they can identify.

Palloff and Pratt (1999) suggest that an online community involves active interaction comprised of both academic and social communication, collaborative learning, and social construction of knowledge. A learning community is, therefore, based on both intellectual and emotional components.

Elements of Online Community

Rovai (2002a) believes that SoC can be viewed as what people do together and is not constrained by location or physical proximity. He applied the elements of community to the classroom setting and pointed out that an online learning community will have the four elements of community outlined by McMillan and Chavis (1986). In applying those elements to online education, he labeled them spirit, trust, interaction, and commonality of expectations and goals (learning).

Spirit is described by Rovai (2002a) as "recognition of membership in a community and the feelings of friendship, cohesion, and bonding that develop among learners as they enjoy one another" (p. 2). This sense of belonging allows students to support one another through the learning process and can decrease the sense of being alone and isolated. The second dimension described by Rovai is trust, which he defines as group members feeling that they can rely on each other with confidence. Trust enables students to communicate honestly regarding gaps in their learning with an expectation of receiving support from their classmates. Construction of knowledge can occur between students and instructor in an open and comfortable environment when trust has been established.

The third element, interaction, is described by Rovai (2002a) as interaction between learners. He differentiates between task-driven interaction, which involves completion of assignments, and socio-emotional interaction, which occurs as students become acquainted and seek support from each other. Task-driven interaction is typically controlled by the instructor, whereas socio-emotional interaction is self-generated.

The final element in community is common expectations. According to Rovai (2002a), this element "reflects the commitment to a common educational purpose and epitomizes learner attitudes concerning the quality of learning" (p. 3). Learning within this social community goes beyond simply acquiring information and involves transformation of roles and understanding as students find that their educational needs are being met.

Studies of Sense of Community in Online Learning

This section will review empirical studies related to SoC in online learning. Studies are organized by discussion of the need for community, the process of community building, and the challenges of building community in an online environment.

The need for community in online learning. Establishment of a community to support learners is important in online learning (Gallagher-Lepak, Reilly, & Killion, 2009; Liu et al., 2007; Moller, 1998; Wegerif, 1998). Moller (1998) believes that community in a distance learning environment fulfills two functions: social reinforcement and information exchange. Social reinforcement leads to group cohesion, which can result in lower turnover and improved participation. Information exchange which results from collaborative learning can lead to enhanced knowledge building. Palloff and Pratt (1999) believe that community is mandatory for online learners because of the role it plays in supporting active learning online.

Development of a SoC in an online learning environment is also associated with student outcomes. A number of empirical studies have found that SoC is positively

related to perceived learning (Liu et al., 2007; Shea, 2006), course satisfaction (Drouin, 2008; Exter et al., 2009; Liu et al., 2007), and learning outcomes (Liu et al., 2007; Shea et al., 2006). Some authors also have found an association between SoC and student retention (Anderson & Elloumi, 2004; Tinto, 1975) and persistence (Shea et al., 2006).

Wegerif (1998) argues that the social dimension is critical to student success in online learning. He believes that student success is closely tied to the degree of collaborative learning that occurs and to a student's sense of belonging to a learning community. Wegerif (1998) conducted an ethnographic study of student and tutor experiences in an asynchronous online course. Participants were 14 faculty members and 48 graduate students in 14 different online courses at a regional comprehensive university. Convenience sampling was used to select experienced online instructors, and the instructors invited the students in their classes to complete a survey. Using data gathered from participant observation, in-depth interviews, e-mail messages, and a postal questionnaire based on Brown's (2001) community building framework, the authors conducted exploratory content analysis to identify themes.

Most students (85%) and all instructors perceived that being part of a learning community helped students learn. The majority of students (94%) experienced a sense of being part of a community. Factors affecting SoC were drawn from interviews with students and included differential access to the shared conversation, conflicts of discourse, staging of exercises from structured to more open, student-led teaching opportunities, and time for reflection at the end of the course. The authors argued that the social dimension is important to effectiveness of asynchronous learning.

Gallagher-Lepak et al. (2009) explored student perceptions of community to guide understanding of pedagogy in the online classroom. Their study focused on the experience of undergraduate level nursing students at one Midwestern university.

Gallagher-LePak et al. (2009) used a case study design and captured participant experiences through focus group interviews. Questions elicited student examples of community, isolation, actions taken by students to build community, and actions taken by instructors to build community. Of 19 scheduled participants, 18 attended a focus group facilitated by two experienced moderators and lasting 90 minutes. Sessions were recorded and transcribed verbatim. Content theme coding was used to organize data and identify themes in participant responses. Code validation was performed by the three researchers.

Results of this study demonstrated the importance of SoC to this group of nursing students and provided examples of what produces an engaging, facilitative, and supportive learning environment. The structural themes that emerged were class structure, required participation, teamwork, and technology. Factors related to process of community building were becoming, commonalities, disconnects, mutual exchange, online etiquette, and informal discussion. Emotional factors which emerged were aloneness, trepidations, unknowns, nonverbal communication, and anonymity. The authors concluded that there are many direct benefits to developing a SoC in the online learning environment. Their findings support the idea that politeness, concern, respect, and trust can be modeled in online courses and that efforts must be made to bridge the communication gap between online and face-to-face environments using innovative pedagogical approaches.

Study limitations were not discussed by the authors. While the use of a case study approach was appropriate for this exploration, triangulation of results using course data such as student postings and a validated measure of student SoC would have strengthened the study. Existence of a SoC was assumed by the authors. The participant sample was predominantly female and Caucasian. The lack of diversity in the sample, paired with the sample being drawn from one university, limits the representativeness or transference of the results to a wider population.

Liu et al. (2007) used a case study approach to examine student and faculty perceptions of building a learning community in online courses. In this study the authors explored whether or not SoC is important and what factors are important to effectively build it.

Interviews were conducted with 28 faculty members and 20 graduate students in an MBA program at a large Midwestern university. Student satisfaction was measured using a 65-question program evaluation instrument, which was completed by 102 students. Occurrence of collaboration and interactions was determined by content analysis of 27 online courses.

A vast majority of students felt they were part of a community of learners. Correlation analysis revealed positive relationships between SoC and learning engagement, perceived learning, and satisfaction with courses. Moderate positive correlations were found between SoC and four elements which made up social presence: perceived familiarity with other students, not feeling isolated, comfort level with reading messages, and perceived emotional presence of other students. A positive relationship

also was found between SoC and three items which made up instructor presence: regular feedback, helpfulness of instructor facilitation, and informative feedback. A moderate negative correlation was found between intention to drop out of the program and SoC.

The authors determined that several instructional strategies were positively correlated with SoC. Regular course announcements and feedback were moderately related to SoC, and group work was related to group community but not to class level community. While some instructors felt community was relevant in online learning, not all instructors felt community building was important, citing time limitations for both instructors and students. Students also reported varied levels of desire for community. This low level of awareness and value for community may be related to the authors report that participants expressed a narrow view of community as a social network not necessarily related to course outcomes.

An interesting result of this study is that instructors recommended technological solutions for low levels of community in online courses. Students, in contrast, recommended more social interaction activities to allow them to develop relationships.

A limitation of this study was the small sample drawn from one university, which limited generalization to other populations. Instrumentation was a significant limitation. An existing unvalidated program evaluation survey was used to measure SoC, and a copy of the instrument was not provided. The authors mentioned that the measurement of this construct was not multidimensional, and the study would be improved by use of a more valid instrument.

The process of community building in online learning. Brown (2001) used grounded theory to explore how community is formed in online learning. Her study sheds light on how online students define community, what events lead to community, and the process of community formation.

Brown (2001) chose a qualitative design to examine process without the intent to generalize to a wide population. She used grounded theory methodology to build a theory about online community development and the relationships among the concepts identified.

Participants were selected using theoretical sampling, through which students were selected based on their ability to contribute to theory development. Twenty-one graduate level students enrolled in asynchronous online educational administration courses at one Midwestern university were chosen. Twelve fall semester students were veteran online students, six spring semester students were novices, and three summer semester students were enrolled in a class with both novices and veterans. Three faculty members who facilitated classes were chosen as participants.

Data was collected through interview and archived notes from course postings. Brown (2001) found that nine themes emerged from data analysis. She described the themes as similarities/differences of students, student needs, student roles, instructor roles, class structure, program structure, comparisons of distance education delivery format, change in communities and education over time, and feelings students experienced. Axial coding was used to examine relationships between the categories.

Results revealed that students' definitions of community tended to revolve around

commonalities with other students and student responsibility for their own and each other's learning. Brown (2001) identified three levels of community that developed: making online acquaintances; being accepted into the online community through ongoing interaction; and camaraderie, which developed after long-term personal communication, often outside the virtual course management system. The increasing levels of community appeared to be accompanied by increased participation in the course. Not all students reported feeling that they were part of a community. Some were limited by such things as their definition of community, circumstances which prevented full engagement, or lack of desire to develop online relationships with other students. Veteran students had more capability to develop community early in their courses, as they were more comfortable with online technology and did not have to divert their energy and time resources to learning technology. Novices needed more support and requested a tight class structure and frequent interaction with the instructor.

In a case study that explored the dynamics of SoC, Rovai (2001) found that community grew over the course of a semester. The purpose of Rovai's study was to determine whether online instructors can create a virtual environment that supports development of SoC, whether gender influences online communication patterns, and how communication patterns related to gender influence SoC.

Participants were 20 adult learners who were taking graduate online classes in one online education course. The course lasted for five weeks and was asynchronous, with the exception of limited online chat. The instructor acted as a facilitator by introducing topics, posing questions, summarizing discussions, encouraging, and supporting. Students

had substantial input on discussion topics as well as on topics for collaborative group projects.

The author used an observational case study design with both qualitative and quantitative measures. He examined frequency and content of course interactions, employing descriptive statistics and methods. Patterns of wording used by students in discussion board posts were evaluated in a manner which blinded the researcher to the student's gender. Messages were analyzed for connected vs. independent voice patterns. Connected voice was described as referencing self or family, referencing another student's family, describing personal experiences, praising, encouraging, and supporting. Independent voice was described as arrogant, argumentative, confrontational, defensive, asserting self, disagreeing, rude, or hostile.

SoC was measured using the Sense of Community Classroom Index (SCCI) (Rovai & Lucking, 2003). The SCCI is a validated self-report instrument which contains 40 items to measure subscales of trust, spirit, interaction, and learning. The scale uses 5-point Likert responses ranging from strongly agree to strongly disagree, and higher scores reflect a stronger SoC than lower scores. The SCCI was administered after the first week of class and was repeated during the last three days of the 5-week class. Learner feedback on course strengths and weaknesses was elicited through a discussion board posting during the final week of the class.

Results indicated that SoC increased over the duration of this course, which supports the idea that instructors can create online courses which support development of community. Male and female communication patterns were found to be significantly

different in terms of connectedness. Males tended to use more authoritative, impersonal, and assertive messages than females. Females tended to use more supportive and personal messages. Students with higher SoC scores tended to write with a connected voice. Learner feedback indicated that interactions promoted the development of community.

The author concluded that instructors can design courses which minimize feelings of isolation by promoting community. Instructors should be aware of students' communication patterns and should facilitate interaction of diverse group members.

Limitations of this study are its small sample size and the use of only one course. The author noted that all participants had experience as online learners previous to the course used for this study, and their experience of developing community may have been accelerated by this experience. These results may, therefore, apply only to experienced online learners. The author included a narrow range of interactions in his analysis, focusing on asynchronous discussion board postings. Synchronous communications and e-mail messages were not examined.

Factors influencing community in online learning. In a similar study, Conrad (2002) explored what influences online learners' participation in online community. She used interpretive qualitative methods to look in depth at the interactions between online learners. Participants were members of a cohort of students who took courses together. Data was collected through in-person interviews with seven adult learners in one undergraduate online course.

In spite of discussion of the concept of community during orientation, participants

struggled with defining this term. Some narrowly defined it as the cohort group which took classes together, and others defined it quantitatively as the number of messages they exchanged. They valued an optional face-to-face meeting as a first step in forming a bond and building community. Conrad (2002) found that participants expended effort to establish and maintain harmony within the course. An interesting finding was the careful manner in which participants went about interacting in their course. They carefully monitored their own communications to maintain a pleasant learning experience for the group. They commented on the permanence of the text-based messages they shared and the level of reflection and deliberation in which they engaged before posting messages.

Conrad (2002) concluded that development of an online community is critical to a successful online learning environment. She found that these adult students created a community that was "functional, time-driven, and carefully modulated" (p. 16), and believes there are differences between the communities built by one-time interactions and those built by students with ongoing programs. She purports that online interactive activities contribute to creation and maintenance of community. Her results also support Brown's (2001) finding that the needs of students and the nature of the online community change over time.

This study would have been strengthened by a more detailed description of methodology and data analysis methods. Additional data sources which could be used to triangulate results also would have enhanced this study.

Challenges of building online community. While research supports the importance of developing community, it also points to the difficulties inherent in building

a learning community in an online environment. Brown (2001) found that students reported taking a longer time to develop friendships and community in an online course than they would in face-to-face interactions.

Similarly, Vesely, Bloom, and Sherlock (2007) found that students felt that, while community was important for learning, it took more time and effort to build community in an online course. In this qualitative study, 14 faculty and 48 graduate students responded to a survey to share their perceptions of development of community in online courses. SoC was reported to be very important to both instructors and students. They reported challenges with text-only communication, finding time for building community, variations in level of student participation, and the need for frequent checking in to remain in the loop.

In a study which compared SoC levels across three delivery formats (face-to-face, blended, and online courses), Ritter, Polnick, Fink, and Oescher (2010) found that online students achieved a lower connectedness score on the Classroom Community Scale (Rovai, 2002b) than did students in either blended or face-face classes. Online students' perceived learning, however, was not significantly different from students taking courses through the other two formats.

Despite these challenges, community can be built to support student learning. An environment which facilitates development of classroom community can be established (Rovai, 2001). Purposeful design of courses which minimize student isolation can enhance community in online learning (McInnerney & Roberts, 2004; Yang & Liu, 2008).

The studies reviewed in this section indicate that, despite the difficulties inherent in building a learning community in an online environment (Brown, 2001; Vesely et al., 2007), there is support for the importance of building community for social reinforcement (Conrad, 2005; Gallagher-LePak et al., 2009; Moller, 1998), information exchange (Moller, 1998), and student outcomes (Anderson & Elloumi, 2004; Drouin, 2008; Exter et al., 2009; Liu et al., 2007; Shea, 2006; Shea et al., 2006; Tinto, 1975; Wegerif, 1998).

These studies show that community arises from commonalities and shared responsibilities (Brown, 2001), and it changes over time (Brown, 2001; Conrad, 2002). While not all students desire connectedness or feel they are part of a community, for those who do seek it, increasing levels of community appear to be accompanied by increased participation in courses (Rovai, 2001).

Interaction

Researchers have struggled with defining the concept of interaction (Simpson & Galbo, 1986; Herring, 1987). Wagner (1994) views interaction in online learning from a perspective of functional outcomes which lead to learning events. She defines interaction as "…reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another" (p. 8). She notes that the purpose of instructional interaction is to respond to a learner in a way that will change his behavior in a goal-directed way.

A common conflation that occurs in the literature on interaction is inappropriate use of the term interactivity. While interaction is an instructional event which focuses on behavior, interactivity describes the attributes of an instructional delivery system

(Roblyer & Weincke, 2003). Interactivity is differentiated, then, as a characteristic of a technology resource such as the ability of a software program to accept input and provide a customized response which moves a student to the next level. This paper addresses the behavior-related construct of interaction rather than interactivity, as the focus of the study is human interaction rather than technology.

Interaction Types

Discussions of interaction in online learning research literature typically begin with Moore's (1989) identification of three types of interaction: learner–content, learner–instructor, and learner–learner. The first type, learner–content (L-C), occurs between the student and the subject of study. This is a foundational characteristic of learning, as interaction with the content is necessary to change the student's perspective and understanding (Moore, 1989). Examples of learner–content interaction would be a student reading a book, listening to a television broadcast, listening to an audiobook, reading lecture notes, or working with a computer software program.

Another type of interaction discussed by Moore (1989) is learner–instructor interaction (L–I). In this interaction, the instructor attempts to stimulate student interest in the course content, to motivate the student, and to facilitate the learning process (Swan, 2003). Examples of learner–instructor interaction are instructor feedback on performance, electronic mail between student and instructor, instructor demonstration of a skill using videoconferencing, and discussion board postings in which an instructor makes comments to guide an evolving student discussion.

Learner–learner interaction (L–L) is a more recent dimension available in distance education and consists of communication between students, in pairs or groups, with or without an instructor present (Moore, 1989). Common examples are discussion board postings on academic topics, working on collaborative projects with a small group, and sharing of personal information to identify commonalities between students.

To these three interaction types, Hillman, Willis, and Gunawardena (1994) added a type unique to distance education: learner–interface interaction. Hillman and his associates pointed out that, in an online environment, the interactions described by Moore must be mediated by some form of technological device. The instructor chooses activities and technologies based to some degree upon her teaching approach, and in turn, the technologies permit or restrict amount and quality of interaction. This medium acts as a filter through which communication passes and can influence message content, learner experience, and learner satisfaction with the communication experience (Hillman et al.). Throughout the process of taking part in an online course, students and faculty interact with and learn to manage such things as computer hardware, learning management systems such as Blackboard, and attaching documents to electronic mail messages.

How Interactions Relate to Sense of Community

Each of these interaction types can help to build spirit, trust, interaction, and learning, the four components of community (Rovai, 2001). Spirit is a "feeling of belonging and acceptance, of group identity" (p. 34). Support, encouragement, and inclusive comments from the instructor (L–I) and other students (L–L) can contribute to spirit. Trust is "the feeling that the community can be trusted and feedback will be

forthcoming and constructive" (p. 34). Interactions that lead to development of trust are such things as instructor content presentations that are informed and accurate (L–C), candid but respectful feedback (L–I, L–L), and open dialogue in which gaps in learning are met with support rather than criticism (L–I).

The third dimension of community, interaction, was defined by Rovai (2001) as "the feeling that closeness and mutual benefit result from interacting with others" (p. 35). This connectedness can arise from interactions such as self-disclosure and empathetic messages (L–L). A sense of mutual benefit is likely to result from interactions that facilitate completion of academic tasks (L–C, L–I)

The final community component, learning, is defined by Rovai (2001) as "the feeling that knowledge and meaning are actively constructed within the community, that the community enhances the acquisition of knowledge and understanding" (p. 35). Examples of interactions within this component would be collaborative group projects (L–L), in-class discussions (L–C, L–I), and validating instructor feedback (L–I).

This study will focus on learner-learner and learner-instructor interaction types. While a number of other interaction types are certainly important in online learning, consideration of all types in the current study would be cumbersome and would detract from the value of the work.

Studies of Interaction in Online Learning

Interaction may be the most important activity in a positive online learning environment, according to McIsaac, Blocher, Mahes, and Vrasidas (1999). For the isolated student, interactions between and among students, as well as interactions

between instructors and students, are crucial in enhancing discussion and motivation to learn. McIsaac et al. (1999) used a mixed methods approach to examining several constructs of distance education including interaction and the social context of learning. Quantitative data were collected from six online courses (including amount of time logged into course conferencing software, number and content of postings and chat times) at a Southwestern university. Student and faculty sample size was not reported. Interviews were conducted to explore questions that quantitative data raised regarding interactions. Descriptive statistics were generated using quantitative data. A holistic interpretive method was used to analyze the qualitative data, in which assertions were generated from rereading of the data without breaking it up into categories.

The themes that arose from faculty data were that teachers spend more time encouraging participation in distance courses than in face-to-face courses, that different forms of communication are used in distance learning which can result in high quality communication, and that teachers spend more time on teaching a distance course than a face-to-face course. Student interactions were goal-directed, and their goals included getting or sharing academic information, obtaining technology help, submitting homework, exchanging ideas through participation in discussion, and socializing. The authors concluded that instructors should create a learning community by providing immediate feedback, participating in discussions, promoting interaction, and using collaborative activities.

Learner–learner interaction. Learner–learner interaction (L–L) consists of communication between students, in pairs or groups, with or without an instructor present

(Moore, 1989). In a qualitative study exploring the perceived benefits of interpersonal interaction and content interaction in online learning courses, Thorpe and Godwin (2006) surveyed over 600 undergraduate students using open-ended questions. Two questions asked students about positive and negative contributions of conferencing and e-mail within their course. Responses were coded and themes were identified. Results indicated that students found interpersonal interaction valuable in terms of learning from peers. They reported sharing views and reactions which reassured them and confirmed their understanding. They reported benefits of team work and problem solving together, such as expanding their learning and being exposed to greater diversity of ideas and expertise of other students. The authors concluded that students valued interpersonal interaction for reasons different from content interaction and that both forms were important.

LaPoint and Gunawardena (2004) examined the relationship between learner–learner interaction and learning outcomes in online learning. They used an a priori qualitative method to determine constructs and content analysis to measure responses. Peer interaction was measured by asking participants to self-report the frequency and nature of interaction with their peers. Learning outcomes were measured using a 5-point Likert scale developed by the author and a learner satisfaction scale previously developed by the author (Gunawardena & Zittle, 1997). Structural equation modeling analysis was used to assess the relationships between variables. Results showed that peer interaction had a strong direct effect on learning outcomes, indicating a strong relationship between these two variables. Increased peer interaction was accompanied by increased learning outcomes.

The studies reviewed in this section indicate that interactions between and among students, as well as interactions between instructors and students, are crucial in online learning (McIsaac et al., 1999). Interaction is an important factor in satisfaction with online courses (Stein, Wanstreet, Calvin, Overtoom, & Wheaton, 2005). Students value interactions with and support from their instructor (Jiang & Ting, 1999). They also value interpersonal interaction as a way to learn from their peers.

Learner–instructor interaction. Learner–instructor interaction (L–I) involves the instructor attempting to stimulate student interest in the course content, motivate the student, and facilitate the learning process (Swan, 2003). Jiang and Ting (1999) sought to statistically examine, in an online environment, the relationships between student perceived learning and 11 factors within four categories: perceived instructor behavior (which included instructor–student interaction, instructor–student communication, instructor evaluation, and instructor responses); perceived student behavior (student–student interaction and student–student communication); perceived contributions of learning activities (online discussion and written assignments); and other variables (learning style, prior computer competency, and time spent on a course).

A 14-question electronic survey was administered to all students enrolled in 78 online courses at one university. A response rate of 58% provided 287 completed surveys. Regression analysis revealed that 33% of the variation in student perceived learning was explained by four of the factors: online discussions, instructor–student interaction, time on course, and written assignments. They concluded that students found a great deal of value in their interactions with their instructor. They valued online

discussions slightly more than written assignments as contributors to their learning. This study supported the importance of interaction in an online learning environment and the importance of support from an instructor.

A strength of this study was its use of research literature to develop independent variables which might be predictive of perceived learning. The sample size and response rate were adequate. The survey administered to participants was unfortunately not provided, which prevents the reader from determining how perceived learning was measured and how the independent variables were operationalized. The authors did not define their variables such as learning style and instructor responses, so application of their results is hampered by lack of a clear understanding of what they actually measured.

In a quantitative study exploring the effects of course format, satisfaction with course structure, satisfaction with interaction, and technical expertise on satisfaction with learning, Stein and his associates (2005) found that interaction was an important factor in satisfaction with online courses. In this study, 34 graduate and undergraduate students in 6 courses at a Midwestern university completed questionnaires at the end of their online courses. Interaction was measured by three items on a questionnaire which rated student satisfaction with dialogue with the instructor, amount of small group dialogue, and amount of sharing between the student and classmates. Regression analysis showed that the combined learner-initiated interaction and instructor-initiated interaction contributed more to student satisfaction with learning than did course structure by itself. The authors concluded that interactions built into the course by the instructor were more important than interactions initiated by students. They recommended that planned interactions

should be flexible at the outset of an online course to allow learners to discover and express their learning needs.

Studies of Sense of Community and Interaction

Bringing students together into a virtual classroom to access content and complete assignments is insufficient to create community (Dawson, 2006; Palloff & Pratt, 1999). What, then, moves students to a level of social connectedness and learning that would cause them to consider themselves a community? A number of studies have investigated the types of interactions that contribute to community development.

Sense of Community Can be Promoted Through Interaction

Stepich and Ertmer (2003) suggested that community in online learning can be promoted through thoughtful attention to course structure and design of learning activities. They used a case study design to describe how they attempted to promote active, collaborative learning and to develop a SoC among online learners. The authors implemented five elements of community introduced by Palloff and Pratt (1999): active interaction, collaborative learning, socially constructed meaning, sharing of resources, and expressions of support.

Subjects were 29 graduate students enrolled in two courses at two universities. The students engaged in complex case studies and collaborative activities. Occasional synchronous chats allowed students to discuss the projects.

The method used in this study was to describe the setting and how the five components of community were implemented in their courses. The authors offered no description of formal qualitative data analysis methods.

The authors found that each of the five components of community appeared in student comments, supporting the idea that facilitation of meaningful interactions can promote community in online courses. They followed up with recommendations for building community through use of strategies such as promoting community from the beginning of a course, monitoring and supporting student communication and participation, providing comments that highlight a coherent "big picture" framework, assessing effectiveness in building community, and providing initial training in technology use to minimize barriers to community building.

This study, while based on solid theory and research literature, has several limitations. The courses under study were taught by the authors, which introduces potential bias. The data analysis was an informal descriptive style with no attempt made to check reliability or seek external validation from less biased sources. There also was no measure of a level SoC. The authors conclude that the presence of certain student comments indicates community but are making an assumption that community within these courses actually exists.

Interaction and socialization played an important role in building SoC in a study by O'Hara (2008). Analysis of student discussion postings in an online class informed O'Hara's testing of criteria for learning community formation. Within an exploratory case study design, she used the Flander's Interaction Analysis Protocol (Flanders, 1970, as cited in O'Hara) and the Palloff and Pratt (1999) criteria for virtual community to evaluate student discussions.

Purposeful sampling was used to select approximately 80 undergraduate and graduate students enrolled in four online courses at one university in Pennsylvania. All courses were taught by the same instructor. Data collection involved online observation of approximately 200 written threaded discussion postings. O'Hara (2008) measured level of participation by calculating number of messages posted as well as mean and median number of messages posted. The degree to which messages were interactive or independent was measured by analyzing whether messages made reference to other messages. The Flander's Interaction Analysis Protocol (Flanders, 1970, as cited in O'Hara) for evaluating interactions describes instructor interactions as supportive, influencing learner participation or action, or critiquing and evaluating learner activities. Student interactions are classified by who initiates an interaction and what type of conversation follows. Criteria for creation of a learning community were drawn from Palloff and Pratt's (1999) model.

NVivio 7™ software was used to organize and categorize interaction events and presence of criteria for learning community found in threaded discussions. The author used coding to develop and analyze themes.

The authors found that students did form community to varying degrees based on developmental factors and previous online experience. They found that students engaged in five interactions most frequently: lecturing/giving opinions, accepting ideas/building on ideas of others, accepting and agreeing with ideas of others, initiating student talk, and lecturing/citing facts. Students used a number of interactions not classified in the Flander's protocol: relating personal experience, reflective comments, use of

flames/emoticons/text messaging language, and expressions of courtesy. Student discussions met all Palloff and Pratt (1999) criteria for community with the exception of offers to evaluate the work of others, which was one element of expressions of support and encouragement. The authors also concluded that the degree to which students used various interactions was related to the amount of university-level study they had completed. Based on the literature and their findings, the authors offer four proposed indicators of a learning community: interaction, socialization, collaboration, and community.

The limitations of this study relate to transference. Participants were drawn from four classes at one university, which limits transference to other student populations. Procedures, however, were well-described and documented, allowing accurate replication by other researchers.

Relationship Between Sense of Community and Interaction

In a mixed-methods study, Baab (2004) found that a high level of interaction was positively correlated with students' SoC across three delivery formats: asynchronous online, online with synchronous and asynchronous, and blended (online combined with face-to-face meetings). While the focus of Baab's study was comparison of factors across course delivery designs, it offers valuable information related to interaction and SoC in online courses. An online survey was used to collect data on four factors: (a) delivery design, (b) student perception of interactivity, (c) student perception of instructor teaching style, and (d) learning style of the student.

Convenience sampling was used to select participants. A total of 31 instructors

and 161 students participated by completing an online survey. SoC was measured using the Classroom Community Scale (Rovai, 2002b). Interaction was measured using the Rubric for Assessing Interactive Qualities in Distance Courses (RAIQDC) (Roblyer & Wiencke, 2003). Baab used the Index of Learning Styles Questionnaire (ILS) (Felder, 1988 as cited in Baab, 2004) to measure student learning style. This is an online tool which assesses learning preferences on four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global). He used survey items based on Grasha's Five Teaching Styles (Grasha, 1996) to measure students' perception of instructor teaching style. The teaching styles are Expert, Formal Authority, Personal Model, Facilitator, and Delegator.

Baab (2004) found that level of interactivity had the strongest effect on SoC. Students felt low SoC in asynchronous online courses with low interactivity and a delegator teaching style. They felt a strong SoC in a combined synchronous and asynchronous online delivery model with a facilitator teaching style. Learning style did not emerge as a statistically significant factor. Qualitative results indicated that when a SoC was established students reported elements of honesty, responsiveness, relevance, respect, openness, and empowerment.

This study is limited by its small sample size. When data was analyzed across delivery designs, many of the interaction cell sizes had fewer than 30 respondents. This limitation decreases the generalizability of results to other populations. The author also reports that because the survey was lengthy, students may have responded quickly and without reflection, which would negatively impact response accuracy.

In a mixed methods study, Lear (2007) found a moderate positive correlation between SoC and class interactivity. Participants were 241 students enrolled in online classes at four Midwestern post-secondary institutions. SoC was measured using Rovai's (2002b) validated 20-question Classroom Community Scale (CCS), which provides a numeric score. Class interactivity was measured using Roblyer and Wiencke's (2003) validated Rubric for Assessing Interactive Qualities in Distance Courses (RAIQDC). The RAIQDC asks students to rate their class on five levels for five elements — social/rapport-building designs, instructional designs, interactivity of technology resources, evidence of learner engagement, and evidence of instructor engagement — ranging from low interactivity to high interactivity. Interviews were conducted with 21 students with the highest community scores and 21 students with the lowest community scores to obtain information of student perceptions of importance of community and contributors to community development.

Data showed a moderate positive correlation between SoC and class interactivity. Three class interactivity elements emerged as significantly different from zero: social/rapport-building designs, instructional designs, and evidence of instructor engagement. While gender was not a significant factor, online experience and degree status were significant. Qualitative results revealed that students believed community was important to them, that it contributed to their learning, and that community was related more closely to instructor engagement and interactivity than to content or student engagement.

The mixed methods design of this study minimizes potential sources of bias such as instructor status as a distance educator and the self-report nature of the surveys. One limitation of this study is that the Rubric for Assessing Interactive Qualities in Distance Courses contains only one question for each interactivity element. Another limitation is the lack of detail provided regarding methods for organizing, coding, and drawing conclusions from interview data. Additional description of methods would enable more accurate replication of this study.

Predictive Value of Interaction for Sense of Community

Dawson (2006) demonstrated that communicative interactions explained a significant proportion of variance in community. He examined the relationship between frequency of interaction and SoC in undergraduate and graduate students enrolled in 25 courses at one university in Queensland, Australia. The response rate for the study was 23%, with a sample size of 464 students responding. Rovai's (2002b) Classroom Community Scale was used to measure the degree of community experienced by students. Demographic data added to the survey covered gender, age, enrollment status, employment status, and university contact hours. Frequency of discussion forum postings and chat communications were recorded through the university information technology system. While the method was not described by the author, frequencies of other communications such as email, telephone, text messages, and face-to-face meetings were also collected, presumably through the survey instrument. A copy of the survey was not provided.

A significant proportion of the variance in community was explained by the communication variables at the individual and course levels. Significant predictors of community were email, face-to-face meetings, and discussion forum postings. Phone contact, online chat, and text messaging were not significant predictors. A fully online format of study was a significant negative predictor of community, while part-time study was a significant positive predictor. Age and gender were not significant predictors. The authors concluded that students with higher frequencies of interaction demonstrated higher levels of SoC.

This study provided a valuable quantitative look at the relationship between interaction and SoC but limited itself to measuring frequency of a limited number of communicative interactions and ignoring a broad range of interactions considered by the field to be important in developing community. Replication would be difficult due to the author's failure to provide sufficient description of his methods and failure to provide a copy of the survey used in the study.

This section has reviewed studies that examine the relationship between SoC and interaction. These studies support the assertion that SoC can be developed in an online learning environment through use of interaction (O'Hara, 2008; Stepich & Ertmer; 2003). A high level of interaction also appears to be positively correlated with students' SoC (Baab, 2004; Lear, 2007). When examined quantitatively, interaction explains a significant proportion of variance in community developed by online students (Dawson, 2006).

Interaction Types Associated With Building Sense of Community

The research literature offers online instructors an overwhelming array of interactions for building community in online learning. Many recommendations are made on the basis of expert opinion, which typically is drawn from a combination of teaching experience and common sense. The following section reviews studies that offer empirical support for learner-learner and learner-instructor interactions found to be associated with SoC. Interaction types are included in this section if they are supported by at least two sources (see Appendix A).

Learner–Learner Interactions

Interactions between the learner and other learners are important to building SoC (Wolcott, 1996). This section will discuss the empirical support for the learner–learner interactions included in the survey used to measure interaction in this study.

Opportunities to learn about other students. The ability to share background information and to learn about fellow students is frequently cited in the literature as critical to building SoC in online learning. Establishing commonalities with classmates served to promote online community in Gallagher-Lepak et al.'s (2009) study. In focus groups, these undergraduate students frequently discussed identification of shared interests and experiences as pivotal in developing community.

In a qualitative study, Stallings and Koellner-Clark (2003) examined a number of teaching strategies in a collaborative online teaching classroom using multiple technology formats. They discussed the importance of highly interactive introductions to allow

students to get to know each other and recommended use of initial face-to-face sessions to facilitate this interaction. Stepich and Ertmer (2003) found that having students post individual introductions helped them to find areas of common interest and background, which facilitated a sense of belonging.

In a mixed methods study, Liu et al. (2007) found a moderately positive relationship between SoC and social presence in online graduate students. One of the four survey items measuring social presence dealt with familiarity with other students.

Ice breaker activities. McElrath and McDowell (2008) called for online instructors to engage students in interactive game-like activities, which leads students to engage with each other, accept each other, and be accepted by the online community. Ho (2003) reported that ice breakers were helpful in building online community in a case study of teachers in training in American Samoa. Students indicated they enjoyed the opportunity to get to know each other while adjusting to new technology. Stepich and Ertmer (2003) specifically asked students to make connections online with two or more classmates and engage in conversation about common interests and reported that this activity helped students build a mutual sense of belonging to the learning community.

Online discussions. Online students develop community, construct understanding, and question and clarify content through discussion with other learners. In a constructivist approach, the instructor takes part in these discussions but acts as a facilitator who guides the discussion rather than controls it (Lefoe, 1998; Nicholson, 2005). Online learning benefits from a balance of whole class and smaller group discussions (Rovai, 2004).

Whole-class discussions are commonly suggested as a means of developing a sense of classroom community (Liu et al., 2007). Adult students in a graduate course indicated that asynchronous class discussions were a significant contributor to their SoC (Rovai, 2001). These students felt they benefited from their classmates' experiences through threaded discussions. The presence of both novice and veteran students in one class can add an element of interdependence among students as they work to construct meaning together (Brown, 2001; Stepich & Ertmer, 2003). In addition to asynchronous discussion, Rogers and his associates (Rogers, Graham, Rasmussen, Campbell, & Ure, 2003) found in their case study involving 19 students in a distance course that both students and instructors valued two-way synchronous discussion for the purpose of asking and answering questions.

Small group discussions. Wolcott (1996) promotes learner-centered activities in online learning, including encouragement of small group interactions such as discussions, study groups, and cross-group communication within an online class. These activities can decrease student isolation and enhance communication (Wolcott, 1996). Guidelines are an important component of small group discussions (Aviv, 2000; Ritter et al., 2010; Stallings & Koellner-Clark, 2003) in order for expectations to be clearly communicated. Students involved in group discussions are able to work toward academic goals together and to assist and support each other as they become active learners (Aviv, 2000).

Stallings and Koellner-Clark (2003) viewed discussion group size as an important factor in structuring the learning environment. They recommended groups of four to six students in order to maintain effective discussion for everyone in the group. In contrast,

Tu and McIsaac (2002) recommend limiting discussion group size to two or three students. Based on their mixed-methods study involving 51 online graduate students, they recommended this small group size to maximize conversational turn taking.

Social communication. Nicholson (2005) posits that the social component of a typical face-to-face class needs to be purposefully facilitated in online learning in order to support social growth of students. Rovai (2001) conducted a case study during a five-week graduate level online course. He found that students made use of a social communication forum to pursue connections with each other and to share information and support.

In Liu et al.'s (2007) mixed methods study, interview results indicated that opportunities for social interaction boosted interpersonal relationships and supported positive communications between and among students. Graduate students in an online instructional design course used an asynchronous social discussion area to express support and encouragement for other students, to discuss similarities, and to share challenges they faced (Stepich & Ertmer, 2003). While some students in Conrad's (2002) interpretive study with adult learners expressed appreciation for the opportunity to communicate socially, others voiced limits regarding how much time they were willing to spend reading social comments. Participants in Gallagher-Lepak et al.'s (2009) study reported that informal conversations helped them build friendship and camaraderie. They found this communication outside the boundaries of the academic requirements to be important in establishing bonds of friendship and in facilitating learning.

Collaborative group projects. The importance of collaborative group work in building online community is well established in the literature. Rovai (2002a) reported that small group activities are positively correlated with SoC. Rovai (2004) states that small group activities in online learning are consistent with constructivist approaches and can lead to development of trust and positive relationships between and among classmates.

McIssac et al. (1999) interviewed students and analyzed student postings in six online courses and found that organized group activities increased learner-learner interaction. Studies have found that students believed collaborative work in their online courses was instrumental in the development of community (Baturay & Bay, 2010; Conrad, 2005; Gallagher-Lepak et al., 2009). Small group work also has shown a positive effect on learning (Cameron, Morgan, Williams, & Kostelecky, 2009; Liu et al., 2007).

The idea that online class community develops primarily among members of small groups rather than across the entire class also has been supported in the literature. Liu et al. (2007) reported that students in an online MBA program formed community with group members but felt little community across the entire class due to limited whole-class interaction. Some authors suggest that group members should be rotated to expand the number of relationships built through the group process (Stallings & Koellner-Clark, 2003). Stepich and Ertmer (2003) also found that rotating group memberships allowed students the opportunity to work with all other learners in their graduate class on instructional design, creating interdependence among learners. They suggest that this interdependence leads to improved learning of course content. Reports

of the impact of collaborative group work typically mention difficulties faced by students working together such as scheduling problems and late submissions (Gallagher-Lepak et al., 2009).

Peer teaching. In an educational technology online course, graduate students expressed the importance of leading group experiences (Wegerif, 1998). The authors postulated that the students desired increased control over their online learning experience, and benefited from the opportunity to contribute to its structure.

First-year undergraduates reported satisfaction with peer teaching activities in a blended learning environment which included face-to-face sessions and online activities (Leese, 2009). Students in small groups worked collaboratively to prepare presentations that they would peer-teach during the next session. Students developed increased confidence in working together, in presenting to peers, and in resolving conflicts.

Exchanging resources. Stepich and Ertmer (2003) suggest that, when students share resources with each other, they become more responsible for their own learning, student participation is enhanced, and relationships among members of the learning community are strengthened. Participants in Stepich and Ertmer's study found that the instructor was not the only source of information and built a shared knowledge base by contributing information sources, techniques, and tools.

In discussing development of online community in interviews over one year, online graduate students indicated the importance of providing each other with multiple resources (Haythornthwaite, Kazmer, Robins, & Shoemaker, 2006). These participants pointed out that the flow of information was reciprocal and helped to build strong ties.

Sharing personal experiences. As a way to offer learner-centered instruction, Wolcott (1996) suggested drawing students into discussions by having them share their personal experiences. Graduate level nursing students in an online course reported that they had the opportunity to learn from each other's clinical experiences (Ali, Hodson-Carlton, & Ryan, 2004). They indicated that they valued other students' contributions in this area.

Baab's (2004) mixed methods study found that students receiving the highest classroom community scores reported they shared personal experiences in the context of class discussions and assignments. Participants reported that sharing their experiences enhanced their learning and helped them make connections to the outside world.

Face-to-face meetings. Haythornthwaite et al. (2000) suggest that face-to-face meetings are important in establishing initial bonding between distance students. Stallings and Koellner-Clark (2003) analyzed student postings and interview responses from graduate students in a single course which combined face-to-face and online components. They found that using the face-to-face meeting time for highly interactive activities resulted in a stronger classroom community. Students reported that the connections forged in the face-to-face sessions were important for the success of the online components of the class. Conrad (2005) indicated that graduate students in her qualitative study reported that face-to-face meetings facilitated communication in online components of the course. Conversely, the online activities contributed to more rich connections during a subsequent in-person meeting.

An initial face-to-face meeting was encouraged by several authors. Participants in Haythornthwaite et al.'s (2000) qualitative study indicated that, while some considered live meetings to be an inconvenience, others found an initial face-to-face experience to be an important way to unite, to establish a shared history, and to develop bonds of friendship. Based on student interviews and analysis of student postings, McIsaac et al. (1999) also suggested that meeting in person before meeting online could help establish community for students. Students who took advantage of an in-person site visit for a course in Conrad's (2002) study indicated the visit allowed them to create a special bond with each other. They reported feeling little kinship with the online students who had not attended the site visit.

Vrasidas and McIsaac (1999) speculated that low student participation in asynchronous discussions might have been due to the occurrence of face-to-face meetings. They considered that alternating in-person and online meetings may have led students to consider online meeting weeks to be a break rather than an opportunity for a different kind of interaction.

Learner–Instructor Interactions

Interactions between the learner and the instructor are important to building SoC (Liu et al., 2007). This section will discuss the empirical support for the learner-instructor interactions included in the survey used to measure interaction in this study.

Providing information on goals, expectations, and ethics. A number of researchers point to the importance of the instructor establishing standards by which an online course will be conducted (Baab, 2004; Gallagher-Lepak et al., 2009;

Haythornthwaite et al., 2000; Rovai, 2002a; Rovai, 2004; Shea et al., 2006; Ritter et al., 2010). In Gallagher-Lepak et al.'s (2009) qualitative study, students indicated an appreciation for clear guidelines for communication requirements. In a multi-site study of over 1,000 students, Shea et al. (2006) found that effective instructional design and organization were positively correlated with SoC. Design and organization included communication of expectations, course goals, topics, and participation guidelines. In similar fashion, students who exhibited a strong SoC in an online course reported an understanding of established norms of the group as well as conflict resolution processes in Baab's (2004) mixed methods study of 161 students. In Lear et al.'s (2010) mixed methods study, students revealed that their SoC was related to the instructor leading and guiding class discussions.

Participating in and guiding discussions. The importance of the instructor's role as discussion facilitator or guide is well documented in the literature (McElrath & McDowell, 2008; McIsaac et al., 1999; Rovai, 2002a; Rovai, 2004). Students in a mixed methods study by McIsaac et al. (1999) felt that instructor participation in their online academic discussions gave credibility to their discussions. They believed that the instructor, as content expert, offered a valuable presence and requested instructor participation. Distance students in a graduate course valued two-way synchronous communication because it enabled them to ask questions of the instructor and receive responses to their questions during discussions (Rogers et al., 2003). McIsaac et al. (1999) suggested this participation should be facilitative rather than authoritarian. In Conrad's (2005) multi-year qualitative study of graduate level online students, effective

instructors were described as able to facilitate discussion and engage meaningfully in both academic and social discussions. The students in Lear's (2007) mixed methods study reported that the interactions which lead to development of SoC were instructor-driven. They added that ongoing instructor responses were important in building on early community development activities as the semester progressed.

Liu et al. (2007) found a positive relationship between SoC in online graduate students and instructor presence and facilitation of discussion. A strong, active instructor presence which included active guiding of discourse was associated with strong SoC in Shea's (2006) study involving over 2,000 online learners from 32 colleges.

Providing support and encouragement. Online community will not thrive unless the instructor provides support and encouragement to students (Rovai, 2002a). In a qualitative study of the social dimension of an online course, Wegerif (1998) found that it was important to provide structure and support in the form of scaffolding at the beginning of a course as students learned complex skills. Over the duration of the course this support could be gradually reduced as students become more secure in their roles as learners and class members. Similarly, Brown (2001) found that support from the online instructor was critical at the early stages of the semester as students dealt simultaneously with new content, new technology, and a novel learning environment.

Rogers et al. (2003) found that instructors of a graduate course felt distance students benefited from one-on-one interaction over the phone to supplement electronic mail communication and interaction within the course. The extra communication helped encourage interaction in the course and helped the students feel more a part of the class.

Providing timely feedback. Graduate students in a qualitative study by Vrasidas and McIssac (1999) reported that they found the lack of prompt feedback to posted essays and discussion postings discouraging and that this lack of feedback led them to participate less in the online discussions. Lear's (2007) mixed methods study found a significant correlation between online student SoC and the interactivity element Evidence of Instructor Engagement. This element was comprised of timeliness and quality (level of analysis, suggestions for improvement) of instructor feedback. Similarly, McIssac et al. (1999) heard from students that promptness and content of feedback was very important in maintaining community. Participants indicated that they required immediate and frequent feedback on their work, feedback on their overall progress, and personalized and group feedback. They felt isolated and unsatisfied when feedback was not immediate.

Liu et al.'s (2007) mixed methods study found a positive relationship between SoC in online graduate students and instructor presence and facilitation. Two of the three survey items measuring instructor presence dealt with feedback. One question addressed regularity of feedback and the other addressed informativeness of feedback.

Conrad's (2005) multi-year qualitative study of community in online learning revealed that graduate student participants had a great deal to say about instructor feedback. They defined effective instructors as present, prompt, and responsive. They reported that "absentee instructors" (p. 12) who did not create a SoC had a negative effect on the sense of purpose and motivation of the students in the course.

Using multiple modes of communication. In interviews conducted over the course of a year, students in online courses indicated the importance of having multiple

ways to communicate in order to sustain interaction (Haythornthwaite et al., 2000). They voiced appreciation for public, private, synchronous, asynchronous, electronic, and face-to-face communication. Rogers et al. (2003) found in their case study that distance students valued multiple ways to interact, including synchronous class meetings, asynchronous communication, and phone contact with the instructor.

Instructor modeling. The demonstration of effective teaching interactions is an important role of the educator (Berge, 1995). Brown (2001) found that instructor modeling was one type of interaction that helped community develop in an online course. Experienced online students also modeled expected communication behaviors early in the semester.

Tu and McIsaac (2002) found that instructors were able to enhance interaction in an online class of 51 graduate students by employing communication strategies such as initiating conversation, using praise, and using an inviting tone of voice in their written responses. In Vesely et al.'s (2007) qualitative study examining SoC in 48 graduate students, student participants ranked instructor modeling as most important in developing community.

Required participation. Pate, Smaldino, Mayall, and Luetkehans (2009) examined the relative importance of required academic participation and optional academic and social participation in an online graduate class. They found that students responded to the required participation with frequent and meaningful responses but posted less frequently to the optional forums. They concluded that SoC can result from social interaction that is built into required academic interaction.

Gallagher-Lepak et al. (2009) reported that students indicated that required participation in their online class was important in the process of building SoC. In their case study, Stepich and Ertmer (2003) reported that students must participate in an online class at a minimum level in order to be successful. They recommended that students be provided with ongoing participation scores and that the instructor help them understand the ways in which their participation allows and supports the collaborative learning that takes place in the class.

A cautionary note was sounded by Gulati (2008), who suggests that required participation limits student autonomy. Diverse ways of learning might be violated by a highly structured environment, and Gulati recommends awareness of this important element.

This section reviewed studies that offer empirical support for interpersonal interactions found to be associated with SoC. Interaction types were included in this section if they were supported by at least two sources. The interactions reviewed here were supported by qualitative and/or quantitative studies beyond expert opinion and will be incorporated into the interaction survey used in this dissertation study.

Summary

This chapter has reviewed the problem addressed in the study, significance of the study, theoretical foundations for the study, and relevant literature related to variables of the study.

Constructivism is the theoretical underpinning of this project. Its emphasis on the importance of social encounters as students actively construct meaning is highly relevant

to the topic of interaction and community in online learning. In a virtual environment the instructor acts as a facilitator who provides opportunities for interaction, which may lead to a supportive SoC among students. This community in turn facilitates the process of student inquiry and enhanced interaction, leading to an active learning process.

The studies of SoC that were reviewed in this chapter support the importance of community in the online learning environment, describe the process by which students build community over time, and discuss the challenges of building community over distance. The studies of interaction discussed here indicate that both students and faculty consider interaction to be one of the most critical elements in successful online education.

This chapter also reviewed a number of studies involving both SoC and interaction. These studies suggested that the development of SoC can be facilitated through interaction, that a positive relationship exists between interaction and SoC, and that this relationship can be quantitatively demonstrated.

Finally, this chapter reviewed learner–learner and learner–instructor interaction types which are empirically supported in the literature as related to SoC. These interaction types form the basis for the interaction survey instrument used in this study. The vast majority of reviewed studies were qualitative in nature, and they provided beneficial information regarding the role of interaction in online learning from descriptions of student experience. They have not, however, offered a great deal of guidance in which types of interaction are most closely tied to development of SoC or how an instructor could best make use of valuable time spent on facilitating SoC in online courses. The next chapter describes the methods employed in the current study,

which will seek to quantitatively investigate the predictive value of each interaction type with regard to SoC.

CHAPTER III: METHOD

The problem addressed in this study is that online learners, when physically and temporally distanced from their instructor and classmates, can experience isolation (Kerka, 1996) and increased drop-out rates. Facilitating the development of online community is one method of decreasing the isolation of online students, and interaction with an instructor and peers has been shown to contribute to a sense of community (SoC). Instructors are offered an overwhelming array of interactions to build into their online courses for the purpose of building online community.

This study is significant because most studies which explore interaction and online community are qualitative in nature. Few quantitative studies exist which attempt to empirically support which types of interaction between and among instructors and students contribute most to community. The results of this study investigating the relationship between interaction and student SoC will provide instructors with information they need to make important choices as they build online courses.

This chapter provides information regarding research methods used to investigate the relationship between interaction and online community. This section also will describe the variables in the research questions:

RQ1: What learner–learner interactions in online learning are most predictive of sense of community?

RQ2: What learner–instructor interactions in online learning are most predictive of sense of community?

This chapter includes a description of participants and the manner in which they were selected. An explanation of the selection and development of survey items used to measure interaction is also provided.

Reliability and validity testing procedures and results are reported on the survey instruments for both the pilot study and the full study. The research design is explained, and the timeline for distribution of the survey is detailed. Procedures for data testing and analysis are described, and regression analysis results for the pilot study are provided.

Participants

This section will describe sampling procedure and demographic characteristics of the sample for both phases of the study.

Phase 1: Pilot Study

Six faculty members in the Department of Communication Disorders were contacted for permission to survey the students in their web course(s). All six granted permission through electronic mail. The total number of enrollments in the selected Communication Disorders courses in Summer 2011 was 152. These enrollments represented 114 unique students, some of whom were enrolled in more than one online course. Participant age ranged from 21 – 60 years (M = 28.69, SD = 7.784). Participants were 96.3% female, 3.7% male. Employment status was more balanced, with 55.6% working full time, 22.2 % working part time, and 22.2% not currently employed. A total of 86 surveys were returned, for a student survey response rate of 57%. Two of the 86 surveys did not have complete information and were not analyzed. Other missing data was minimal and did not follow any apparent patterns.

Phase 2

Faculty members contacted for permission to survey students were all WKU faculty teaching online graduate courses during the Fall 2011 semester. No limitations were placed with regard to college or department represented, and faculty members represented a broad range of disciplines. Graduate courses were identified as holding course number of 400 level with a G indicating graduate, or 500 level or higher. Online courses were identified as those with the campus identifier listed as Web. Faculty members who were surveyed as part of the summer pilot study were excluded.

Of the 150 faculty members who were contacted, 23 did not respond to e-mail or phone contacts. Of the 127 faculty members who were reached through e-mail or by phone, 12 declined permission to survey their students for a variety of reasons. These reasons included the following: a) concern that the survey would influence their students' responses on the end-of-semester faculty evaluation by introducing ideas about types of interaction that the faculty member was not using; b) student workload; c) fear that allowing the survey would obligate the faculty member to answer frequent student questions about the survey; d) instructor inexperience with a new course; e) concern that the course type was not a good example of a typical online course; f) a request that the survey only go to the instructor's undergraduate courses, which were not a part of the study sample; and g) no reason given. Courses for five faculty members were removed from the list, as the courses were practicum courses in which students were enrolled only as a placeholder with no active involvement in a class. The final number of faculty members whose students could be contacted with a request to participate in the study was

110 (73.3% of those initially contacted). No personal demographic data was collected on the faculty members.

Student participants were students at a regional comprehensive South Central university who were over the age of 18 years and taking graduate web courses during the Fall 2011 semester. The database listing of this population included 3266 students. After eliminating students enrolled in courses for which permission to survey was not obtained, 1589 students representing 2189 enrollments remained on the list.

Surveys were sent to 1589 students. Students were allowed to complete the survey more than once if they were enrolled in more than one graduate online course. After all reminders were sent, 381 usable surveys were completed, giving a response rate of 24%. There were 28 partially completed surveys that had insufficient data for inclusion in the analyses.

Descriptive statistics were calculated to describe the study sample and population and are presented in Table 1.

Table 1.

Descriptive Statistics for the Sample and Population

	Mean	Std. Deviation	%	Min	Max	*N*
Sample						
Gender	1.78	0.41		1	2	375
Male			21.6%			81
Female			78.4%			294
Age	32.77	9.01		19	63	376
Experience with online learning	7.58	6.64		0	35	377
Number of face-to-face classes	.57	2.03		0	16	365
Employment status	1.52	0.72		1	3	378
Full time			61.2%			233
Part time			24.9%			95
Not employed			13.1%			50
Population						3266
Gender	1.74	0.44		1	2	3257
Male			26.1%			850
Female			73.9%			2407
Age	32.22	8.36		20	71	3266

Participants in the sample had a mean age of 32.77, and ranged from 19 – 63 years. They were predominantly female, with 78.4% female and 21.6% male. Most participants worked full time (61.2%). Almost 25% worked part time, and 13% reported being currently unemployed. Participants had a wide range of experience with online learning and reported having completed between 0 and 35 previous web courses. Few reported having face-to-face meetings in their Fall 2011 web courses, with 80.8% having no face-to-face meetings. One face-to-face meeting was reported by 12.1% of participants, with the remaining 7.1% reporting between 2 and 16 face-to-face classes during the current semester.

In comparing the demographics of the sample with the available demographic information on the WKU graduate online population, it appears the sample means were not statistically different from the population means for the variable age, $t(375) = .986$, $p > .05$. The sample had a slightly higher proportion of females than the population, $t(374) = 2.068$, $p < .05$.

Descriptive statistics also were used to determine whether the survey responders fell into extremes of experience with regard to sense of community. The distribution of sense of community scores of the sample were found to be normally distributed, falling between $\pm$ 1.0 for both skewness and kurtosis. This indicates students with a wide range of experience with community in their online courses are represented, and students who responded did not represent only very low or very high sense of community scores.

Measures

In this section instruments which were used to measure SoC and interaction constructs will be described. Reliability and validity of these instruments will be reported, including results of reliability analyses of the interaction survey conducted as part of the pilot study and full study.

Measurement of Sense of Community

To measure community, the Classroom Community Scale (Rovai, 2002b) was selected due to its frequent use in the distance learning literature, its relevance to the higher education online classroom setting, and the availability of reliability and validity information (see Appendix B). The author of the Classroom Community Scale (CCS) granted this researcher permission to use this instrument in the current study (see

Appendix C). This scale is comprised of 20 Likert items, which rate student sense of classroom community. Possible responses range from a low score of 1 (strongly disagree) to 5 (strongly agree). Participant scores were summed to achieve a scale total score (possible range 20-100), with higher scores indicating a stronger SoC. The author of the scale does not provide cut-off thresholds for low, medium, or high community levels, but indicates that total score values are relative. The scale provides two subscores which reflect connectedness (sum of odd-numbered items) and perceived learning (sum of even-numbered items) in the course.

Validity and Reliability of the Classroom Community Scale

Rovai (2002b), the developer of the instrument, conducted a study establishing initial face and content validity of the Classroom Community Scale (CCS). A panel of experts conducted content review of scale items, and the final version of the scale contains items that the panel rated as totally relevant to sense of classroom community. Reading level of scale items also was analyzed, and the Flesch Reading Ease score fell at 68.4, which is between the 60 – 70 range of most standard documents. The Flesch-Kincaid grade level score was 6.6.

To establish construct validity and scale reliability, Rovai (2002b) also surveyed 375 graduate students enrolled in 28 online courses at a private urban university for the purpose of validating the CCS for the classroom setting. A correlational analysis revealed that test items are correlated with each other. Results of a factor analysis revealed a Cronbach's coefficient alpha of .93 for the overall scale, which indicates excellent internal consistency, with two factors emerging after rotation. The author reported a

Cronbach's coefficient alpha of .92 for the connectedness subscale and .87 for the learning subscale. These two factors accounted for all significant factor loadings. The equal-length split-half coefficient was .91, which indicates excellent reliability.

A number of other analyses have been conducted to support the validity of the CCS. Rovai and Baker (2005) surveyed 193 graduate education students in Virginia and conducted a factor analysis for the CCS items. They reported Cronbach's coefficient alpha values of .88, .90, and .72, respectively, for the overall community scale, the connectedness subscale, and the learning subscale.

Shea et al. (2006) reported Cronbach's coefficient alphas for the overall construct of learning community and the subscales of connectedness and learning of .93, .91, and .90, respectively. Their participants consisted of 1067 students enrolled in 32 colleges within the State University of New York Learning Network. This system is comprised of diverse institution types.

Dawson (2006) conducted exploratory factor analysis with the CCS using 160 undergraduate and graduate students in Queensland, Australia. Cronbach's alpha coefficients for the overall scale, the connectedness subscale, and learning subscale were .90, .86, and .84. Guttman split-half for the instrument and the connectedness and learning subscales were .89, .85, and .76, respectively.

Confirmatory factor analysis was conducted by Ritter, Polnick, Fink, and Oescher (2010) based on survey results using 126 educational leadership graduate students. The authors reported Cronbach's alpha coefficients of .91, .91, and .86 for the community scale, connectedness subscale, and learning subscale respectively.

Internal consistency of the scale items of the CCS have been established in the literature for a number of university undergraduate and graduate populations. Cronbach coefficient alphas and split-half coefficients are consistently excellent for this instrument and its subscales, indicating excellent reliability of the scale.

Findings Related to Reliability of the Classroom Community Scale

Reliability analyses were conducted on responses to the Classroom Community Scale during the pilot study and the full study to assess internal consistency of the scale.

Phase 1: Pilot study. CCS items that were negatively worded were reverse coded so that a high score indicated a high level of community for all items. Results from two respondents were excluded from the analysis because 50% or more of the CCS items were not answered, lowering the total score and causing these data points to be outliers. Descriptive statistics were calculated for each scale item, as presented in Table 2.

Table 2.

Descriptive Statistics for CCS Items: Pilot Study

		Mean	Std. Deviation	*N*
CCS1.	I feel that students in the course care about each other.	4.22	.817	86
CCS2.	I feel that I am encouraged to ask questions.	4.23	.680	86
CCS3.	I feel connected to others in this course.	3.83	.935	86
CCS4.	I feel that it is hard to get help when I have a question.	3.88	.938	86
CCS5.	I do not feel a spirit of community.	3.93	1.003	86
CCS6.	I feel that I receive timely feedback.	3.78	1.162	86

CCS7.	I feel that this course is like a family.	3.41	1.045	86
CCS8.	I feel uneasy exposing gaps in my understanding.	3.73	.926	86
CCS9.	I feel isolated in this course.	4.09	.821	86
CCS10.	I feel reluctant to speak openly.	3.97	.832	86
CCS11.	I trust others in this course.	3.91	.806	86
CCS12.	I feel that this course results in only modest learning.	3.53	1.048	86
CCS13.	I feel that I can rely on others in this course.	3.76	.781	86
CCS14.	I feel that other students do not help me learn.	3.91	.876	86
CCS15.	I feel that members of this course depend on me.	3.00	.894	86
CCS16.	I feel that I am given ample opportunities to learn.	3.91	.746	86
CCS17.	I feel uncertain about others in this course.	3.72	.954	86
CCS18.	I feel that my educational needs are not being met.	3.97	.832	86
CCS19.	I feel confident that others will support me.	3.81	.843	84
CCS20.	I feel that this course does not promote a desire to learn.	4.16	.733	86
CCS Total		76.60	10.382	86

Note. CCS = Classroom Community Scale

No extreme means or near zero standard deviations were identified. A reliability analysis was conducted to determine reliability of the overall scale and the two subscales of connectedness (odd-numbered items) and perceived learning (even-numbered items). A factor analysis was conducted using Cronbach's coefficient α on the SoC scale items to determine internal consistency of the scale for this population. Cronbach's coefficient α for the overall scale was .898, indicating excellent reliability. Cronbach's coefficient α

for the connectedness subscale and learning subscale were .875 and .823, respectively, which are similar to Rovai's (2002) results.

Phase 2. As in the pilot study, CCS items that were negatively worded were reverse coded so that a high score indicated a high level of community for all items. Descriptive statistics were calculated for each scale item, as presented in Table 3.

Table 3.

Descriptive Statistics for CCS Scale Items

		Mean	Std. Deviation	*N*
CCS1	I feel that students in the course care about each other.	3.72	.910	381
CCS2	I feel that I am encouraged to ask questions.	3.97	.959	380
CCS3	I feel connected to others in this course.	3.44	1.127	380
CCS4	I feel that it is hard to get help when I have a question.	3.67	1.072	381
CCS5	I do not feel a spirit of community	3.44	1.082	378
CCS6	I feel that I receive timely feedback.	3.61	1.155	381
CCS7	I feel that this course is like a family.	2.68	1.136	378
CCS8	I feel uneasy exposing gaps in my understanding.	3.35	1.089	381
CCS9	I feel isolated in this course.	3.56	1.090	381
CCS10	I feel reluctant to speak openly.	3.69	1.000	381
CCS11	I trust others in this course.	3.73	.762	379
CCS12	I feel that this course results in only modest learning.	3.37	1.124	380
CCS13	I feel that I can rely on others in this course.	3.45	1.022	380
CCS14	I feel that other students do not help me learn.	3.73	.944	381
CCS15	I feel that members of this course depend on me.	2.76	.992	381

CCS16	I feel that I am given ample opportunities to learn.	3.73	.986	381
CCS17	I feel uncertain about others in this course.	3.46	.933	381
CCS18	I feel that my educational needs are not being met.	3.61	1.212	381
CCS19	I feel confident that others will support me.	3.58	.929	379
CCS20	I feel that this course does not promote a desire to learn.	3.79	1.139	380
CCSTotal		70.20	13.356	381

Note. CCS = Classroom Community Scale

No extreme means or near zero standard deviations were identified. A reliability analysis was conducted to determine internal consistency of the overall scale and the two subscales of connectedness (using odd-numbered items) and perceived learning (using even-numbered items). Cronbach's coefficient α for the overall scale was .928, indicating the scale has excellent reliability. Cronbach's coefficient α for the connectedness subscale and learning subscale were .916 and .888 respectively, which are similar to Rovai's (2002) results.

Measurement of Interaction

Interaction type and frequency were measured using a 32-item Qualtrics survey developed by the author (see Appendix D). A literature review was conducted to determine the types of learner–instructor and learner–learner interactions that have been supported by either qualitative or quantitative studies. Interaction types that were supported by at least two studies were considered for inclusion in the interaction scale. Those that described similar interactions were grouped into one item, and those that were listed only as recommendations without empirical support were omitted. This review

resulted in the identification of nine types of learner–learner interactions and seven types of learner–instructor interactions. Questions were formulated for use in the questionnaire to elicit the students' perceptions of the frequency with which each interaction occurred in their course and the importance of that interaction to their development of community.

Validity and Reliability of the Interaction Questionnaire

Once the interaction questionnaire questions were created, they were reviewed by a panel of experts. Three Educational Administration faculty members who teach online courses reviewed the questions for clarity and face validity. Numerous modifications were made to the items to maximize accurate interpretation of terms and meanings.

Phase 1: Pilot study. The questionnaire was piloted with six online classes in the Department of Communication Disorders, and results were analyzed for time to complete the survey and percentage of participants completing 100% of the survey. Participants took from three to ten minutes to complete the survey, which was judged to be a reasonable amount of time for completion. Survey completion rate was 77% for the first two classes to be surveyed, which was judged to be low and possibly due to the length of the survey. The author identified a method for minimizing redundant listing of interaction types which the participant had indicated did not occur in their class. This resulted in approximately five to ten fewer response items for participants. The survey completion rate for the remaining four classes was 97%.

A focus group was conducted with one online class that met face-to-face on campus toward the end of the summer term. These students had completed the survey online the previous week and were provided a hard copy of the survey for reference

during the focus group. Students were questioned regarding their interpretation of the items, their input on reasons for widely ranging intra-class responses on two items (frequency of in-person class meetings and use of videoconferencing), and any problems with access to and navigation through the survey. Modifications were made based on student feedback to further improve the survey.

Reliability analysis was conducted to determine internal consistency of the interaction scales. Cronbach's coefficient α was .854 for the learner-learner frequency scale and .856 for the learner-learner importance scale, indicating good reliability. Cronbach's coefficient α was .840 for the learner-instructor frequency scale, and .893 for the learner-instructor importance scale, indicating good reliability.

Phase 2. Reliability analysis was again conducted on the data in the fall to determine internal consistency of the interaction scales with the full sample. Cronbach's coefficient α was .880 for the learner-learner frequency scale and .909 for the learner-learner importance scale, indicating good reliability. Cronbach's coefficient α was .893 for the learner-instructor frequency scale, and .896 for the learner-instructor importance scale, again indicating good reliability.

Research Design

This study involved no intervention or control group and is, therefore, a non-experimental quantitative descriptive study intended to determine which types of interaction in online courses are most predictive of student SoC (Wiersma & Jurs, 2005). The researcher attempted to determine the frequency and perceived importance of occurrence of interactions in online graduate courses through participant self-report. It

also was necessary to determine level of SoC through self-report. These measures could then be analyzed to determine how predictive the interactions were for SoC.

This study also could be described as survey research, which has the stated purpose of surveying a sample about attitudes, opinions, or perceptions (Wiersma & Jurs, 2005). A cross-sectional survey design was employed in which data was collected from a sample at one point in time.

There were a number of threats to validity within this study design. Lack of reliability of survey instruments was one potential threat, which was addressed through reliability analysis and factor analysis in the case of the CCS and through expert panel review, focus group feedback, and reliability analysis in the case of the interaction survey. A second threat was that selective responsiveness from the sample could result in nonrepresentativeness of the responding participants. In this situation, distance students who have had a very positive or very negative online experience might be more likely to respond to the survey, resulting in data not representative of the population. This threat was addressed through use of descriptive statistics of the responders and nonresponders to determine representativeness. A third potential threat to validity was that a low response rate could negatively affect statistical power of the analyses. Response rate was recorded, and conclusions were made with consideration of any limitations.

Variables Defined

SoC is defined in the literature by McMillan and Chavis (1986) as "a feeling that members have of belonging, a feeling that members matter to one another and to the

group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9).

Interaction is defined as "reciprocal events that require at least two objects and two actions" (Wagner, 1994, p. 8). In an online learning environment, interactions between and among learners and the instructor contribute to the formation of a learning community. Learner-learner interaction is communication between students, in pairs or groups, with or without an instructor present (Moore, 1989). In learner-instructor interaction, the instructor attempts to stimulate student interest in the course content, to motivate the student, and to facilitate the learning process (Swan, 2003).

Variables Operationalized

SoC (the dependent variable) was operationalized as the overall score on the Classroom Community Scale (Rovai, 2002b). Frequency of learner–learner interaction was operationalized as participant scores on a 5-point Likert scale with responses ranging from 1 (Never) to 5 (Very Often). Frequency of learner–instructor interaction was operationalized as participant scores on a 5-point Likert scale with responses ranging from 1 (Never) to 5 (Very Often). For both learner–learner and learner–instructor interaction, importance was measured by participant scores on a 5-point Likert scale with responses ranging from 1 (Not at All) to 5 (Very).

Procedures

This section will describe procedures followed in acquiring permission to conduct the study from the Institutional Review Board (IRB) as well as distribution of surveys and collection of data.

IRB Approval

Permission was obtained from the Institutional Review Board at Western Kentucky University (WKU IRB HS11-305). The application and approval letter are provided in Appendix E.

Phase 1: Pilot Study

Faculty and student contact information were obtained through WKU Information Technology (IT) Requests for Programming Services. Six faculty members in the WKU Department of Communication Disorders who were teaching online courses were contacted through electronic mail messages. Faculty members received a description of the study and were asked for permission to survey students in their online Summer 2011 classes. Faculty members were encouraged to invite the students in their online courses to participate. Surveys were sent by the Principal Investigator to students through electronic mail using WKU TopNet Email Utility, which sends blind mass emails as single items, to maintain confidentiality and minimize messages being filtered into junk or spam folders. Students received a description of the study, a consent form, a brief demographic questionnaire, the Classroom Community Scale (Rovai, 2002b), and the interaction survey to complete. Two follow-up e-mail reminders were sent to non-responders.

Phase 2

Faculty and student contact information was obtained through WKU IT Requests for Programming Services. All WKU faculty teaching online graduate courses (N = 150) were contacted through electronic mail messages with two reminder e-mail messages to non-responders. Faculty members received a description of the study and were asked for

permission to survey students in their online graduate Fall 2011 classes. A follow-up phone call was placed to those who did not respond to e-mail messages. Faculty members who were surveyed as part of the summer pilot study were excluded.

Faculty members who gave permission (N = 110) were sent an e-mail message providing a date range in which the survey and reminders would be sent to their students. These faculty members were encouraged to invite the students in their online courses to participate.

Surveys were sent by the Principal Investigator to students through electronic mail using WKU TopNet Email Utility. Students received a description of the study, a consent form, a brief demographic questionnaire, the Classroom Community Scale (Rovai, 2002b), and the interaction survey to complete.

Two follow-up e-mail reminders were sent to non-responders. After the two reminders were sent, 409 surveys had been initiated by participants, and 381 had sufficient responses entered to be usable for data collection. The remaining 28 had not been completed and were not included when data was downloaded to Excel for preparation.

Data Analysis

The following research questions guided the analysis of collected data:

RQ1: What learner-learner interactions in online learning are most predictive of sense of community?

RQ2: What learner-instructor interactions in online learning are most predictive of sense of community?

Phase 1: Pilot Study

Results were compiled and analyzed in SPSS 19.0. An alpha level of .05 was used for all statistical tests. After reviewing the results, two cases were disregarded due to missing data. Means and standard deviations of the 84 students' responses on the CCS were presented in Table 1.

Means and standard deviations for learner-learner interaction frequency items are presented in Table 4 and for learner-instructor interaction items in Table 5.

Table 4.

Descriptive Statistics of the L-L Frequency Items

	Mean	Std. Deviation	*N*
LLF_1: introductions	2.76	1.175	83
LLF_2: icebreaker activities	1.77	1.086	83
LLF_3: entire class online discussions	3.47	1.253	83
LLF_4: small group online discussions	2.39	1.413	83
LLF_5: social (non-academic) communication	2.61	1.360	83
LLF_6: collaborative group project	1.83	1.198	83
LLF_7: peer teaching	1.94	1.203	83
LLF_8: exchange resources	3.28	1.172	83
LLF_9: contribute personal experiences	3.29	1.110	83

Note. L-L = learner-learner

Table 5.

Descriptive Statistics of the L-I Frequency Items

	Mean	Std. Deviation	*N*
LIF_1: goals, expectations, ethics	3.98	.776	84
LIF_2: facilitating discussions	4.39	.695	84
LIF_3: support and encouragement	4.14	.763	84
LIF_4: timely feedback	4.06	.883	84
LIF_5: multiple communication modes	3.79	1.054	84
LIF_6: instructor modeling	3.76	.989	84
LIF_7: required participation	3.82	1.204	84

Note. L-I = learner-instructor

Tables 6 and 7 display the correlations between CCS Total Score and interaction items. Learner–learner items 1, 2, 3, 5, and 9 were significantly associated with higher CCS Total Score. Learner-instructor items 1, 2, 3, 4, 5, and 6 were significantly associated with higher CCS Total Score.

Table 6.

Correlations Between CCS Total Score and L-L Frequency Items

	CCS Total	1	2	3	4	5	6	7	8
LLF_1	.434*								
LLF_2	.287*	.606*							
LLF_3	.270*	.252*	.188*						
LLF_4	.143	.299*	.535*	.310*					
LLF_5	.287*	.483*	.435*	.258*	.307*				
LLF_6	.053	.387*	.505*	.200*	.414*	.416*			
LLF_7	.048	.404*	.391*	.302*	.315*	.291*	.628*		
LLF_8	.177	.341*	.233*	.359*	.266*	.420*	.494*	.557*	
LLF_9	.336*	.624*	.460*	.383*	.402*	.503*	.422*	.479*	.584*

Note. * indicates $p < .05$; CCS = Classroom Community Scale; L-L = learner-learner

Table 7.

Correlations Between CCS Total and L-I Frequency Items

	CCS Total	1	2	3	4	5	6
LIF_1	.376*						
LIF_2	.373*	.577*					
LIF_3	.497*	.698*	.689*				
LIF_4	.507*	.512*	.354*	.470*			
LIF_5	.423*	.451*	.380*	.458*	.610*		
LIF_6	.316*	.401*	.296*	.349*	.416*	.690*	
LIF_7	.148	.266*	.373*	.461*	.293*	.482*	.318*

Note. * indicates $p < .05$; CCS = Classroom Community Scale; L-I = learner-instructor

Multicollinearity diagnostics indicated no cause for concern using a cutoff value of 5. No Variance Inflation Factor (VIF) values for independent variables or demographic variables exceeded 2.885. Stepwise linear regression analysis was conducted to investigate the relationship between interaction types and SoC. For learner–learner items, interaction survey items 1 through 9 were entered as independent variables. CCS Total Score was entered as the dependent variable. For learner-instructor items, interaction survey items 1 through 7 were entered as independent variables and CCS Total Score was entered as the dependent variable. Results are presented in Tables 8 and 9.

For learner–learner interactions, the regression model is significant ($F = 18.794$, $p < .05$), with the adjusted R^2 value of .178 indicating that 18% of the variance in SoC is explained by opportunity for introductions among students. The other items were excluded from the model due to their nonsignificant impact on SoC.

For learner–instructor interactions, the regression model is significant

($F = 21.144$, $p < .05$), with the adjusted R^2 value of .327 indicating that a third of the variability in SoC is predicted by support and encouragement from the instructor and timely feedback. The other items were excluded from the model due to their nonsignificant impact on SoC.

Table 8.

Significance of the Regression Models

Model	*F*	*p*-value	*R*	R^2	Adjusted R^2
L-L Model[a]	18.794	.000	.434	.188	.178
L-I Model [b]	21.144	.000	.586	.343	.327

Note. a = Predictors L_LF_1; b = Predictors = L_IF_3 and L_IF_4

Table 9.

Regression Coefficients for the Significant Predictors in L-L and L-I Models

Model		B	SE	β	*t*	Sig.	VIF
1	(Constant)	65.912	2.684			0	
	LLF_1	3.883	0.896	0.434	4.335	0	1
2	(Constant)	41.215	5.606		7.352	0	
	LIF_4	4.132	1.202	0.351	3.439	0.001	1.284
	LIF_3	4.526	1.391	0.332	3.254	0.002	1.284

This pattern of results indicates that introductions, support and encouragement, and timely feedback contribute strongly to student SoC. These results should be interpreted with consideration of the low to moderate correlations between a number of other interactions and SoC. While the stepwise regression analysis did not extract these other interaction types as predictive, the correlations indicate that they may be important factors in SoC.

As a preliminary analysis of demographic variables, the effects of online experience, age, and employment status were investigated with SoC as the dependent variable. Gender was not included in the analysis due to the homogeneity of the sample (78 of 81 participants reporting gender were female). Regression analysis revealed that none of the demographic variables had a significant effect on SoC.

Phase 2

Data were entered into SPSS 19.0. Descriptive statistics were used to report distribution of demographic variables. A total SoC score was calculated by summing CCS responses for each participant. For both research questions, multicollinearity diagnostics were conducted followed by stepwise linear regression analysis to investigate amount of variance explained by each type of interaction in the following classifications: learner–learner and learner–instructor. Demographic variables were entered into the regression model to determine their effect on SoC. Stepwise linear regression was used because there are multiple independent variables with continuous data and a dependent variable with continuous data. This analysis method allowed the researcher to investigate which interactions contribute most to student SoC.

Results also were interpreted using a matrix that identified high and low frequency and high and low perceived importance of learner–learner and learner–instructor interactions. This matrix analysis was used to identify the interaction types which could be categorized as low-frequency, high importance items, and high-frequency, high importance items. The items so categorized are expected to be the interaction types most useful to an instructor in online course design.

Conclusions

This chapter has reviewed the methods used to empirically support the contribution of interaction to development of SoC for online students. The research design was described, variables were defined and operationalized, and reliability and validity of survey instruments were reported. Reliability analyses indicated that the CCS and interaction scale had good internal consistency. Pilot study results were reported, in which interactions were highly correlated with each other and with SoC. Three interaction types also emerged as predictive of SoC. Demographic factors did not emerge as predictive of SoC, though this pilot study sample was small, and these factors may emerge as more important in the full sample in Fall 2011.

The procedures for this study were described, including IRB approval, description of participants, methods for contacting participants, and methods for collecting and analyzing data. The next chapter will review statistical analyses used to answer research questions and will report results of the study.

CHAPTER IV: RESULTS

The problem addressed in this study is that online learners can experience isolation when physically and temporally distanced from their instructor and classmates (Kerka, 1996), leading to increased drop-out rates. One method of decreasing the isolation of online students is facilitating the development of online community, and interaction with an instructor and peers has been shown to contribute to development of sense of community (SoC). The research literature offers instructors a vast array of interactions to incorporate into their online courses for the purpose of building online community, and it can be difficult to determine how best to prioritize options.

This study is significant because most studies examining interaction and online community are qualitative in nature. Few quantitative studies exist that empirically support which types of interaction contribute most to sense of community. The results of this study investigating the relationship between interaction and student SoC will provide instructors with information they need to make important choices as they build online courses.

The Classroom Community Scale (Rovai, 2002b) was selected to measure student sense of community. The scale is comprised of 20 Likert items which rate student sense of classroom community. Possible responses range from a low score of 1 (strongly disagree) to 5 (strongly agree). Participant scores were summed to achieve a scale total score (possible range 20-100), with higher scores indicating a stronger SoC. The author of the scale does not provide cut-off thresholds for low, medium, or high community levels but indicates that total score values are relative. The scale provides two subscores

which reflect connectedness (sum of odd-numbered items) and perceived learning (sum of even-numbered items) in the course.

Interaction type and frequency were measured using a 32-item Qualtrics survey developed by the author (see Appendix D). Interaction types empirically supported by at least two studies were included the interaction scale, resulting in nine learner-learner items and seven learner-instructor items. Students' perceptions of the frequency with which each interaction occurred in their course and the importance of that interaction to their development of community were measured using 5-point Likert items.

This study was guided by two research questions. Instructors must make choices among interaction types during course development to build in opportunities for a select set of activities which encourage interaction between and among learners. Research Question 1 is designed to identify which learner-learner interactions are most contributive to SoC.

RQ1: What learner-learner interactions in online learning are most predictive of sense of community?

As they create online courses, instructors also make choices regarding which interactions between learners and the instructor will be built into the course. Instructors would, therefore, benefit from knowing which types of learner-instructor interaction will best support community. Research Question 2 is designed to identify which learner-instructor interactions are most contributive to SoC.

RQ2: What learner-instructor interactions in online learning are most predictive of sense of community?

Findings Related to Research Question 1

Research Question 1 asks: What learner-learner interactions in online learning are most predictive of sense of community?

Results were compiled and analyzed in SPSS 19.0. An alpha level of .05 was used for all statistical tests. Means and standard deviations of responses to the learner-learner interaction frequency items are presented in Table 10. No extreme means or near-zero standard deviations were identified.

Table 10.

Descriptive Statistics of the Learner-Learner Frequency Items

		Mean	Std. Deviation	*N*
LLF_1	introductions	2.92	1.104	381
LLF_2	ice breakers	2.22	1.138	381
LLF_3	entire class online discussions	3.75	1.257	380
LLF_4	small group online discussions	2.99	1.357	379
LLF_5	social (non-academic) communication	2.31	1.233	381
LLF_6	collaborative group project	2.15	1.290	380
LLF_7	peer teaching	2.20	1.292	380
LLF_8	exchanging resources	2.95	1.205	380
LLF_9	contributing personal experiences	3.22	1.235	381

Note. LLF = learner-learner frequency

Table 11 displays the correlations between CCS Total Score and learner-learner interaction items. All interaction items were fairly to moderately associated with higher CCS Total Score.

Table 11.

Correlations Between CCS Total Score and L-L Frequency Items

	CCS Total	1	2	3	4	5	6	7	8
LLF_1	.595*								
LLF_2	.495*	.651*							
LLF_3	.408*	.373*	.314*						
LLF_4	.404*	.465*	.382*	.375*					
LLF_5	.446*	.531*	.537*	.363*	.410*				
LLF_6	.481*	.474*	.524*	.307*	.388*	.500*			
LLF_7	.400*	.463*	.504*	.280*	.411*	.435*	.583*		
LLF_8	.522*	.582*	.472*	.392*	.446*	.454*	.481*	.530*	
LLF_9	.520*	.590*	.433*	.410*	.460*	.356*	.412*	.428*	.582*

Note. * indicates $p < .05$.
LLF = learner-learner frequency

Multicollinearity diagnostics indicated no cause for concern using a cutoff value of 5. Multicollinearity refers to a situation in which there are high correlations among predictor variables; in some cases, the presence of this high correlation means that the results of the regression analysis are inflated. Variance Inflation Factor (VIF) values under 5 indicate that the regression results can be interpreted with confidence. In the current study, no VIF values for independent variables or demographic variables exceeded 1.882. Stepwise linear regression was conducted to investigate the relationship between learner-learner interaction types and SoC. For learner-learner items, interaction survey items 1 through 9 were entered as independent variables, and CCS Total Score was entered as the dependent variable. Results are presented in Table 12.

For learner-learner interactions, the regression model is significant ($F = 62.861$, $p < .05$) with the adjusted R^2 value indicating that 46% of the variance is explained by the five predictor variables Introductions, Collaborative Group Projects, Contributing

Personal Experiences, Entire Class Online Discussions, and Exchanging Resources. The other items were excluded from the model due to their non-significant impact on SoC.

Table 12.

Significance of the Regression Model and Regression Coefficients for Significant Predictors in Learner-Learner Model

Model	*F*	R^2	Adjusted R^2	β	*t*	Sig.
L-L Model	62.861	0.46	0.453			
LLF_1: Introductions				0.307	5.847	0.000
LLF_6: Collaborative group project				0.177	3.882	0.000
LLF_9: Contribute personal experiences				0.138	2.655	0.008
LLF_3: Entire class online discussions				0.133	3.080	0.002
LLF_8: Exchange resources				0.126	2.396	0.017

Note. LLF = learner-learner frequency

This pattern of results indicates that Introductions (LLF_1), Collaborative Group Projects (LLF_6), Contributing Personal Experiences (LLF_9), Entire Class Online Discussions (LLF_3), and Exchanging Resources (LLF_8) contribute strongly to student SoC. These results should be interpreted with consideration of the moderate correlations between the excluded variables and SoC. While the stepwise regression analysis did not extract the interactions Icebreaker Activities, Small Group Online Discussions, Social Communication, and Peer Teaching as predictive, the moderate correlations indicate they are important factors in SoC.

An analysis of the demographic variables Experience with Online Learning, Number of Face-to-Face Class Meetings, Gender, Age, and Employment Status was conducted with SoC as the dependent variable. Experience with online learning had a

significant effect on SoC ($p < .05$). Employment Status, Number of Face-to-Face Class Meetings, Gender and Age had a nonsignificant effect on SoC. It should be noted that the sample was homogeneous with regard to the number of reported face-to-face meetings. Fully 80% (295 of 365) of participants reported no face-to-face meetings in their class. Such a homogeneous sample may be insufficient for this demographic variable to be a valid representation of the effect of face-to-face meetings.

Findings Related to Research Question 2

Research Question 2 asks the following: What learner-instructor interactions in online learning are most predictive of sense of community?

Results were compiled and analyzed in SPSS 19.0. An alpha level of .05 was used for all statistical tests. Means and standard deviations of responses to the learner-instructor interaction frequency items are presented in Table 13. No extreme means or near-zero standard deviations were identified.

Table 13.

Descriptive statistics of the L-I frequency items

		Mean	Std. Deviation	*N*
LIF_1	Goals, expectations, ethics	3.64	1.075	379
LIF_2	Facilitating discussions	3.51	1.268	378
LIF_3	Support and encouragement	3.55	1.150	379
LIF_4	Timely feedback	3.63	1.181	378
LIF_5	Multiple communication modes	3.34	1.219	380
LIF_6	Instructor modeling	3.22	1.245	378
LIF_7	Required participation	4.32	1.030	380

Note. LIF = learner-instructor frequency

Table 14 displays the correlations between CCS Total Score and learner-instructor interaction frequency items. All interaction items were moderately associated with higher CCS Total Score with the exception of item 7 (required participation), which had a low association.

Table 14.

Correlations between CCS Total Score and L-I frequency items

	CCS Total	1	2	3	4	5	6
LIF_1: Goals, expectations, ethics	.523*						
LIF_2: Facilitating discussions	.556*	.571*					
LIF_3: Support and encouragement	.613*	.676*	.611*				
LIF_4: Timely feedback	.544*	.615*	.460*	.728*			
LIF_5: Multiple communication modes	.569*	.513*	.521*	.626*	.595*		
LIF_6: Instructor modeling	.656*	.630*	.684*	.737*	.663*	.734*	
LIF_7: Required participation	.320*	.373*	.382*	.280*	.308*	.262*	.333*

Note. * indicates $p < .05$. LIF = learner-instructor frequency

Multicollinearity diagnostics indicated no cause for concern using a cutoff value of 5. No Variance Inflation Factor (VIF) values for independent variables or demographic variables exceeded 3.528. Stepwise linear regression was conducted to investigate the relationship between learner-instructor interaction types and SoC. For learner-instructor items, interaction survey items 1 through 7 were entered as independent variables and CCS Total Score was entered as the dependent variable. Results of regression analysis are presented in Table 15.

For learner-instructor interactions, the regression model is significant ($F = 71.386$, $p < .05$) with the adjusted R^2 value indicating that about 48% of the variance is

explained by Instructor Modeling, Support and Encouragement, Facilitating Discussions, Multiple Communication Modes, and Required Participation. The other items were excluded from the model due to their non-significant impact on SoC.

Table 15.

Significance of the Regression Model and Regression Coefficients for Significant Predictors in Learner-Instructor Model

Model	*F*	R^2	Adjusted R^2	β	*t*	Sig.
L-I Model	71.386	.494	.487			
LIF_6: Instructor modeling				.275	3.939	.000
LIF_3: Support and encouragement				.221	3.863	.000
LIF_2: Facilitating discussions				.128	2.396	.017
LIF_5: Multiple communication modes				.141	2.527	.012
LIF_7: Required participation				.081	1.996	.047

Note. LIF = learner-instructor frequency

This pattern of results indicates that Instructor Modeling (LIF_6), Support and Encouragement (LIF_3), Facilitating Discussions (LIF_2), Multiple Communication Modes (LIF_5), and Required Participation (LIF_7) contribute strongly to student SoC. As mentioned previously, these results should be interpreted with consideration of the moderate correlations between the excluded variables and SoC. While the stepwise regression analysis did not extract the interactions Providing Goals, Expectations, Ethics or Timely Feedback as predictive, the moderate correlations indicate that they are important factors in SoC.

Additional Analyses

Chi-square analyses were conducted to examine the relationship between the frequency and importance of each interaction. Due to low cell count in some cells, responses were recoded to collapse data into three categories for each variable.

Frequency data were recoded as 1 = None (comprised of participant response 1 indicating the interaction never occurred); 2 = Low Frequency (comprised of participant responses 2 and 3 indicating the interaction occurred rarely or occasionally); and 3 = High Frequency (comprised of participant responses 4 and 5 indicating the interaction occurred often or very often).

Importance data was recoded as 1 = None (comprised of participant response 0 and 1 indicating the interaction never occurred or was not at all important); 2 = Low Importance (comprised of participant responses 2 and 3 indicating the interaction were slightly or fairly important); and 3 = High Importance (comprised of participant responses 4 and 5 indicating the interaction was quite important or very important). This recoding resulted in elimination of low cell counts and allowed examination of the data organized into low and high frequency and importance categories.

For each interaction item, the frequency data were entered as a row variable and importance data were entered as a column variable. This analysis allowed the researcher to determine whether a relationship existed between how often an interaction type occurred and how important it was to students.

Chi-square results showed that, for each type of learner-learner and learner-instructor interaction, frequency was significantly related to importance as presented in

Table 16 and 17. For all types of interaction, the relationship was positive in direction. Frequency data from the chi-square analysis were then used to calculate ratios, which placed each type of interaction in a quadrant of an importance:frequency scatterplot, with each interaction representing either Low Importance /Low Frequency, Low Importance/High Frequency, High Importance /Low Frequency, or High Importance /High Frequency. Low values were defined as less than 1.0, and high values were defined as more than or equal to 1.0.

Ratios were calculated using low and high cell counts for each interaction importance and frequency item. The intention of this analysis was to determine which interaction types offer the highest payoff for the instructor in terms of balance between effort and benefit. It was expected that some interaction types would be considered of high importance by students even if they occurred infrequently, and some might be considered of low importance regardless of frequency.

Table 16.

Chi-square Results for L-L items

	Pearson Chi-Square	*df*	Asymp. Sig. (2-sided)	*N*
LL1: Introductions	283.56	4	.000	381
LL2: Icebreaker activities	371.98	4	.000	381
LL3: Entire class online discussions	264.59	4	.000	380
LL4: Small group online discussions	301.72	4	.000	379
LL5: Social communication	351.36	4	.000	381
LL6: Collaborative group project	371.55	4	.000	380
LL7: Peer teaching	407.40	4	.000	380
LL8: Exchange resources	315.07	4	.000	380
LL9: Contribute personal experiences	366.41	4	.000	381

Note. LL = learner-learner

Table 17.

Chi-square Results for L-I items

	Pearson Chi-Square	*df*	Asymp. Sig. (2-sided)	*N*
LI1: Goals, expectations, ethics	154.97	4	.000	379
LI2: Facilitating discussions	286.17	4	.000	378
LI3: Support and encouragement	228.96	4	.000	379
LI4: Timely feedback	296.57	4	.000	378
LI5: Multiple communication modes	244.99	4	.000	380
LI6: Instructor modeling	323.26	4	.000	378
LI7: Required participation	165.56	4	.000	380

Note. LI = learner-instructor

Learner-Learner Ratios

Results of this analysis (see Table 18) showed that, for learner-learner interactions, the following interaction types were Low Importance /Low Frequency items: Item 1 (Introductions), Item 2 (Icebreaker Sctivities), Item 5 (Social Communication), Item 6 (Collaborative Group Projects), and Item 7 (Peer Teaching). This indicates that these items did not occur with great frequency, and that students did not feel that they contributed greatly to their SoC.

Table 18.

Importance:Frequency Ratios for Learner-Learner Items

		Importance	Frequency
LL1	Introductions	0.80	0.52
LL2	Ice Breakers	0.54	0.38
LL3	Entire Class Online Discussions	2.18	3.41
LL4	Small Group Online Discussions	1.38	1.03
LL5	Social (non-academic) Communication	0.64	0.41
LL6	Collaborative Group Project	0.80	0.66
LL7	Peer Teaching	0.77	0.66
LL8	Exchanging Resources	1.25	0.78
LL9	Contributing Personal Experiences	1.21	1.08

Note. LL = learner-learner

Item 8 (exchanging resources) was a High Importance /Low Frequency item. This item occurred infrequently among students but was considered highly important in building SoC. Items 4 (Small Group Discussions), 9 (Contributing Personal Experiences), and 3 (Entire Class Discussions) were High Importance /High Frequency items. Item 3 (Entire Class Discussions) occurred with far greater frequency than any other interaction, reflecting its almost ubiquitous use in current online course design. These High Importance /High Frequency items occurred often in the students' online classes, and they were valued for their contribution to development of SoC.

There were no Low Importance /High Frequency items. These would have been items which took up student time but which were not considered important in building SoC. Low Importance/Low frequency items were Items 1 (Introductions), 2 (Ice Breakers), 5 (Social Communication), 6 (Collaborative Group Projects), and 7 (Peer

Teaching). These items occurred infrequently and were perceived as low importance by students in their contribution to SoC. These results are displayed in Figure 1, with points in the left quadrants of the scatterplot representing low importance items and points in the right quadrants representing high importance items. Bottom quadrant points indicate low frequency, and top quadrant points represent high frequency. This figure allows one to see the standing of the items in relation to each other.

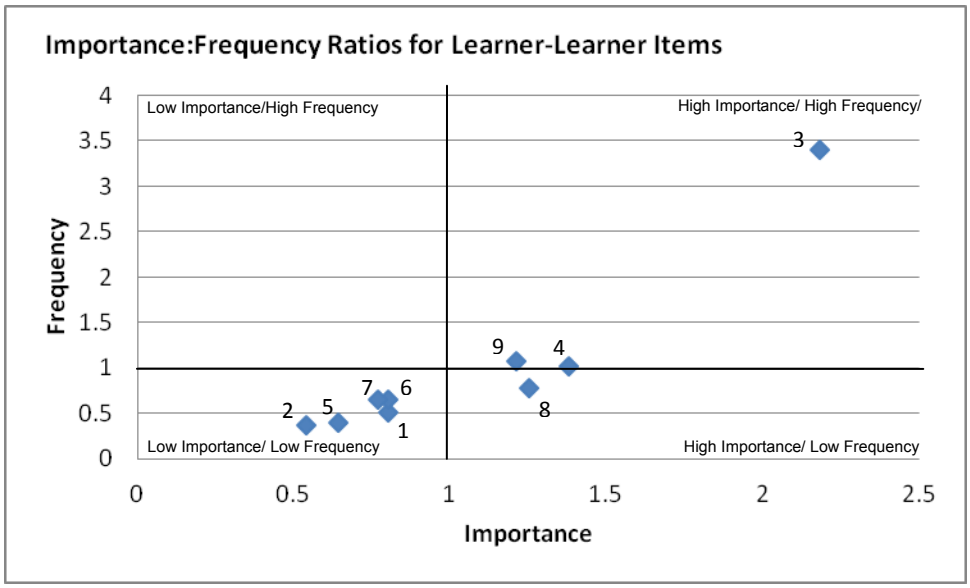

Figure 1. Importance:frequency ratios for learner-learner interaction items. In this matrix analysis, four quadrants of low and high frequency and low and high importance are delineated by horizontal and vertical black lines along the 1.0 value markers. Points are ratios of frequency to importance for each interaction item and are labeled as 1 = introductions, 2 = ice breakers, 3 = entire class discussions, 4 = small group discussions, 5 = social communication, 6 = collaborative group project, 7 = peer teaching, 8 = exchanging resources, and 9 = contributing personal experiences.

These results indicate that exchanging resources with each other is considered highly important to students in their development of community, even though it may not occur with great frequency. Having a chance to contribute their personal experiences

related to course topics and participating in discussions with both the entire class and with small groups were interactions that occurred with frequency and which students valued as important in building community.

Learner-Instructor Ratios

Results of this analysis (see Table 19) indicated that, for learner-instructor interactions, there were no Low Importance items. This means that all learner-instructor interaction types were valued by students as important contributors to building SoC.

Table 19.

Importance:Frequency Ratios for Learner-Instructor Items

		Importance	Frequency
LI1	Goals, expectations, ethics	1.82	1.71
LI2	Facilitating discussions	2.25	1.69
LI3	Support and encouragement	3.26	1.43
LI4	Timely feedback	3.68	2.09
LI5	Multiple communication modes	1.60	1.29
LI6	Instructor modeling	1.86	0.96
LI7	Required participation	1.94	8.00

Note. LI = learner-instructor

Item 6 (instructor modeling) was a High Importance/ Low Frequency item, though the frequency was only marginally low. Item 1 (Goals, Expectations, Ethics); Item 2 (Facilitating Discussions); Item 3 (Support and Encouragement); Item 4 (Timely Feedback); Item 5 (Multiple Communication Modes); and Item 7 (Required Participation) were High Frequency/High Importance items.

These results are displayed graphically in Figure 2, with points in the left quadrants of the scatterplot representing low importance items and points in the right quadrants representing importance items. Bottom quadrant points indicate low frequency, and top quadrant points represent high frequency. This figure allows visualization of position of items relative to each other.

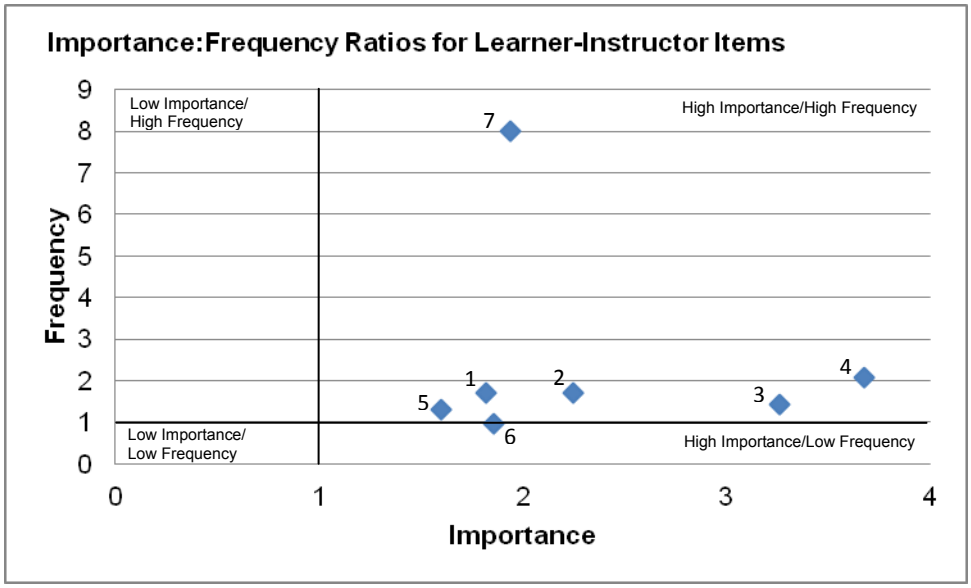

Figure 2. Importance:frequency ratios for learner-instructor interaction items. Four quadrants of low and high frequency and low and high importance are delineated by horizontal and vertical black lines along the 1.0 value markers. Points are ratios of frequency to importance for each interaction item and are labeled as 1 = goals, expectations, ethics, 2 = facilitating discussions, 3 = support and encouragement, 4 = timely feedback, 5 = multiple communication modes, 6 = instructor modeling, and 7 = required participation.

These results indicate that instructor modeling, regardless of perceived infrequent occurrence, was considered highly important in developing community. All other learner-instructor interactions occurred frequently and were considered by students to be important in building SoC.

Conclusions

This chapter presented quantitative results of the study regarding the relationship between interaction and sense of community in online learning. Descriptive statistics were presented. Correlations between Classroom Community Scale Total Scores and both learner-learner interaction items and learner-instructor interaction items were revealed. Correlations were moderate with the exception of Small Group Online Discussions, Entire Class Online Discussions, and Required Participation, which were low.

Results of stepwise linear regression analyses also were presented to address Research Questions 1 and 2. For learner-learner interactions, almost half of the variance of SoC was explained by the five predictor variables Introductions, Collaborative Group Projects, Contributing Personal Experiences, Entire Class Online Discussions, and Exchanging Resources. For learner-instructor interactions, almost half of the variance in SoC was explained by Instructor Modeling, Support and Encouragement, Facilitating Discussions, Multiple Communication Modes, and Required Participation. These interaction items, then, emerged as most strongly contributive to SoC.

Chi-square analyses of relationships between importance and frequency of each interaction item were described, along with assignment of interactions to a quadrant in an Importance/Frequency Matrix based on descriptive data. For learner-learner items, Exchanging Resources was a High Importance /Low Frequency item, indicating this item occurred infrequently among students but was considered highly important in building SoC. Small Group Discussions, Contributing Personal Experiences, and Entire Class

Discussions were High Importance /High Frequency items, indicating these interactions occurred often in online courses and were valued highly by students with regard to SoC development.

For learner-instructor interactions, there were no Low Importance items, indicating that all learner-instructor interaction types were valued by students as important contributors to building SoC. Item 6 (Instructor Modeling) was a High Importance/ Low Frequency item, though the frequency was only marginally low. Instructor modeling appears to be highly valued in spite of perceived infrequent occurrence. All other interactions were High Importance/High Frequency, indicating they occurred often and were valued by students.

Chapter V will interpret and discuss these results with the intention of providing information beneficial to instructors as they design interaction into their online courses.

CHAPTER V: DISCUSSION

The focus of this study concerned the need to minimize isolation of online learners. Distance learning literature suggests that one way to decrease student isolation is through the development of a sense of community (SoC). One element that has been shown to contribute to SoC is interaction among learners and between learners and the instructor. In online learning, this interaction must be intentionally built into courses as they are developed, because the electronic interface of online learning does not lend itself to spontaneous and rich interaction without planning.

Online instructors must make choices as they build interaction into their courses, however, and must balance the benefit of various interactive activities against the time, effort, and schedule burden these activities represent. Instructors would benefit from research which guides them in which interaction types best support development of SoC.

This study is significant because it adds to the body of knowledge regarding the contribution of various types of interaction to SoC. It builds on the qualitative literature which has explored many elements of interaction and community and empirically supports which types of interaction are most contributive to community for online learners. This study provides the instructor with quantitative evidence related to which interactions among learners and between learners and instructor will support the development of community in an online classroom.

The research questions guiding this study were:

RQ1: What learner-learner interactions in online learning are most predictive of sense of community?

RQ2: What learner-instructor interactions in online learning are most predictive of sense of community?

Discussion of Findings

The following section interprets results in light of the research questions and relates results to theoretical background and literature findings.

Discussion of Findings Related to Research Question 1

Results of this study revealed that learner-learner interactions are correlated with sense of community and identified a number of interactions that are contributive to SoC. Learner-learner interactions which emerged as most highly contributive to community, in decreasing order of contribution, were a) introductions, b) collaborative group projects, c) contributing personal experiences, d) entire class online discussions, and e) exchanging resources.

These results support the findings of Gallagher-Lepak et al. (2009) and Stepich and Ertmer (2003) which indicate that introductions at the beginning of an online class allow students to establish commonalities upon which they can build throughout the semester. It is likely that getting to know basic information about each other facilitates ongoing contacts and communication about assignments, content, and the experience of being in an online class. Students learn quickly that they are not on their own and that they are having a shared experience with peers who happen to be in a different geographic location. It would make sense that, when students have an opportunity for introductions early in the semester, they can move more quickly to establishing commonalities and relationships than if they had to initiate this contact independently.

Introductions may allow students to get off to an earlier start with online community building, which allows them more time to develop a rich sense of community.

The emergence of collaborative group projects as a contributor to SoC supports the extensive literature that promotes the importance of getting students to work as a team on shared projects to bring them together (Baturay & Bay, 2010; Conrad, 2005; Gallagher-Lepak et al., 2009; McIsaac et al., 1999; Rovai, 2002a; Rovai, 2004). Group projects generate the kinds of experiences among students that develop or break trust and can contribute to positive relationships. Group collaborations increase frequency of interactions among students, which can contribute to the development of a sense of connectedness and shared learning.

Surprisingly, contributing personal experiences explained almost 14% of the variance in SoC. While this type of interaction has not received much attention in the online learning literature, it makes sense that it is as important for distance students to connect their learning with their own experiences as it is for any learner. This relates to the social constructivist theory which underpins this study. In a constructivist learning environment students are active in the process of knowledge construction, and the attitudes and experiences they bring to the learning process are considered important. Giving students an opportunity to express how class content relates to their life or professional experience may be a time-consuming activity in an online class, but based on the results of this study it apparently is an important one in terms of building connectedness and shared learning. Students not only make connections between the content and their own experiences, they learn from each other's experiences, mistakes,

and insights. This finding supports studies of online community by Ali et al. (2004), Wolcott (1996), and Baab (2004).

Academic discussion among students as an entire class is an intuitive contributor to community. It is in this venue that students question content, seek clarification, build their understanding, and begin to form an impression of their peers in the class (Liu et al., 2007; Rovai, 2001). Students engaged in discussion learn about each other's views, benefit from each other's input, and can establish roles such as veteran or mentor to less-experienced students (Brown, 2001). The emergence of entire class online discussions as contributive supports constructivist theory which holds that learning should be negotiated as learners engage in the learning process. Learners construct knowledge and understanding within the context and support of a social environment.

Finally, exchanging resources emerged as a contributor to SoC in support of Stepich and Ertmer (2003) and Haythornthwaite et al. (2000), who promoted the idea that, when students exchange resources within the context of an online class, they build community. This autonomous interaction activity also supports social constructivist theory, as students benefit from engaging in some measure of self-regulation and interaction without the presence of the instructor. Students who share information, documents, and techniques become more responsible for their own learning and find they have resources beyond the instructor upon whom they can depend. They learn they have peers with whom they can enter into a mutually supportive relationship as they struggle to learn and manage their responsibilities.

Interestingly, these resource sharing activities tend to occur outside the knowledge or influence of the instructor, yet they appear to play an important role in establishing community in online learning. Certainly, instructors could encourage sharing of resources by suggesting activities which facilitate it, such as having a cohort of students set up a social media group page. Encouraging students to share resources they encounter related to another student's project, for example, not only plants the idea of sharing but gives students permission to take on this independent role. Human nature being what it is, the instructor will likely need to clarify the difference between sharing of learning resources and inappropriate sharing during the examination process.

Icebreaker activities, small group online discussions, social communication, and peer teaching did not emerge in this study as strongly contributive. The variables which emerge in a stepwise regression analysis, however, are relative to each other, and not every variable can be on the top of the pile. It is possible that, in spite of efforts to clarify the difference between the introductions and icebreaker activities, the variable icebreaker activities may have suffered from a tendency to be misidentified. Students may have experienced icebreaker activities but thought of them as extensions of introductions and may have been thinking of icebreakers when they responded to the introduction items which occurred first in the survey. It is also possible that peer teaching may have been misidentified. Activities included in this item, such as student presentations, may not be considered by students as examples of peer teaching. Failure on the part of participants to fully read survey item descriptions and examples could have resulted in participants reporting that peer teaching did not occur when in fact it had occurred.

It should be noted that these interaction types had low to moderate correlations with SoC. This indicates that, while they did not emerge as contributive with this sample, they may remain important factors in SoC and should not be dismissed by the instructor.

Discussion of Findings Related to Research Question 2

The learner-instructor interactions that were most contributive to SoC, in decreasing order of contribution, were: a) instructor modeling, b) support and encouragement, c) facilitating discussions, d) multiple communication modes, and e) required participation.

Instructor modeling, or the demonstration of expected communication behaviors by the instructor, emerged as highly contributive to SoC. Instructors have the ability to enhance positive interaction in their online courses by showing students how to engage in behaviors such as initiating conversation, accepting varied viewpoints, praising others' efforts, and inviting continued commentary (Tu & McIsaac, 2002). This important form of interaction is highly valued by students, but instructors may not be aware of the great potential of this interaction in forming community. As Vesely et al. (2007) reported, graduate students ranked instructor modeling as most important in developing community, while it was low on the instructors' lists.

The emergence of Support and Encouragement as an important contributor is consistent with the literature in online learning. Students benefit from both structural support in the form of scaffolding (Wegerif, 1998) and emotional support (Rovai, 2002a) as they learn new skills. Novice students who are simultaneously managing new content,

technology, and a new learning environment especially need support and encouragement from the instructor early in the semester (Brown, 2001).

Based on the results of this study, online students value an instructor who can support their learning by offering content that increases in complexity at a reasonable pace. It is easy for instructors who have become skilled at online teaching to forget the many skills they themselves have had to master over time. These skills in managing hardware and using software were learned in a scaffolded manner, with the instructor able to defer new applications when a semester brought software updates or a change from PC to Mac that pushed the limits of the instructor's comfort with change. Once the instructor is comfortable with given technologies, those technologies can become transparent; it is easy to forget that students need an opportunity to learn progressively. Students benefit from an instructor who keeps in mind that it is best to keep things simple early in the semester as everyone climbs the learning curve.

The importance of facilitating discussions in online courses is well documented in the literature (McElrath & McDowell, 2008; McIsaac et al., 1999; Rovai, 2002a; Rovai, 2004). Certainly, the instructor's role as facilitator is in alignment with principles of social constructivism. The results of this study support the assertion of many authors that the instructor plays an important role in participating in and guiding student discussions. These discussions may occur in online courses as asynchronous threaded discussions within a course management system, as synchronous text chat, or as synchronous audio and/or video conferencing. Regardless of the format, students find that the guidance of the instructor during discussions contributes strongly to SoC.

Students may feel more a part of a learning community when they know their contributions to a discussion are being reviewed and considered by the instructor and that the discussion is being nudged and prodded in a thoughtful and informed direction. Students discussing topics among themselves without instructor input may feel they are engaging in busy work which does not contribute to their learning. In the current academic environment in which students expect a tangible return on their investment in tuition costs, they are likely to value instructor guidance of discussions as evidence that they are not engaged in self-instruction.

The finding that students value multiple communication modes between themselves and the instructor is in agreement with Haythornthwaite et al. (2000) and Rogers et al. (2003). The ability to communicate over distance using public, private, synchronous, asynchronous, electronic, and face-to-face communication helps the student feel connected and decreases a sense of isolation.

This finding contradicts the idea that students might seek out distance learning primarily for its efficiency and that they have little time for the effort involved in building community with the instructor. While certainly some students want to jump online, complete assignments independently, and log off to pursue other responsibilities, there is evidently a high value placed by many students on opportunities to communicate with the instructor. Students desire flexible communication with their instructor as a means of seeking clarification of expectations, verifying that their ongoing work is proceeding in the right direction, and gaining feedback on the quality and accuracy of their work.

The availability of multiple modes of communication also speaks to the diversity of students' needs that an instructor finds in any course. Some students may be content and comfortable with interaction being restricted to one-way asynchronous communications such as e-mail notifications from the instructor and electronic submission of assignments. Many students, however, experience anxiety if they are unable to engage in two-way communication and may feel that they are missing important information if they are unable to engage in a more traditional synchronous conversation. A Skype session or telephone conversation can set students' minds at ease and allow them to proceed on assignments with confidence. In this way students can also gain a sense of connectedness to an instructor who is a real person with whom they will engage in reciprocal effort.

In addition to accommodating diverse student preferences for type of contact, multiple modes of communication also recognize varied student schedules and time zones. Not all students are available at times convenient to the rest of the class, and their geographic location may place them several times zones away from the instructor, with the result that they may not always be at their best during class time. An opportunity for conversation when they are well-rested and engaged in coursework can be productive for them academically as well as contributing greatly to a sense of connectedness with the instructor.

There is some discussion about the impact of required participation on student autonomy (Gulati, 2008), but this study underscores the importance of participation in building a cohesive group of students. In the current study, a strong majority of students

(96%) reported their instructors required participation in their online course, reflecting the instructors' belief that optional assignments would receive little attention from busy students. It is likely that this required participation leads to increased interaction, which in turn facilitates other interaction types. Reading peer responses and posting to a discussion board allow students to get a feel for each other's learning and communication style, which may encourage them to form alliances with peers of similar style. These alliances can facilitate group work and ongoing discussion among learners. Increasing comfort with each other also may facilitate more sharing of personal experiences and willingness to share resources, which in turn leads to increased SoC.

Providing goals, expectations, and ethics did not emerge as a contributor to SoC but was moderately correlated with SoC. It is likely that this process of providing structure within the course is a somewhat transparent or background activity and that students may not always perceive that it is occurring. They may, therefore, not report that it has occurred, which would influence its tendency to emerge as predictive.

The surprise result of this study is that timely feedback did not emerge as predictive of SoC as we would expect based on the work of numerous authors (Conrad, 2005; Lear, 2007; Liu et al., 2007; McIssac et al., 1999; Vrasidas & McIssac, 1999). Frequency data indicate that students reported receiving timely feedback on a frequent basis, so its absence from the predictive model is not due to a lack of occurrence. It is possible that feedback, with its potential for being either negative or positive, may not always be perceived as building community. Its primary function may be more related to instructing and informing rather than building connectedness. Additionally, this study did

not attempt to determine perception of the quality of feedback, which may be an important factor in its role in building SoC.

Contribution of Demographic Characteristics of the Sample to SoC

Demographic characteristics of students had little to contribute to the development of SoC in this study. Age, gender, and employment status did not appear to contribute to SoC in this sample, as would be expected based on studies by Exter et al. (2009) and Gallagher-Lepak et al. (2009). Only experience with online learning emerged as a contributor to SoC. This result supports the work of Brown (2001), Gallagher-Lepak et al., (2009), Lear (2007), and Rovai (2001). Veteran distance learners, no longer burdened with the double task of learning content and technology, tend to interact and work toward building community with their peers more than novice online learners. They have learned through experience that community can be established in an online course and that it will assist them in their efforts. They have learned the value of interacting with their instructor and peers and begin early in the semester to make the contacts that will support their connectedness and learning. In this way experienced distance learners share the instructor's workload in the area of building SoC; they model communication behaviors that help novice online learners begin to learn the ropes of building community.

Discussion of Additional Analyses

The chi-square analyses conducted to determine whether a relationship existed between how often an interaction type occurred and how important it was to students revealed some interesting results. For each type of learner-learner and learner-instructor

interaction, frequency was positively associated with importance. It is apparent that the more an interaction type tends to occur, the more important students perceive that interaction to be in development of SoC. Frequency of occurrence may raise their awareness of the benefits of a given interaction type in helping them connect with peers and instructors. Additionally, students may take cues from the fact that instructors build an interaction type into a course and make assumptions about its importance based on its frequent use.

In answer to the question of which interaction types offer the highest payoff for the instructor in terms of balance between effort and benefit, the current study offered several options. For learner-learner interactions, four of the nine interaction types were viewed by students as highly important in building SoC: small group discussions, entire class discussions, the opportunity to contribute personal experiences, and exchanging resources with peers. Only exchanging resources, however, was viewed as highly important even though it did not occur that often, meaning this interaction appears to offer the greatest yield to the busy instructor who seeks to facilitate community. Attention to encouraging students to work together and support each other's learning by sharing documents, knowledge, strategies, and skills would be time well spent in bringing students together.

For learner-instructor interactions, it is very interesting to note that students viewed all seven instructor interaction types as important and frequently occurring. Clearly, students value interaction with their instructor and perceive that it plays an important role in helping them feel a sense of belonging and trust within an online course.

The interaction type that offers the greatest payoff in terms of balance between effort and benefit appears to be instructor modeling. This sleeper interaction, of which many instructors have little awareness, offers a sizeable benefit in online learning. Students are evidently watching instructors. They're learning when to interact, how to interact, and how to become part of the community of online learners by observing their instructors. They're taking their cues from instructors and from veteran online learners in their class. Instructors would be wise to realize the power and influence of the ways in which they choose to respond to and guide students in their classes.

Conclusions

In summary, findings of this study revealed that learner-learner and learner-instructor interactions are correlated with sense of community. Learner-learner interactions which contribute most strongly to SoC are introductions, collaborative group projects, contributing personal experiences, entire class online discussions, and exchanging resources. The learner-learner interaction type that offers the highest payoff for the instructor with regard to effort vs. benefit is exchanging resources. This type of interaction is highly important to students in building SoC, even though it may occur infrequently. This interaction offers the greatest yield to the instructor who seeks to efficiently facilitate community. Three of the remaining eight interaction types were viewed by students as highly important in building SoC: small group discussions, entire class discussions, and the opportunity to contribute personal experiences.

These interactions can be facilitated by the instructor through inclusion of activities which promote sharing of commonalities, group discussions, and collaborative

work. During those discussions, the instructor would further facilitate SoC by encouraging students to make connections by relating personal experiences with the course content. Only the exchanging of resources is a type of interaction that typically exists outside the direction of the instructor, as it tends to occur spontaneously and autonomously between students. An instructor could facilitate this exchange, however, by raising student awareness of the benefit of this type of interaction early in the semester. Encouragement and permission from the instructor would likely increase this mutually supportive interaction between students.

The learner-instructor interactions that contribute most strongly to SoC are instructor modeling, support and encouragement, facilitating discussions, multiple communication modes, and required participation. Students viewed all seven instructor interaction types as important and frequently occurring. Clearly, students value interaction with their instructor and perceive that it plays an important role in helping them feel a sense of belonging and trust within an online course.

The learner-instructor interaction type that offers the greatest payoff when balancing effort and benefit is instructor modeling. Many instructors have little awareness of the influence their own comments, responses, and communication style have on the communication acts of their students, but this modeling of interaction behavior offers an important benefit in building SoC in online learning. Early and frequent positive comments, respectful acceptance of divergent views, requests for clarification, supportive comments in the presence of stressful situations, and private communication of negative feedback are examples of the kinds of communication behavior that an instructor can use

to lead by example in an online class.

Age, gender, and employment status did not contribute to SoC in this sample. Only experience with online learning contributed to SoC in the current study. The online instructor should be aware that novice learners may not have the resources to reach out to peers at the beginning of the semester, as they are attempting to climb the new technology learning curve while processing content materials. They are the students who are most at risk of becoming overwhelmed and not completing the course requirements. They may not be aware of the benefits an online community can offer and may not have sufficient time to reach out, yet they have need for the support and encouragement that SoC offers.

Implications for Practice

The results of this study offer guidance to the online instructor who is interested in facilitating the development of a SoC in online courses. An instructor can build learner-learner interaction into a course to support SoC for online learners in the following ways:

- Provide an opportunity for students to get to know each other early in the semester. This enables students to establish commonalities and connections which increase their comfort with contacting each other. These contacts encourage further interaction throughout the semester, leading to increased SoC.
- Build in collaborative group projects in order to encourage students to work as a team. Provide sufficient direction and support to improve the chances that this teamwork is positive and contributes to community.

- Provide opportunities for students to contribute brief stories of their own experience during either asynchronous threaded discussions or synchronous discussions. Not all students will want or need to contribute, but this opportunity to connect personally to academic content will benefit those who do participate.
- Require class discussions on academic topics to allow students to negotiate meaning and to learn from each other. These discussions can be synchronous or asynchronous.
- Talk with students early in the semester about the benefits of sharing learning resources with each other. Experienced online learners can support novice learners, and students with expertise or skills in a particular professional area can contribute to the success of peers in the class by sharing resources such as documents, research articles, formatting tips, or links to topics of academic interest. Social media can be suggested as a means of sharing resources.

An instructor interested in facilitating SoC can build learner-instructor interaction into an online course in the following ways:

- Be aware of the importance of the instructor's communication behaviors in showing students how to engage in behaviors that build community in online course. Students observe instructor behavior and learn from it, taking cues in such areas as initiation of conversations, acceptance of opposing viewpoints, offering of encouragement, and use of tact in disagreements.
- Support students through use of scaffolding of new skills, both technological and academic. Do not expect them to pick up in three weeks technology skills that

took you two semesters to master. Let them know they are not alone in their efforts to manage online learning, and encourage them by pointing out their successes and the normalcy of their experience.

- Maintain a presence in academic discussions, whether synchronous or asynchronous. Facilitate discussions by offering comments, questions, and feedback to guide the discussion.
- Offer multiple ways for students to communicate with the instructor. Students with varied communication styles and schedules will benefit from the instructor's flexibility in using synchronous, asynchronous, public, and private communication modes.
- Require participation and interaction in the course. Busy students who are juggling competing demands will put their finite resources behind required activities.
- Determine students' experience level with online learning very early in the semester and establish frequent interaction with novice learners. All interactions do not have to involve the instructor. Veteran learners within the class can be an important resource to novice learners, as they have acquired skills and strategies they can share with those new to distance learning. The instructor can facilitate this process by pairing novice and veteran learners in projects and by encouraging their interaction through an informal or formal buddy system.

The message of this study is that in this age of dazzling technology there is still no substitute for opportunities for students to interact in multiple ways with peers and their

instructor in an online environment. An instructor who desires to retain students through facilitating SoC has many tools for building interaction into an online course. Through judicious use of activities which incorporate interaction between and among instructor and students, the instructor can create a welcoming and accepting online course in which students have a sense of belonging and trust.

Limitations

Limitations of this study included issues related to nature of data collection, timing of data collection, and generalizability. The surveys administered attempted to collect data based on student report of their perception of human interaction events within their online courses. While an effort was made to clearly communicate the nature of these events, there is always room for interpretation in social constructs of this kind. Students may have responded to survey items with a different type of event in mind than the researcher had intended.

Data were collected approximately three weeks before the end of the Fall 2011 semester in order to allow time for data collection, analysis, and interpretation. It is likely that some interactions within courses were missed as a result. Some interaction types such as collaborative group projects might have been better represented if data had been collected after the full semester had been completed.

The final limitations relate to the generalizability of the results of this study. The sample was drawn from a group of students at one South Central university, so results may not apply to students at other universities. The sample was, however, drawn from students across all disciplines which offered online learning. The low response rate to the

electronically distributed survey further limits generalizability. The timing of data collection at three weeks before the end of the semester resulted in students being asked to complete the survey during a very busy time of the semester. This may have contributed to the low response rate. It is not possible to determine if results would have been different had a larger proportion of the population been represented in the sample.

Recommendations for Future Research

This study offers interesting results to inform instructor practices in facilitating online SoC, but further research in this area would be beneficial to address a number of areas. Future studies on this topic could shift the timing of data collection to the end of the semester to allow better representation of interaction types that tend to occur late in the semester. Investigation of the types of interaction valued by students in varied education models also would be of interest; cohort models in which a group of students take multiple online courses together over an extended time period would be likely to experience changes in how and why they interact.

Future studies of online SoC would benefit from including multiple universities to provide a more broad and diverse population. Additional strategies such as offering incentives could also be implemented to increasing the response rate during data collection.

Use of qualitative methods including interviews with students would assist the researcher in interpreting quantitative results. Student open-ended responses might shed light on the reasons behind some interaction types emerging as low or high importance.

An additional element addressed in only the pilot study was the comparison between faculty and student perspectives on interaction in SoC. Additional studies could delve further into this comparison with a large sample and could reveal interesting differences between what faculty members think is occurring and what students are experiencing in an online class. Future studies also could consider other types of interaction such as learner-content or learner-interface, to determine their relative contribution to SoC.

This area of study has tremendous potential to provide rich and beneficial guidance to instructors in how they can facilitate sense of community in their classes. Further research can help instructors make informed and efficient use of interactions as they develop courses. These interactions will support students as they undertake the challenges of learning and will bring students into a community of learners upon whom they can depend as they strive to reach their educational goals.

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APPENDIX A: SUPPORTING RESEARCH FOR INTERACTION SURVEY ITEMS

Item Number	Item	Supporting Research
L_IF_1 (Learner—Instructor Frequency 1)	In this class, how often did your instructor provide information on topics such as goals, expectations, ethics, information about the instructor?	Baab (2004) Gallagher-Lepak et al (2009) Haythornthwaite, Kazmer, Robins, & Shoemaker (2000) Lear (2010) Ritter (2010) Rovai (2002a) Rovai (2004) Shea, Li, & Pickett (2006)
L_IF_2	In this class, how often did your instructor participate in and guide discussions?	Conrad (2005) Lear (2007) Liu, Magjuka, Bonk, & Lee (2007) McElrath & McDowell (2008) McIsaac (1999) Rogers, Graham, Rasmussen, & Ure (2003) Rovai (2002a) Rovai (2004) Shea (2006)
L_IF_3	In this class, how often did your instructor provide support and encouragement to students when needed?	Brown (2001) Rogers et al. (2003) Rovai (2002a) Wegerif (1998)
L_IF_4	In this class, how often did your instructor provide timely feedback on your performance?	Conrad (2005) Lear (2007) Liu, Magjuka, Bonk, & Lee (2007) McIsaac, Blocher, Mahes, & Vrasidas (1999) Vrasidas & McIssac (1999)
L_IF_5	In this class, how often did your instructor use multiple ways to communicate with you (such as phone, email, Skype, course announcements)?	Haythornthwaite et al. (2000) Rogers et al. (2003)
L_IF_6	In this class, how often did your instructor interact in ways that showed you how to be	Berge (1995) Brown (2001) Tu & McIsaac (2002) Vesely , Bloom, & Sherlock (2007)

	part of an online classroom community (leading by example)?	
L_IF_7	In this class, how often did your instructor require participation in discussions or postings?	Gallagher-Lepak et al. (2009) Pate, Smaldino, Mayall, & Luetkehans (2009) Stepich & Ertmer (2003) Gulati (2008)
L_LF_1 (Learner—Learner Frequency 1)	In this class, how often did you have the opportunity to get to know classmates by sharing information about yourselves?	Gallagher-Lepak et al. (2009) Liu (2007) Stallings & Koellner-Clark (2003) Stepich & Ertmer (2003)
L_LF_2	In this class, how often did you participate in an activity (such as a game or ice breaker) to get to know classmates?	Ho (2003) McElrath & McDowell (2008) Stepich & Ertmer (2003)
L_LF_3	In this class, how often did you take part in online discussions with the entire class?	Brown (2001) Lefoe (1998) Liu et al. (2007) Nicholson (2005) Rogers (2003) Rovai (2001) Rovai (2004) Stepich & Ertmer (2003)
L_LF_4	In this class, how often did you take part in small group discussions online?	Aviv (2000) Ritter (2010) Stallings & Koellner-Clark (2003) Tu & McIsaac (2002) Wolcott (1996)
L_LF_5	In this class, how often did you communicate with other students about non-academic topics (such as an open discussion board, Water Cooler forum, etc.)?	Conrad (2002) Gallagher-Lepak et al. (2009) Liu et al. (2007) Nicholson (2005) Rovai (2001) Stepich & Ertmer (2003)
L_LF_6	In this class, how often did you work with a group of classmates on	Baturay & Bay (2010) Cameron, Morgan, Williams, & Kostelecky (2009)

	a collaborative project?	Conrad (2005) Gallagher-Lepak et al. (2009) Liu et al. (2007) McIsaac et al. (1999) Rovai (2002a) Rovai (2004) Stallings & Koellner-Clark (2003) Stepich & Ertmer (2003)
L_LF_7	In this class, how often did you take part in peer teaching (such as giving presentations or leading discussions)?	Leese 2009 Wegerif (1998)
L_LF_8	In this class, how often did you exchange resources (such as links or documents) and information with classmates?	Haythornthwaite et al. (2000) Stepich & Ertmer (2003)
L_LF_9	In this class, how often did you contribute personal experiences as they relate to course content?	Ali, Hodson-Carlton, & Ryan (2004) Baab (2004) Wolcott (1996)

APPENDIX B: CLASSROOM COMMUNITY SCALE (ROVAI, 2002B)

Directions: Below, you will see a series of statements concerning a specific course or program you are presently taking or have recently completed. Read each statement carefully and place an X in the parentheses to the right of the statement that comes closest to indicate how you feel about the course or program. You may use a pencil or pen. There are no correct or incorrect responses. If you neither agree nor disagree with a statement or are uncertain, place an X in the neutral (N) area. Do not spend too much time on any one statement, but give the response that seems to describe how you feel. *Please respond to all items.*

	Strongly Agree (SA)	Agree (A)	Neutral (N)	Disagree (D)	Strongly Disagree (SD)
1. I feel that students in the course care about each other.	(SA)	(A)	(N)	(D)	(SD)
2. I feel that I am encouraged to ask questions.	(SA)	(A)	(N)	(D)	(SD)
3. I feel connected to others in this course.	(SA)	(A)	(N)	(D)	(SD)
4. I feel that it is hard to get help when I have a question.	(SA)	(A)	(N)	(D)	(SD)
5. I do not feel a spirit of community.	(SA)	(A)	(N)	(D)	(SD)
6. I feel that I receive timely feedback.	(SA)	(A)	(N)	(D)	(SD)
7. I feel that this course is like a family.	(SA)	(A)	(N)	(D)	(SD)
8. I feel uneasy exposing gaps in my understanding.	(SA)	(A)	(N)	(D)	(SD)
9. I feel isolated in this course.	(SA)	(A)	(N)	(D)	(SD)
10. I feel reluctant to speak openly.	(SA)	(A)	(N)	(D)	(SD)
11. I trust others in this course.	(SA)	(A)	(N)	(D)	(SD)
12. I feel that this course results in only modest learning.	(SA)	(A)	(N)	(D)	(SD)
13. I feel that I can rely on others in this course.	(SA)	(A)	(N)	(D)	(SD)
14. I feel that other students do not help me learn.	(SA)	(A)	(N)	(D)	(SD)
15. I feel that members of this course depend on me.	(SA)	(A)	(N)	(D)	(SD)
16. I feel that I am given ample opportunities to learn.	(SA)	(A)	(N)	(D)	(SD)
17. I feel uncertain about others in this course.	(SA)	(A)	(N)	(D)	(SD)
18. I feel that my educational needs are not being met.	(SA)	(A)	(N)	(D)	(SD)
19. I feel confident that others will support me.	(SA)	(A)	(N)	(D)	(SD)
20. I feel that this course does not promote a desire to learn.	(SA)	(A)	(N)	(D)	(SD)

APPENDIX C: E-MAIL GRANTING PERMISSION TO USE THE CCS

From: Alfred Rovai [mailto:alfrrov@regent.edu]
Sent: Monday, June 13, 2011 12:44 PM
To: Shackelford, Jo
Subject: RE: Request for permission to use CCS

Hi,

You may use the instrument for the purpose you described provided you cite the following article in any report you write.

Rovai, A. P. (2002). Development of an instrument to measure classroom community. Internet & Higher Education, 5(3), 197-211. (ERIC Document Reproduction Service No. EJ663068) Available online at http://dx.doi.org/10.1016/S1096-7516(02)00102-1

This article also provides you with information regarding the instrument's validity and reliability.

Attached is a clean copy of the instrument.

Best wishes,
Fred

_____

Alfred P. Rovai, Ph.D.
Interim Vice President for Academic Affairs
Regent University
Phone: 757.352.4861

From: Shackelford, Jo [mailto:jo.shackelford@wku.edu]
Sent: Monday, June 13, 2011 1:29 PM
To: Alfred Rovai
Subject: Request for permission to use CCS

Dr. Rovai,

I am writing to request permission to use your Classroom Community Scale as an instrument to collect data for my dissertation research examining the relationship between learner–learner and learner–instructor interactions and sense of community in online learning. I would also like to request any information you can provide on the validation of this instrument.

I can provide you with more information on the research project if you wish. I appreciate your consideration, and look forward to hearing from you.

Jo Shackelford, M.A., CCC-SLP
Doctoral Student, Leadership in Educational Administration
Instructor and Pre-SLP Program Coordinator
Communication Disorders Department
Western Kentucky University
1906 College Heights Blvd. #41030
Bowling Green, KY 42101-1030

APPENDIX D: INTERACTION SCALE

Directions: The following statements relate to interactions **between you and other students** in your class. Please indicate how often these interactions happened in this class.

FREQUENCY: In this class, how often did you:

have the opportunity to get to know classmates by sharing information about yourselves?	Never	Rarely	Occasionally	Often	Very often
participate in an activity (such as a game or ice breaker) to get to know classmates?	Never	Rarely	Occasionally	Often	Very often
take part in online discussions with the entire class?	Never	Rarely	Occasionally	Often	Very often
take part in small group discussions online?	Never	Rarely	Occasionally	Often	Very often
communicate with other students about non-academic topics (such as an open discussion board, Water Cooler forum, etc.)?	Never	Rarely	Occasionally	Often	Very often
work with a group of classmates on a collaborative project?	Never	Rarely	Occasionally	Often	Very often
take part in peer teaching (such as giving presentations or leading discussions)?	Never	Rarely	Occasionally	Often	Very often
exchange resources (such as links or documents) and information with classmates?	Never	Rarely	Occasionally	Often	Very often
contribute personal experiences as they relate to course content?	Never	Rarely	Occasionally	Often	Very often

IMPORTANCE: How important were each of these interactions in contributing to your sense of community in this course?

have the opportunity to get to know classmates by sharing information about yourselves?	Not at all	Slightly	Fairly	Quite	Very

participate in an activity (such as a game or ice breaker) to get to know classmates?	Not at all	Slightly	Fairly	Quite	Very
take part in online discussions with the entire class?	Not at all	Slightly	Fairly	Quite	Very
take part in small group discussions online?	Not at all	Slightly	Fairly	Quite	Very
communicate with other students about non-academic topics (such as an open discussion board, Water Cooler forum, etc.)?	Not at all	Slightly	Fairly	Quite	Very
work with a group of classmates on a collaborative project?	Not at all	Slightly	Fairly	Quite	Very
take part in peer teaching (such as giving presentations or leading discussions)?	Not at all	Slightly	Fairly	Quite	Very
exchange resources (such as links or documents) and information with classmates?	Not at all	Slightly	Fairly	Quite	Very
contribute personal experiences as they relate to course content?	Not at all	Slightly	Fairly	Quite	Very

The following statements relate to interactions **between you and your instructor**. Please indicate how often these interactions happened in this class.

FREQUENCY: In this class, how often did your instructor:

provide information on topics such as goals, expectations, ethics, information about the instructor?	Not at all	Slightly	Fairly	Quite	Very
participate in and guide discussions?	Not at all	Slightly	Fairly	Quite	Very
provide support and encouragement to students when needed?	Not at all	Slightly	Fairly	Quite	Very
provide timely feedback on your performance?	Not at all	Slightly	Fairly	Quite	Very

use multiple ways to communicate with you (such as phone, email, Skype, course announcements)?	Not at all	Slightly	Fairly	Quite	Very
interact in ways that showed you how to be part of an online classroom community (leading by example)?	Not at all	Slightly	Fairly	Quite	Very
require participation in discussions or postings?	Not at all	Slightly	Fairly	Quite	Very

IMPORTANCE: How important were each of these interactions in contributing to your sense of community in this course?

provide information on topics such as goals, expectations, ethics, information about the instructor?	Not at all	Slightly	Fairly	Quite	Very
participate in and guide discussions?	Not at all	Slightly	Fairly	Quite	Very
provide support and encouragement to students when needed?	Not at all	Slightly	Fairly	Quite	Very
provide timely feedback on your performance?	Not at all	Slightly	Fairly	Quite	Very
use multiple ways to communicate with you (such as phone, email, Skype, course announcements)?	Not at all	Slightly	Fairly	Quite	Very
interact in ways that showed you how to be part of an online classroom community (leading by example)?	Not at all	Slightly	Fairly	Quite	Very
require participation in discussions or postings?	Not at all	Slightly	Fairly	Quite	Very

Demographic Questions

About which class are you answering the questions in this survey?

Drill down menu with Prefix, Number, Section, Instructor

Approximately how many online courses have you taken prior to this course?

Pull-down menu (0-50)

Did your entire class meet in person in a physical classroom at least once during the semester?

Yes No

What is your employment status?

Employed full time Employed part time Not currently employed

What is your gender?

Male Female

What is your age?

Pull down menu (18-99)

APPENDIX E. IRB APPROVAL LETTER

WKU

A LEADING AMERICAN UNIVERSITY WITH INTERNATIONAL REACH

HUMAN SUBJECTS REVIEW BOARD

In future correspondence, please refer to HS11-305, June 16, 2011

Jo Shackelford
c/o Dr. Maxwell
Communication Disorders
WKU

Jo Shackelford
& Dr. Maxwell:

Your research project, *Sense of Community in Online Learning: Contribution of Interaction*, was reviewed by the IRB and it has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects' welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that you need to orient participants as follows: (1) signed informed consent is not required; (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data. (3) Appropriate safeguards are included to protect the rights and welfare of the subjects.

   This project is therefore approved at the Expedited Review Level until April 30, 2012.

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Sponsored Programs at the above address. Please report any changes to this approved protocol to this office. A Continuing Review protocol will be sent to you in the future to determine the status of the project. Also, please use the stamped approval forms to assure participants of compliance with The Office of Human Research Protections regulations.

Sincerely,

Paul J. Mooney, M.S.T.M.
Compliance Manager
Office of Research
Western Kentucky University

INSTITUTIONAL REVIEW BOARD WKU APPROVED

IRB APPLICATION # 11-305
APPROVED 6/16/11 to 4/30/12
EXEMPT EXPEDITED FULLBOARD
DATE APPROVED 6/16/11

cc: HS file number Shackelford HS11-305

APPENDIX F. CURRICULUM VITAE

JO SHACKELFORD, M.A., CCC-SLP

EDUCATION	Ed.D. in Educational Leadership in progress, Western Kentucky University, Bowling Green, Kentucky. Anticipated date of completion: May 2012 **Master of Arts**, Speech Communication, University of Maine, Orono, Maine, 1986 **Bachelor of Science**, Dual Major Speech Correction and Elementary Education, University of Maine at Farmington, Farmington, Maine, High Honors, 1984
CERTIFICATION/ LICENSURE	Certificate of Clinical Competence Current Speech Pathology License, State of Kentucky Current Kentucky Professional Teaching Certificate Current
PROFESSIONAL MEMBERSHIPS	American Speech-Language-Hearing Association Kentucky Speech and Hearing Association
RESEARCH INTERESTS	Distance learning, Age-related cognitive decline, Computer-based cognitive interventions, Quality of life outcomes in dysphagia
COMMITTEES AND SERVICE	CHHS Undergrad Curriculum Committee, Alternate, 2009-present, Western Kentucky University CHHS Sabbatical/Faculty Awards Committee, 2010-present Master Scholar Committee 2008-2009, Western Kentucky University Honors Committee 2007 to present, Western Kentucky University Dept. of Communication Disorders

PROFESSIONAL EXPERIENCE	Western Kentucky University Pre-SLP Program Coordinator, Spring 2009 to present Instructor, July 2008 to present Clinical Instructor/Supervisor, July 2007 to July 2008 Distance Learning Graduate Advisor, August 2006 to July 2008 EnduraCare Therapy Management, Inc., 2003 to 2007 Warren County Schools, Bowling Green, KY 2002 to 2003 Bowling Green City Schools, Bowling Green, KY 1999 to 2002 Sundance Rehabilitation, Bowling Green, KY 1995 to 1998 Pinnacle Rehabilitation, Bowling Green, KY 1993 to 1995 Brewer Rehabilitation and Living Center, Brewer, Maine 1990 to 1992 University of Maine, Orono, Maine 1988 to 1989 Eastern Maine Medical Center, Bangor, Maine 1987 to 1988
PUBLICATIONS/ PRESENTATIONS	Shackelford, J.L. & Bland, L. (2011). *Developing a sense of community in distance learning courses*. Poster session presented at the annual meeting of the American Speech Language-Hearing Association, San Diego, CA. Bland, L., Brindle, B., Dressler, R., Etienne, J., Shackelford, J.L. & Smith, J. (2010). *Using Adobe Connect Pro as a Distance Learning Tool*. Poster session presented at the annual meeting of the American Speech Language-Hearing Association, Philadelphia, PA. Shackelford, J.L. & Bland, L. (2009). *Quandaries, questions, and queries: A strategy for teaching clinical decision making*. Poster session presented at the annual meeting of the American Speech Language-Hearing Association, New Orleans. Shackelford, J.L. (2009). *Cognition and Aging*. Invited presentation at Kentucky Speech and Hearing Association Annual Convention, Louisville, KY. Shackelford, J.L. (2007, November). *Using linguistic cues to decrease problem behaviors in dementia patients*. Poster session presented at the annual meeting of the American Speech-Language-Hearing Association, Boston, MA. Shackelford, J.L. (2005, Spring). *Aphasia intervention using functional activities*. Guest lecture, CD 504 Seminar in Language Disorders, Western Kentucky University. Shackelford, J.L. & Whiteside, A. (2005). *Dementia assessment and intervention in long term care*. Invited lecture, EnduraCare Corporate Training Seminar.

AWARDS/ HONORS	WorldTopper Study Abroad Scholarship, Winter 2012 College Heights Foundation Scholarship, 2012 College Heights Foundation Scholarship, 2011 Nominated for Faculty Award for Teaching, 2009-2010 Nominated for Faculty Award for Teaching, 2008-2009
PROFESSIONAL ACTIVITIES	Service Learning Project, study abroad to Ecuador, Winter 2012 Internship, Faculty Center for Excellence in Teaching, WKU May 2010 to present Basic Skills in College Teaching Certificate, WKU, Summer 2010 FaCET Summer Conference, June 2009 Council on Post-Secondary Education Conference, May 2009 Program Coordinator, Pre-SLP Program (Fall 2008 to present) Develop and administer prerequisite program to prepare web students for admission to Master's degree program Text Review, Allyn and Bacon, 2007
TEACHING	CD 507 Aphasia (Fall 2009, Spring 2010, Fall 2010, Fall 2011) Student Enrollment: 24-35 CD 514 Dysphagia (Spring 2009, Fall 2009, Spring 2011, Fall 2011, Spring 2012) Student Enrollment: 24-35 CD 489G Geriatric Communication Disorders (Fall 2008, Spring 2009, Spring 2010, Fall 2010, Spring 2011, Spring 2012) Student Enrollment: 30 CD 511 Neurology (Summer 2010) Student Enrollment: 24 CD 591 Clinical Externship (Fall 2008, Spring 2009, Summer 2009) Supervision of graduate clinicians in off-site clinical placements, Student Enrollment: 6-8 CD 280 Introduction to Speech Pathology and Audiology (Fall 2007, Spring 2008, Fall 2008) Live classroom with interactive video to two distance sites, Student Enrollment: 25-31 CD 590 Clinical Externship (Summer 2008, Summer 2009) Supervision of graduate clinicians in off-site clinical placements, Student Enrollment: 6-9 CD 495 Clinical Internship (Fall 2007) Supervision of undergraduate clinicians Student Enrollment: 8

SKILL AREAS	Blackboard Academic Suite Adobe Connect Pro videoconferencing software Interactive Video Technology Microsoft Office (Word, Excel, PowerPoint)
REFERENCES	Available upon request