ENHANCING STUDENT LEARNING AND SUCCESS THROUGH

THE USE OF SOCIAL NETWORKING TECHNOLOGIES,

A DESIGN-BASED RESEARCH APPROACH

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ABSTRACT

Institutions of higher learning are engaged in a difficult process of ensuring that more students are successful in student learning and persist into future coursework. Four-year and two-year institutions differ greatly in their approaches to dealing with academic progress and degree completion. With the integration of a variety of technologies into teaching and learning, determining which of these technological tools can foster greater levels of student success is a key issue. Research has focused on attaining higher levels of student success that are attributed to active and collaborative learning, driven by student-generated, ubiquitous, transparent environments. This research attempts to answer the question: can social networking technologies, linked with academic coursework and student support services, increase levels of self-efficacy leading to student success and retention?

The constructs used to measure the outcomes of participating in a social networking environment include perceived sociability of the technology used and the formal and informal peer interactions that occur and self-efficacy levels. In a design-based research environment, an experiment took place over the course of three semesters. It was proposed that the perceived sociability and formal and informal peer interactions will increase the students’ self-efficacy levels. This impact will drive higher levels of student success and retention in their academic career endeavors. The research takes place in the framework of design-based research, and focuses on defining technology as a process, not just an artifact that can impact teaching and learning methods.
Results support the theories related to perceived sociability of computer learning environments, effects of peer interaction and self-efficacy on course completion, and retention. There was considerable overall support for the proposed theoretical model. However differential effects of the social networking treatment were mixed as not all the results showed a significant difference in impact between the treatment and control groups. A path analysis evaluation showed that peer interaction and the treatment intervention had a predicted effect on academic self-efficacy. A test of indirect effects of using the social networking on student success and retention showed small, but significant, indirect effects mediated through self-efficacy. This indirect impact of the social networking treatment on student success through self-efficacy provides support for the overall conceptual model. The results do provide a great deal of practical guidance as the aim to create a campus-wide social networking environment continues at the selected college.
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CHAPTER 1. INTRODUCTION TO THE STUDY

Incorporating technology into education continues to be on the forefront of research focused on improving student success. As the nation struggles with getting more students educated and prepared for work, researchers are trying to combine and integrate technologies that successfully support student learning. Taking into account the numerous ways that technology can be incorporated into student learning and success, the research areas are diverse and far reaching. Examples of the diversity include:

- Strategies focused on supporting “always on” learners through technology (Baird & Fisher, 2005);
- Supporting student college completion through technology driven degree planning and scheduling (Dechter, 2009);
- Developing social and collaborative learning environments for online students (Fisher & Baird, 2005);
- Utilizing social networking sites (SNS) to support classroom collaboration (Lampe, Wohn, Vitak, Ellison, & Wash, 2011);
- Information dissemination and knowledge creation through social software and participatory learning (McLoughlin & Lee, 2007);
- Pedagogical transformation focused on social learning (Brown & Adler, 2008);
- The use of microblogging and social networking to engage students and impact grades (Junco, Heilbergert, & Loken, 2011); and
- Alignment of technology to increase graduation and transfer rates, while reducing time to degree (Edyburn, 2011).
As these fundamental shifts in learning are taking place, educators continue to evaluate the way courses and topics are pedagogically organized. The diffusion of information and communication technologies alongside the explosion of social networking technologies has pushed further pedagogical changes (Fischer & Konomi, 2005; McLoughlin & Lee, 2007). Methods of creating stronger communities of learning have mainly been applied to distance education in an attempt to fill the void left by the absence of face-to-face interaction (Fisher & Baird, 2005; Miltiadou & Savenye, 2003). Fewer studies have examined the effect of social networking technologies on student success in face-to-face courses.

This study addresses the need to understand the surrounding support mechanisms that are necessary for student created relationships and the need to foster these relationships with technology that could increase success levels measured by retention through design-based research (DBR). The purpose of this study will be to examine the relationships that occur between important factors in student learning and the ability they feel they can complete course work. It is proposed that through social networking interfaces, students will have stronger feeling of perceived sociability via the social networking site, stronger levels of informal and formal peer interaction, which impact their self-efficacy levels, leading them to feel confident that they can complete particular course work. It is proposed that a causal relationship exists between the factors that lead to increased completion and re-enrollment into future semesters.
College administrators and faculty need to be aware of and encourage the connections and relationships among students that can increase student success and progress, leading to higher levels of graduation and contributions to the nation as a whole. Similar to the changing landscape of the business environment, numerous external factors are driving the changing landscape of higher education, including digitalization, ubiquitous connectivity, and globalization (Prahalad & Krishnan, 2008).

Social media is focused on collaboration, sharing and participation. These activities are closely tied to the social constructivist approach to teaching and learning. The technologies emerging within education can help students create their own knowledge and learning approaches. The affordances of social technology include the enabling of constructivist learning, and the requiring and enforcing of social constructivist learning as part of the structure and consequence of the engagement (Tay & Allen, 2011).

The major goal of this research study is to determine whether student success is increased by integrating social networking into the curriculum at a commuter-based community college. In order to build an appropriate social networking platform for students, the study begins with exploratory focus groups composed of students. Results of the focus groups pinpoint smartphones as the most valued technology tool for their primary communication and information search device. Texting rose to the top of the communication list as the single most popular form of communication between friends and family, but the focus groups also indicated they would like more communication via text from the college. Another important factor in designing the social networking
platform was the students’ desire to have mobile applications and sites available to view grades, register for classes, and view advising information.

The participants in the study were members of an entry-level remedial math course. First, the experiment involved using the social networking platform in the classroom environment in a pilot study. The pilot study provided insight in developing the course curriculum around the social networking site for the treatment group and via face-to-face interaction for the control group. The pilot study also revealed the need for more training of the faculty and staff to enable them to incorporate their daily communication activities to students via course announcements, workshop information, etc.

The data sources used in collecting information for the study included electronic survey collection (via SurveyMonkey) of developed construct measures motivated by prior research in the areas of perceived sociability, formal peer interaction, informal peer interaction, and academic self-efficacy. Additional data was collected from the university’s operational data store (ODS) available only with permissible access and IRB exempt approval. The data included student success (measured by earning credit for the course) and retention (measured by enrollment the following semester). Treatment and control groups were formed from sections of the math course based upon student self-selection of available courses. The students were unaware of which sections would include social networking versus face-to-face study skills information. The intervention utilized a social networking platform developed by the researcher and owned and sanctioned by the community college.
The method of analyses included correlations, regressions, and path analysis, to evaluate the data obtained from the treatment and control groups. The data revealed a number of statistically significant differences in the groups as described below:

- A significant correlation between perceived sociability of the networking interface and participants’ academic self-efficacy levels indicates a relationship between the perceptions of the sociability of the networking site and the perceptions of their confidence in succeeding in the course.
- In both treatment and control groups, formal peer interaction predicted academic self-efficacy levels.
- Results indicated that participants in the face-to-face environment had higher levels of formal peer interaction.
- The academic self-efficacy variable predicted the success of a student measured by earning credit for the course and measured by re-enrolling the following semester.
- A significant difference was noted in the way individuals rated the sociability of the site based upon the gender of the participants. Male participants had higher ratings in the measure of sociability than female participants.
- When measuring the two peer interaction variables--formal peer interaction and informal peer interaction--treatment and control groups showed no difference, suggesting the social networking platform did not have an impact on either of the variables.
• A path analysis discovered small, but significant, indirect effect of the social networking treatment on the likelihood to receive credit for Math 9, mediated through self-efficacy.

• The same analysis also provided evidence of small, but significant, indirect effect of the social networking treatment on the likelihood to re-enroll, mediated through self-efficacy and Math 9 credit.

The results of the study provide additional incentive to continue developing strong social networking platforms embedded in the curriculum design to increase levels of formal and informal peer interactions and increase academic self-efficacy. The increased level of self-efficacy will contribute to student success and retention.
CHAPTER 2. REVIEW OF THE LITERATURE

Addressing the Education Landscape

Over the last several decades two-year and four-year institutions have focused on the question of enrolling and graduating more students. Institutions of higher learning are now tasked with addressing the need for higher levels of persistence and retention. This research will specifically address the need of increasing the success of community college students. Community colleges have spent the last ten years increasing access and implementing policies to support equal opportunity. Having reached an all-time high in 2008 at 3.1 million 18-24 year-olds (Fry, 2009), community colleges across the nation continue to have strong enrollments well into the 2010 academic year. These enrollment numbers have called for increased student tracking and policy development, such as the implementation of the Integrated Postsecondary Data System (IPEDS). This system allows for tracking enrollment data, student graduation and transfer data to four-year institutions. The State of Hawaii follows the national trends and continues to see record-breaking enrollment numbers for the community college campuses.

As colleges work towards accommodating the large growth in student enrollments, colleges are now refocusing on issues related to large numbers of underprepared students entering the classroom. Initiatives across the nation such as Achieving the Dream (Hoffman & Vargas, 2010) and Complete College America (Lee & Rawls, 2010) are assisting states with research related to remediation redux, course redesign and wrap-around support services (Giegerich, 2008). The common goal of these initiatives is to help colleges increase the success of this underprepared student
population. Gaston Caperton, President of the College Board Advocacy and Policy Center (2010), notes that the United States once had the highest level of adults ages 25-34 with postsecondary credentials, but now the U.S. ranks number twelve. Research published by the Lumina Foundation for Education, *A Stronger Nation Through Higher Education* (Matthews, 2010) outlines the issue the United States will face as one of the few nations where the educated levels of young adults is less than their parents. This will present a challenge to the U.S. because 60% of U.S. jobs will require postsecondary education by 2018. For the first time in history, there is a clear relationship between higher education and economic forces.

Specifically focusing on the state of Hawaii, 2008 census data shows that 42 percent of the state’s working age adults (25-64 years old) hold a minimum of a two-year degree. Data compiled by Georgetown University Center on Education and the Workforce, in conjunction with the Lumina Foundation Research (2010), shows that Hawaii’s economy in 2018 will require 65% of jobholders to have at least a postsecondary education. This data alone requires educational professionals in Hawaii and across the nation to look at improving student success, not only of college ready students, but also of students requiring remediation.

Community colleges generally enroll a wider variety of students than four-year colleges. There are more minority students, first-generation college students, students with lower levels of high school academic achievements, and students from low-income families enrolled at community colleges than at four-year colleges (Bailey & Alfonso, 2005). Students tend to be older and often have part-time or full-time jobs. The typical
and majority of the learning environments of this particular community college are face-to-face, classroom-based. In many instances, students only interact with faculty unless required to interact with peers on classroom projects (see Appendices A and B).

Community colleges are completely redesigning the way they engage and service students. Similar to course redesign, institutions must closely evaluate the design of student support services, such as financial literacy information, career planning, academic advising, etc. It is apparent that most students do not participate in optional activities that could benefit them. As students view it, they “don’t do optional.” For example, if new student orientation is offered as an option, typically 20% of new students will participate. Ironically, these 20% of new students will fare well in their educational endeavors. It is the other 80% that will need the additional support services above and beyond the norm. Activities such as orientation are key to providing necessary information to students about college, policies, courses, and more. This has forced a much more intrusive delivery of information for new and continuing students. It is also forcing student services to be aggressive in their approaches to interacting with all students. Empirical research focusing on community colleges concludes that counseling, advising, and developmental (remedial) education are critical issues for community college students (Bailey & Alfonso, 2005).

*Design-based Research*

This research project falls under the new and emerging paradigm of design-based research (DBR). DBR brings together empirical educational research with innovations in teaching and learning, with the goal of understanding relationships and their impact on
theory, design and practice. The Design-Based Research Collective (2003) identifies five characteristics of DBR. First, learning theory and learning environments are integrated. Research is not conducted in a silo but between a partnership of researcher and practitioner. Second, the innovation and research work on a cycle very much like a continuous improvement cycle: completing a continuous cycle of analysis, redesign, and delivery. Third, the results gained are then used to be shared with other practitioners and the successful innovations are placed into other teaching environments. Fourth, the delivery of these innovations takes place in true teaching and learning environment and can produce outcomes of success or failure while contributing to the practical outcomes related to theory development and revision. As opposed to an experiment in a laboratory, the research is conducted in the real world-learning environment. Fifth, the delivery methods connect to the desired outcomes. The ultimate goal of this research project is to determine whether social networking embedded in remedial coursework will drive higher levels of student success. If this type of intervention in the learning environment has a positive impact on student success, then the intervention provides evidence that the underlying theory—which was based on critical variables identified through both prior theories and previous research—is informative and effective. Unsuccessful outcomes of intervention analysis will also contribute to theory and provide evidence for revisions to drive more effective learning.

Previous research by Amiel and Reeves (2008) utilized design-based research to evaluate technology in the educational setting as a process, as opposed to an artifact. “…two things must inform research in educational technology: first, an understanding of
technology and technique as processes rather than artifacts; second, a resolute concern for the values, and principles guiding educational technology research.” (p.31) Integrating technologies into the classroom leads to substantial changes in social organization, student-teach relationships, and a myriad of other factors that cannot be investigated successfully by predictive research. Researchers must make a commitment to conducting interventionist research in real-world contexts such as school, accepting the complexity of the setting.

The unique environment of design-based research brings together the researcher and practitioner (teacher), grounded in theory and formative evaluation with multiple data sets and methods (Orrill, Hannafin, & Glazer, 2003; Wang & Hannafin, 2005;). Wang and Hannafin (2005) describe the characteristics of design-based research as flexible with various approaches. The research is pragmatic. Through the iterative process, it provides valuable evaluation for conceptual understanding and practical dissemination. It is grounded in selected theory related to teaching and learning. “The theory-driven nature of design-based research is important in that its approaches are considered more a research paradigm than an evaluation method.” (p.9) The research is also grounded in the real-world environments, allowing the practitioners and researchers to interact with participants (students) in real time. The research is described as interactive, iterative and flexible. Complex relationships between the researcher and practitioner are key to the evaluation as an ongoing effort to revise, implement and reevaluate. The lessons learned affect the local environment when being conducted but may extend with greater external validity compared to laboratory research (Greeno, Collins, & Resnick, 1996; Wang &
Hannafin, 2005). The research is integrative and contextual by design, utilizing various analysis methods: surveys, longitudinal evaluations, comparative analysis, interviews and case studies (Wang & Hannafin, 2005).

As a purposeful and systemic approach, Wang and Hannafin (2005) propose nine guiding principles when defining and planning design-based research.

- **Principle one**: Support design with research from the outset
- **Principle two**: Set practical goals for theory development and develop an initial plan
- **Principle three**: Conduct research in representative real-world settings
- **Principle four**: Collaborate closely with participants
- **Principle five**: Implement research methods systematically and purposefully
- **Principle six**: Analyze data immediately, continuously, and retrospectively
- **Principle seven**: Refine designs continually
- **Principle eight**: Document contextual influences with design principles
- **Principle nine**: Validate the generalizability of the design

While the Design-Based Research Collective (2003) discussed above identifies five general characteristics of good DBR, Wang and Hannafin (2005) provide more concrete principles to assist in guiding researchers conducting DBR.
**Student Success**

A greater number of students drop out of two-year community colleges as opposed to four-year institutions. A number of factors can contribute to this drop-out rate. The composition of students at community colleges is mainly part-time students, which affects the students’ ability to become involved. These students tend to commute to campus and many have part-time or full-time off-campus jobs, leaving no additional time to meet with other students, make new friends, interact with faculty, etc.

Community college faculty include higher levels of part-time lecturers than four-year institutions. This impacts the faculty member’s ability to help acclimate the students to their new learning environment because they are acclimating themselves as well. There are other factors that put community colleges at a disadvantage in fast tracking student success. Astin (1984) described factors that increase student involvement and engagement: living in on-campus facilities, participating in honors programs, academic involvement, student-faculty interaction, athletic involvement and involvement in student government and on-campus part-time jobs. Unfortunately, these factors are more difficult to access or simply not available to community college students.

For decades there has been extensive research on student involvement (engagement) and its relationship to student success. Student involvement refers to the amount of physical and psychological energy that the student devotes to the academic experience (Astin, 1984). The definition of involvement shows the differences between the involved and uninvolved student. The involved student is one who is involved not only in course work but in campus activities and student organizations.
Astin’s (1984) work related to early student development identifies theories related to student learning. The subject-matter (content) theory states that student learning and development depend on delivering the right subject matter or content. Students will learn by attending lectures and reading assignments. The responsibility of learning is placed on the student playing a passive role, a major limitation to the theory. As an alternative, the resource theory of student learning is focused on the resources that college administrators and faculty provide to students. The resources include physical facilities (laboratories, libraries), human resources (faculty members, counselors, tutors), and fiscal resources (financial aid, research funds, support funds). As in the case of the subject-matter theory, the student continues to play a passive role in the resource theory of student learning. The students must take the responsibility to actively participate and utilize the resources being provided. In reality, resources tend to be focused on high-level faculty and research, not specifically allocated to student success. This creates a silo effect and not a comprehensive impact on student engagement and learning. The resource theory has changed over time, noted by Kuh (2009), with the focus on the way resources are assigned to create structures to allow for the highest levels of student engagement. Kuh coined the term “educational value-added” to describe the level of effort put forth by colleges to enhance engagement through the allocation of resources. A third theory, the individualized theory, allows for students to determine or customize their educational journey. This includes student choices in curriculum, student advising and independent studies. This is a difficult theory to put into practice because of the resource planning problem, and since it typically allows students to choose their services, it can be
very expensive. This theory also assumes students possess the necessary expertise to select the appropriate learning experiences for their needs.

To counter the limitations of the content theory and the resource theory, Astin’s (1984) theory of student involvement would emphasize active participation in the learning process by structuring the learning environment to encourage participation. He identifies environmental influences that can help colleges design learning environments that aid student success. Some of the environmental factors include: living on-campus, participating in extracurricular activities (honors programs, ROTC, social organizations), part-time on-campus jobs, athletic involvement, and faculty-student interaction. Psychological and behavior dimensions of time on task and quality of effort are highlighted. Perhaps the most important institutional resource is student time. In other words, focus less on what the educators do (content) and what resources the educators have, and focus more on what the student does. Although this construct sounds like motivation, Astin prefers using the term involvement because it is more susceptible to direct observation and measurement.

In more recent research, Pascarella and Terenzini (2005) identified student engagement as the amount of time and energy students commit to meeting their educational objectives and found that student engagement was positively linked to student success in undergraduate education. Similarly, Kuh (2009) defines engagement as the time and effort students devote to activities that are empirically linked to desired outcomes of college and what institutions do to induce student to participate in these activities.
The commonly cited reliability and validity measures of engagement come from the National Survey of Student Engagement (NSSE) and Community College Survey on Student Engagement (CCSSE). These surveys have identified five cluster areas of effective educational practices: 1) academic challenge; 2) active and collaborative learning; 3) student-faculty interaction; 4) supportive campus environments and; 5) enriching educational experiences.

Tinto (1993) emphasizes changing the character of the college to address the roots of student attrition as opposed to altering the student experience. He outlines six areas that educational institutions must address in order to be truly focused on increasing student success.

1 - Commitment on behalf of the college to increase student success, especially low-income and under-represented students.

2 – Expectations must be high, no one rises to meet low expectations.

3 – Support mechanisms must be in place to support and promote success in the academic arena, the social arenas and the financial arena.

4 – Feedback to guide student on their incoming status, ongoing academic studies and progress checks.

5 – Involvement within academic and social integration. The more integrated students are, the more likely they will succeed.

6 – Learning, as the most important factor, will ensure they are prepared to advance in their area of study.
Most importantly, related to this study is the involvement factor for community college students. Involvement must occur in the classroom since, for many students, the classroom is the only place they will become socially and academically integrated.

Many empirical studies have focused on building strong and more common faculty-student interactions. Some studies have focused on how to encourage these interactions (Kuh, 2009) while others have focused on what characteristics of particular faculty members encourage student-faculty interaction (Cox, McIntosh, Terenzini, Reason, & Quaye, 2010). The type of interaction that occurs in the non-classroom environment and has substantive focus provides more impact to the student (Cox et al., 2010; Kuhn & Hu, 2001). The quantity as well as the quality of these interactions is important. Cox, McIntosh, Terenzini, Reason, and Quaye (2010) performed a quantitative study to examine the types of interactions, both casual and substantive, that occur outside the classroom. Cox et al. (2010) define a substantive interaction is one characterized as having more focus and related to the student’s future career, intellectual or academic-related matters, as well as student’s personal (non-academic) matters. The casual interactions were measured by the frequency of exchange brief greetings, have casual conversations, and discuss non-academic topics of mutual interest (p.772). Their results indicated that on average, male faculty engaged in casual interaction more than female faculty counterparts. Caucasian faculty members also tended to interact in more casual interactions, and specifically those who choose to teach first-year courses. Full-time faculty members engage in more substantive interactions than do part-time faculty, and full-time faculty members not on a tenure track position also had higher levels of
substantive interactions with students. Overall, faculty members engage in casual interaction twice as often as substantive interaction.

In summary, the literature on student success is well-established and on-going. The addition of student involvement (engagement) as related to student success has been actively researched for the last three decades. The focus of this research study is to gain insight into the effect of having students use a social networking type of technology to support their learning and engagement through online interactions. We know through prior research done by the National Survey of Student Engagement (NSSE) 2012 that successful student outcomes are accomplished through increased student engagement in college. Knowing that engagement is an important key, the critical issue is determining how technologies effectively support students in their educational endeavors by encouraging these interactions online. If building these communication links can benefit students, then illustrating a successful model of social networking between students and college constituents (advisors, faculty, administrators and peers) will help other colleges build support networks and information sharing sites.

Constructivism and Technology linked to Education

The question of how we improve student learning is complicated by the changing learning styles of the net centric generation. The web enhances communication amongst students and faculty through a shared co-produced knowledge pool. This new area is characterized as “student centered, technologically- and socially- rich environment that promises breakthroughs across the educational spectrum” (Baird & Fisher, 2005). Learning as a social function now occurs as the focus shifts on how we learn, through
socially constructed activities, about the relative content through action or problem solving (Brown & Adler, 2008).

Many studies in this area have focused on the constructivist approach, which places responsibilities on the student to be actively engaged in their learning by constructing, testing, and revising their understanding. The students learn by sharing diverse experiences and participating in shared learning (Fisher & Baird, 2005). As opposed to the transfer of knowledge by transmission via a traditional lecture, constructivism is seen as paradigm shift where the learner is the active agent in the process of learning (Abbott & Ryan, 1999). The process of combining one’s experience and current knowledge with unfamiliar information results in this theory of learning (Richardson, 2003).

Earlier studies have shown that creating effective communities of learning, whether an informal study group or formal academic group, can be a strong indicator of student success (Light, 2001). Additionally, the involvement of mentors and other peer interactions has effects on student groups such as creating a ‘sense of belonging,’ leading to study progress (Meeuwisse, Severiens, & Born, 2010). Social interdependence theory (Johnson & Johnson, 1989, 1991) identifies how the goals defined by a group impacts how the group members interact, ultimately affecting their individual success. The synergy and engagement of being a member of a group provide the support needed for success at the individual level. Brown and Burdsal (2012) attempted to link students’ feelings of belonging to a sense of community to increased student success; however, they found that a student grade point average was not greatly dependent on their self-
evaluation of community membership. The collaborative sensemaking process, identified by Weick (1995), looks at a community creating a “group mind.” The technology allows members of a stated community to participate by interpretation of the events taking place within the organization.

All of these previous research outcomes point to the importance of social connections as part of the educational process. “Learning is best accomplished by engaging students in constructing knowledge by acquiring, generating, analyzing, manipulating, and structuring information” (Alavi, 1994). The question then becomes how to facilitate more productive social interaction, both face to face and in supplementary forms.

**Social Networking and Education**

Similar to the way social networking has changed the fields of marketing and public relations, education is also affected by the social media ecosystem (Hanna, Rohm, & Crittenden, 2011). Educational systems have observed the social networking phenomena and recognize the influence of peers’ opinions and views (Hanna et al., 2011). Yet, in an attempt to keep the professional boundaries clear, many faculty avoid using the very popular form of social networking to stay connected with students. Students often stay in contact with their social networking favorites from 40 minutes to an hour each day (Heiberger & Junco, 2011). These authors note that given the ubiquitous, cost-effective, engaging environment of social networking, there are few better ways to connect with students, not just on the physical campus but from a faculty member’s home.
Given the shift in technology and new ways of learning, the curriculum and the process of teaching must change and adapt. While previous educational practices were controlled by the instructor within a course, the boundaries of traditional learning are changing into ever growing systems of networks, for example, YouTube, search engines like Google, and other electronic course management tools. Active engagement that must occur for learning by the digital-centered student is not formal or informal, not structured or unstructured. It becomes a process of consecutiveness and collaboration that includes both ends of these dichotomies (Siemens, 2008). J. Thompson (2007) describes the unpredicted boom in the use of social networking sites, such as MySpace and Facebook, and its effect on incoming consumers of education using Web 2.0 technologies.

Studies that have evaluated some aspect of social networking include an evaluation of Twitter on college students’ engagement levels and grade outcomes. The microblogging activities embedded in class activities evaluated a treatment group in several course sections. The study found that students’ engagement levels were, in fact, higher in the treatment group--the sections utilizing Twitter--than the control group. The increased communication and openness of the network resulted in deeper interpersonal connections around academic and co-curricular activities (Junco et al., 2010).

Both students and parents have become accustomed to seeking out information about universities or colleges via the internet. Social networking sites have proliferated into numbers of peoples’ lives. Facebook has become a norm for incoming college students. A 2007 report conducted by Higher Education Research Institute (HERI) notes that 94% of entering freshman utilize social networking platforms, and Ellison,
Steinfield, and Lampe (2007) note that college students have on average between 150-200 friends on the Facebook platform. This allows for students to bond, share information and maintain social capital. Salaway, Caruso, and Nelson (2008) reports more than half of these students use their social networking platform to communicate with classmates about school and their college experience.

Perceptions and use of social networking sites between groups of students and faculty differ greatly. Roblyer, McDaniel, Webb, Herman, and Witty (2010) found through surveying members of a college community that students are more open to incorporating Facebook into their classroom learning, where faculty tend to be “laggards” and are more in support of utilizing “traditional” technologies, such as email. The focus of their study was to determine the uses and perceptions of Facebook as a potential classroom support tool. In this particular population, 95% of students had Facebook accounts and used them to keep in touch with existing contracts versus 73% of faculty. The population also differed in the frequency of use of the social networking platforms. As expected, student use of the communication tools was reported at higher levels. Gray, Annabell, and Kennedy (2010) noted that case studies indicated that educators had little support to make pedagogical changes to include the social networking innovations into teaching and learning. These authors note that technologies like Facebook can transform students from passive and disengaged to active and participatory learners, but evidence gained from the study was not supportive of the anticipated result.

Pempek, Yemolayeva, and Calvert (2009) found that even though interactions among students are taking place, “lurking,” outpaces the time spent communicating one
to one or one to many. Lurking is described as time observing others’ actions, reading feed, and watching what friends are doing. Skues, Williams, and Wise (2012) stated that students with more “open” personalities are more likely to connect via Facebook, and “lonely students” use their Facebook time to compensate for lack of face-to-face communication and relationships.

In order to change and adapt the educational environment, educators will have to experiment with new business models, look at hybrid approaches and embrace the qualities and expectations of the new learner. Students’ utilization of social networking technologies are primarily to remain in contact with existing contacts versus creating new ones (Bosch, 2009; Ellison, Steinfield, & Lampe, 2007; Hew, 2011). Understanding the motivations of students can help educators better organize the use of social networking technologies to build connectivity and collaboration. College students, as developing older adolescents, have the common characteristics of forming their own identities and creating relationships with others and peer groups (Pempek, Yemolayeva, & Calvert, 2009), all of which can be further supported online.

Lampe et al. (2011) used Facebook as a platform to determine students’ predictors for using social networking technologies to organize course behaviors, such as collaborating, discussing, arranging study group appointments or asking questions. The study used Facebook as a platform not sanctioned by the university but an informal Facebook group’s page. The purpose of the social networking platform use was to provide an environment for social interaction among students. The researchers hoped to determine if social and psychological factors were predictors to using Facebook. The
findings revealed that students with high levels of self-esteem were less likely to collaborate negatively but not more likely to collaborate positively. The positive collaboration scale queried information on arranging group projects or discussing items related to the class or school work. The negative collaboration scale queried information such as “collaborate on an assignment in a way the instructor would not like.” Also, using the site to learn more about others or connect with strangers was predictive of both positive and negative collaboration.

The use of social networking technologies is not only being used to increase connectiveness in the classroom but also to increase connections among incoming college students. The goal is to increase their feelings of connectedness to the college, thereby increasing their perceptions of preparedness and efficacy regarding their future success at college (DeAndrea, Ellison, LaRose, Steinfield, & Fiore, 2012). It is not surprising that other researchers have identified social connectedness as a key to persistence and retention (Allen, Robbins, Casillas, & Oh, 2008; Robbins, Allen, Casillas, Peterson, & Lee, 2006).

Research finds that students whose experiences integrate them into both the social and intellectual life of the institution are more likely to be successful (Tinto, 1993). Yet community college students are generally lacking social integration experiences because of the limited time they spend on campus. Instead, the students have a relatively isolated, only academic experience.
Theory Development - Constructs

For the purposes of this study, the research questions position three constructs as key to predicting student success: perceived sociability of the networking platform (used to measure how social they perceive the site to be), formal and informal peer interaction, and the students’ academic self-efficacy. Each of the constructs is discussed below.

Construct: Perceived Sociability

In a chapter entitled Online Communities: Focusing on Sociability and Usability, Preece and Maloney-Krichmar (2003) state that the key components of sociability are the community’s purpose, its people and the policies that help guide online behavior. The community’s purpose is interaction in an educational dimension, its people are the students, and the policies are the learning activities and socialization that the students carry out. Development of sociability in student networking communities such as an academic course is critical to the success of the community.

Research studies in asynchronous delivery systems have focused on building a social environment when face to face interaction is absent. Computer-supported collaborative learning (CSCL) environments can support communication and collaboration among students leading to greater student success. CSCL environments can range from functional to sociable environments. The functional sites deal mainly with the task-specific information such as retrieving materials needed for a course assignment. Creating a site that is inclusive of the social aspects of learning is important in building a collaborative environment for distance learning (Kreijns, Kirschner, & Jochems, 2003; Kreijns, Kirschner, Jochems, & van Buuren, 2004). Previous research has identified
sociable CSCL environments as those “able to facilitate the emergence of a sound social space with attributes as trust and belonging, a strong sense of community, and good working relationships” (Kreijns, Kirschner, Jochems, & van Burren, 2007). Without the social aspect included in the learning process, the necessary social interaction to support student engagement and eventual student success will be absent.

The results of recent studies continue to stress the need to create not only a task related functional environment but also a non-task related social environment (Kreijns et al., 2007). Self-reported survey findings of Abedin, Daneshgar, and D’Ambra (2011) indicate that as students learned how the CSCL system worked, they were more positive about their communication behavior in the environment. As students adapted to the context of the environment, the level of the use of technology improved and the perception of the social environment improved. The designers and developers of social software must be especially concerned about the sociability of the website to support casual social interactions, but also collaborative learning (Gao, Dai, Fan, & Kang, 2010). A collaborative environment is one where the learning is an active process and the students take responsibility for that learning. The teaching and learning are based upon shared experience amongst the students and faculty and the development of social and team skills (Kirschner, 2001).

Gao, Dai, Fan, and Kang (2010) studied the factors affecting perceived sociability. Their research indicated sociability of social software is influenced by various factors. These include the social climate, the social-contextual factor that can affect the way relationships are made, benefit and purpose, people, interaction richness,
self-presentation and support for formal interaction. These factors can be used to predict users’ attitudes and intention to use a specific social software.

Kreijns, Kirschner, and Jochems (2003) identified two major pitfalls with attempts to create a socially interactive environment using computer-supported collaborative learning environments. The two major pitfalls are 1) assuming that social interaction will occur because the technologies create an environment to foster that interaction and; 2) the tendency to focus social interaction on educational interventions, or task based work. The goal in a collaborative environment is to create teams of students, both formal and informal, that will work together to create shared knowledge and skill building. It is essential to ensure that the social interactions are valued and recognized in the task based work, group assignments, homework, etc. Sometimes the need to build the socialization with non-task based activities is the critical factor. The dominant factor in building a collaborative group is the social interaction that must be present. The conceptual approach proposed by Kreijins et al. (2003) takes into account the following conditions for enforcing a collaborative environment. It is important to note these are in many ways dependent upon each other.

- Positive interdependence: team members are linked to each other in such a way that each team member cannot succeed unless the others succeed and/or that each member’s work benefits the others (and vice versa).
- Promotive interaction: individuals encourage and help each other in order to reach a group’s goal.
• Individual accountability: all group members are held accountable for doing their share of the work and for mastery of all of the material to be learned.

• Interpersonal and small-group skills: specific skills are needed when learners are learning within a group; students who have not been taught how to work effectively with others cannot be expected to do so until those skills are developed.

• Group processing: the group determines which behaviors should continue or change or maximizing success based upon reflection of how the group has performed so far. (Sharan & Sharan, 1992)

Kreijns, Kirschner, Jochems, and van Buuren (2007) validated a self-reported 10-item one-dimensional Sociability Scale. The scale’s purpose is to determine the perceived degree of the sociability of a particular computer-supported collaborative learning environment. The development of the scale pulls from several theoretical frameworks including: the ecological approach, concept of sociability, and social presence theory. Authors define sociability as the extent to which a CSCL environment is perceived to be able to facilitate the emergence of a sound social space.

This study will focus on discovering the mediating effects of students’ participation in online activities aimed at building student success in academic courses. The students will be asked to participate with others in sharing experiences to build non-task sociability along with task specific problem-solving and group processing. The Kreijns et al. (2007) sociability scale is important because it determines how the student
perceives the site to foster a social environment. The scale used in this study was previously validated with a 0.92 Cronbach’s alpha, indicating a high internal consistency. With the feedback gained through the surveys, the site can be altered to improve its sociability. As previously noted in the student success section, having the ability to foster the needed sense of belonging and sociability is key to helping students succeed. Abedin et al. (2011) recognize the importance of the social environment and the impact it has on student learning and continued success.

Construct: Formal and Informal Peer Interaction

Students who collaborate on academic projects and assignments often begin to form social bonds. These social bonds allow students to learn from one another and transfer skills and abilities to benefit each other. As students learn from one another, they become more motivated and form a sense of accountability to the group partners. Web courses that require students and faculty to exchange ideas and perspectives are, in essence, creating a level of social exchange (Fisher & Baird, 2005).

Tinto’s (1993) model on student retention distinguishes between two specific systems within the educational institution: the academic system and social system. Broken down within the social system are the formal and informal forms of social integration with peers, faculty and other administrators. Student retention increases when there is a higher degree of social and academic integration. Tinto’s (1975) original model of student retention serves as a foundation that other researchers have tested as academic integration and social integration. As a precursor of retention and success there must be some level of academic social interaction (Tinto, 1993). Differences have
surfaced in the measures used for both constructs varying from academic integration as an experience and performance measure (Beekhoven, De Jong, & Van Hout, 2002; Cabrera, Castanada, Nora, & Hengstler, 1992) to students’ estimations and perceptions (Berger & Milem, 1999; Meeuwisse et al., 2010).

Some academic debate has taken place around the definition of social and academic interaction. Beekhoven et al. (2002), similar to Tinto’s definition, include any type of faculty interaction as part of the academic integration, as opposed to social integration. Other researchers (Pascarella, & Terenzini, 1983) identify different types of faculty-student interaction as partially social and partially academic, taking into account instances of faculty providing advice not specifically limited to education. In addition to these differences, there are also differences in the way academic and social integration have been measured. Academic integration in some cases is measured by student perceptions of their academic development and interactions with faculty (Berger & Milem, 1999) and in other studies measured by experiences and performance (Cabrera et al., 1992). These studies have largely focused on determining the differences in majority and minority students’ performance and their overall sense of belonging (Meeuwisse et al., 2010).

Alexander Astin (1984) defined a developmental theory that outlines student engagement as a key predictor of student success. The engagement levels in this case are based upon effort put forth by the student. Kuh (2009) later defined engagement as two types: activities that take place in the classroom with faculty and other peers, as well as
engagement outside of the classroom via extracurricular activities. Each of these interactions or activities can be further enhanced by the use of technology.

On a two-year commuter campus, students typically attend classes but have limited experiences with their peers and interactions with faculty. Tinto, Russo, and Kael (1994) found that involvement in the classroom becomes a vehicle for further involvement outside of the classroom. By reorganizing classroom requirements to promote shared, collaborative learning experiences, students can academically share knowledge and, more importantly, socially share knowledge of one another as peers. This can promote engagement and lead to supportive peer groups (Tinto, 1998; Zhao & Kuh, 2004). This finding will be implemented by combining the academic and social systems in the social networking environment in this study.

Closely tied to the notion of academic and social integration is the overall sense of belonging and learning environment for students of individual campuses. Meeuwisse et al. (2010) identified four antecedents addressing interaction that positively affected sense of belonging as an important factor of majority students’ intentions to continue their academic endeavor, but not for minority students. Severiens and Wolf (2008) also research the same data set but tested the formal and informal social interactions in relation to impact on credits earned, grades and deep approaches to learning. Their results indicated the total majority population of students showed a positive relationship between formal social interaction and credits earned. The various previous studies conceptually should be able to identify distinctions between the two integrations
(academic and social); however, since they are so closely interrelated, consistent results have not been achieved (Beekhoven et al., 2002).

Havnes (2008) argues there is a large effort of learning that occurs outside of the classroom and dyadic structure as “peer learners.” Students here are defined as “agents of learning” (Havnes, 2008) or “social agents and form identities as learners, professionals and more widely, as member of society” (Checkering, 1969). Under this view the impact of collaborative learning, cooperative learning, and peer tutoring are all multifaceted methods of driving stronger levels of learning on the part of the student. Peer learning can be spurred by the instructional interaction but takes on its own form as students organize space for dialogue, collaboration and form support mechanisms (Havnes, 2008).

More focused research has occurred using computer-mediated communication technologies as antecedents to self-reported peer interaction. LaPointe and Gunawardena (2004) identified five constructs: 1) learner characteristics, 2) perceived teaching style, 3) task design, 4) course requirements and 5) prior CMC experiences as influencers of self-reported peer interaction which in turn influences self-reported learning outcomes as a second dependent variable. The statistical analysis of structural equation modeling showed a strong and statistically significant relationship between self-reported peer interaction on self-reported learning outcomes. The researchers concluded that as self-reported peer interactions increase, so do self-reported learning outcomes.

For the purposes of this research proposal, the model will address only the formal and informal peer interaction measures (previously called formal and informal social
interaction by Severiens and Wolff, 2008) as precursor for student achievement. The justification relies on the assumption that students will interact and share information as a collective pool, allowing the interaction and conversation to drive the retention of knowledge (Tinto, 1993). The developed social networking platform will provide the student with predominately peer generated content. The results by Meeuwisse et al. (2010) provided evidence that these antecedents, in addition to formal teacher interaction and informal teacher interaction, did show a positive relationship to sense of belonging for the total majority of participants, but not for the ethnic minority they were proposing in their research. Taking from the research conducted by Meeuwisse et al. (2010), this study investigated the constructs of formal and informal peer interaction as antecedents of self-efficacy.

**Construct: Self-Efficacy**

Bandura’s (1977, 1982, 1986) social cognitive learning theory describes self-efficacy as “individuals’ confidence in their ability to control their thoughts, feelings, and actions, and therefore influence an outcome.” Bandura (1977) describes the continuous self-appraisal process on a daily basis for individuals making decisions about future actions, especially in taxing situations. The information that is acquired by individuals and assessed comes from four main areas: actual experiences, vicarious experience, verbal persuasion and emotional arousal. Performance accomplishments, as actual experiences, are cited as the most influential. Vicarious experiences result from individuals observing others in the same situation(s). Seeing peers’ success or failure will impact one’s self perception of their own abilities. Emotional arousal or someone’s
physiological state will impact future actions as well. The feeling of high arousal can create tense emotions and an agitated environment.

The judgments of self-efficacy can be directly applied to the research in this proposal. Students will make daily determination of how much effort they will exert to meet specific activities, for example, course assignments. The impact of peer interaction and technology will introduce the vicarious affects. Seeing peers succeed should impact a student’s perception of their own ability to succeed. As technology provides more information to students, the tension and uncertainty experienced as an emotional arousal should diminish.

Related research focused on self-efficacy has found self-efficacy to impact career choices in vocational fields and behaviors related to academic performance (Betz & Hackett, 1981, 1983). Self-efficacy expectations have also been used as a precursor to measure student success and persistence of students planning to enter careers in science and engineering (Lent, Bown, & Larkin, 1984, 1986). A meta-analysis of early research on self-efficacy provides evidence that self-efficacy beliefs relate to important performance and persistence variables in academic environments (Multon, Brown, & Lent, 1991). Miltiadou and Savenye (2003) identified motivational constructs tested in traditional courses and applied those constructs to online course environments to drive higher levels of student success in online environments.

Betz and Hackett (1981) investigated self-efficacy theory in relation to the career choices made by women. In their study, the researchers identified the following: 1) self-efficacy expectations as the belief that the individual can complete a task; 2) the level of
self-efficacy expectations as the degree of difficulty to complete the task; and 3) the strength of self-efficacy expectations as the person’s confidence in their capability of completing the task. The survey collected information on two career related self-efficacy measures. The first assessing self-efficacy in the person’s ability to complete educational requirements for the particular career and the second as the self-efficacy that the person could complete the job duties of that particular career. This research identified sex differences in self-efficacy, specifically lower self-efficacy in women, in regards to traditional and non-tradition occupations.

Building on the previous research, Lent et al. (1984, 1986) investigated the relationship between individual’s self-efficacy beliefs and academic success and persistence, specifically among college students exploring majors to enter science and engineering career paths during a career explorations course. The results indicated that students with higher strength and higher level self-efficacy ratings performed better academically and persisted longer. The persistence was measured one year after taking the career class. Further research by the authors identified an additional measure of self-efficacy in regards to their ability to accomplish a critical step in their academic success path, such as completing the math requirements for an engineering field.

Schunk (1981) worked with children deficient in math through an experimental form of research to determine the effects of the intervention on self-efficacy, persistence and accuracy. In his experiment he identified a number of personal and situational factors that affect an individual’s perceptions. This further illustrates the supported
hypotheses of self-efficacy beliefs which impact motivation, performance, and persistence.

As computer-mediated communication continues to build online resources for students, assessments for the impact and success of the online resources and student perceptions must be developed. Compeau and Higgins (1995) developed a computer self-efficacy measure that assesses the importance of online technologies in the environment of online education. In this case, the authors expected higher self-efficacy levels about the online technology could increase peer and instructor interaction. This outcome would lead to decreased attrition rates. This research discussed the importance of the relevant dimensions of self-efficacy judgments. Magnitude, strength and generalizability are the three distinct but interrelated dimensions that pertain to self-efficacy judgments. Magnitude refers to the level of task difficulty one perceives, strength refers to the confidence or conviction one holds to complete the task and generalizability refers to the perception that one can complete a task within a certain environment or under certain conditions.

Researchers have noted that specific self-efficacy measures have been more effective in predicting performance on a desired task than general self-efficacy measures (DeTure, 2004; Joo, Bond, & Choi, 2000). Previous research notes that institutions of higher learning can help build students’ self-efficacy levels in an effort to increase their success (Brown & Burdsal, 2012). Given the importance of prior research outlining self-efficacy as a strong predictor of various outcomes (Multon et al., 1991) such as academic
performance and course satisfaction, this research proposal will utilize self-efficacy as one of the constructs.
CHAPTER 3. CONCEPTUAL MODEL AND RESEARCH METHOD

The purpose of this study is to determine whether there is a causal connection between students participating in online social networking requirements and students’ success in course completion and retention. It is proposed that through the use of social networking sites, perceived to be social, students will be more likely to share information and interact with peers leading to stronger feelings of self-efficacy. If students have more confidence in their ability to complete a course, student success and retention rates will increase. Key to this approach are the mediating effects of web 2.0 technologies, specifically social networking.

Conceptual Model

Based upon the literature review, the constructs of perceived sociability, peer interaction (separated into formal and informal peer interaction), and self-efficacy are elements that are reported in prior research to impact student success related to online and face to face learning. This research study’s purpose was to determine the impact of perceived sociability, formal and informal peer interaction, and self-efficacy on success and retention. The relationships in the conceptual model are shown in Figure 3.1.
This research proposal will focus on answering the following four research questions (RQ).

**Research Question One**

RQ1: Can we effectively support student success and retention by using social networking technologies focused on increasing student engagement through formal and informal peer interaction?

This research question can be broken down further to more specific questions referred to as sub-questions. For the purpose of this research, social networking is
defined as the interactions that occur between students, faculty, and staff on a defined platform developed by the researcher and owned by the college (HCConnect).

- RQ1a: Does formal peer interaction between students increase with the use of social networking environments?
- RQ1b: Does informal peer interaction between students increase with the use of social networking environments?
- RQ1c: Is formal peer interaction associated with informal peer interaction among students?
- RQ1d: When do students perceive the social networking environments to be most beneficial (i.e., orientation, first-year, second-year, individual course level)?

*Research Question Two*

The second set of research questions focuses on the causal relationships between the perceived sociability of HCConnect and the students’ level of confidence that they can succeed in the course.

RQ2: Is perceived sociability of social networking environments associated with stronger levels of students’ academic self-efficacy (the degree to which students feel they can succeed in a course) leading to course completion and retention?

This research question can also be broken down to more specific questions referred to as sub-questions.
• RQ2a: Is increased perceived sociability of social networking environments associated with increased levels of students’ academic self-efficacy?

• RQ2b: Which students are more impacted by the perceived sociability of social networking environments (i.e. freshman, transfer student, first-generation)?

Research Question Three

The third set of research questions focuses on the impact of utilizing social networking technologies to increase self-efficacy. For the purpose of this research, self-efficacy is defined as an individual’s confidence in his ability to be academically successful (complete a course). This proposed causal relationship is mediated through peer interaction, both formal and informal.

RQ3: Will the required participation in online social networking technologies increase students’ academic self-efficacy?

This research question can also be broken down to answer more specific questions referred to as sub-questions.

• RQ3a: Among students in social networking environments, does formal peer interaction between students lead to an increase in students’ self-efficacy levels?

• RQ3b: Among students in social networking environments, does informal peer interaction between students lead to an increase in students’ self-efficacy?
• RQ3c: Which factor will play the largest role in increasing academic self-efficacy (i.e. formal peer interaction, informal peer interaction or perceived sociability of the networking site)?

• RQ3d: Which students are more impacted by academic self-efficacy through social networking participation (i.e. high-risk, low level gpa, first-generation)?

Research Question Four

The final research question will focus on the impact caused by the participation in social networking activities. The goal of the research is to determine which mediating factors support higher levels of student success and retention when social networking is used in the academic environment.

RQ4: Do increased levels of self-efficacy via the social networking activities increase student success in a given course leading to retention into the next semester?

Overview of the Design-Based Research Study

This research study used a design-based research method to help understand how, when, and why educational innovations work in practice (The Design-Based Research Collective, 2003). Typically, in a laboratory-based experimental design, an attempt is made to isolate and manipulate several variables in an effort to be able to predict an outcome and generalize the results of the study. In this design-based research project, the contexts of practice (in this case, the use of social networking in this particular setting) will influence the complexity of the outcomes (success and retention). If the intervention
is associated with learning (success), it will be specific to the setting (context), and difficult to generalize to other settings. A critical step in the design-based research method is that it is an iterative process—one in which continuous cycles of design, enactment, analysis, and redesign occur. After the semester ends, the researcher and involved faculty members will work together to refine and redesign the key components of the social networking environment to improve and extend the desired outcomes.

Over the course of the semester, there may be hundreds or thousands of interactions between technology, teachers, and students in this setting. The process will support student to student or student to teacher interactions mediated by technology (Barab, 2004). Hopefully, these interactions promote student engagement which, in turn, will lead to success and retention.

This research study utilized a number of important evaluation techniques. The researcher began by holding several focus group meetings to determine the types of technologies students are utilizing. This set the initial framework for establishing the social networking platform, later named HCConnect. A web programmer was hired with the purpose of developing the online social networking site. This process included work across campus constituents to determine the organization of the site. Once the site was launched, the student body government organization was used to help provide input and guidance on the organization of the site. The feedback received was taken into account and changes were made based upon their analysis of the site. A series of training sessions then took place to assist faculty and staff on uploading and designing their
profiles and exploring the ways faculty and staff could communicate and stay in touch with students.

**Focus Groups**

The social networking site was created to allow for social networking amongst students, faculty and staff and is focused on identifying pathways for students leading to degree completion and job placement. Prior to the creation of the social networking platform, focus groups were conducted to determine the type of technologies students were using. During the month of August 2011, two focus groups with a total of 32 participants were held. The first group was made up of students enrolled in a second-year level science course. The second group was comprised of members of campus student government. The purpose of the focus groups was to determine the types of technologies students are using, which resources they have found helpful, and which resources they would have liked to have available. A complete list of the focus group questions and summaries of the answers by group are listed in Appendices A and B.

Both groups identified their smartphones as the most valued technology tool they rely on each day. Their smartphones are their primary communication and information search device. They rely on texting as the single most popular form of communication between friends and family but also indicated that they would like to have the college communicate with them via text on a more regular basis. They also wanted to have other college/university services available via mobile application. Specifically, students would like to view grades in real-time throughout the semester, view the STAR student advising system and the registration systems online as mobile applications.
The students belonging to the student government group mainly work for the Student Life and Development office and have the responsibility for informing and guiding new students through certain processes (financial aid, registration, etc.) and support services (tutoring, mentoring activities, etc.). They noted the importance of using the new technologies of QR codes but also having them link to mobile access links to access information faster.

The students belonging to the second-year science course group largely were enrolled as home-based students from other UH community college campuses on Oahu. Their feedback gave insight into the importance of having technology-enabled factors that are important to their decision making when registered across many campuses. For instance, students taking courses across the system felt that having access to registration linking the final exam times of these classes was key in their decision to choose course sections for the semester.

Prior to the pilot testing of this research, it was important to understand the extent to which students engage with their classmates via a specific technology or in a face to face environment. These focus groups revealed that students do not tend to communicate with other students unless forced to do so for a group or class project or only after seeing each other several times in different courses. Then they will actually engage with one another. This is the link that other current research is focused on in hopes of improving student success.
The research took place in a community college environment. This college has been the subject of previous research that is conducted every two years through the University of Texas at Austin titled the Community College Survey of Student Engagement (CCSSE). The previous research has identified areas of student engagement that are lacking for the students on this campus. The CCSSE research is focused on driving institutional improvements leading to strong levels of student engagement, defined as “the amount of time and energy students invest in meaningful educational practices” (CCSSE, 2010). The CCSSE results provide the campus with an assessment of their performance, or perceptions of their students’ experiences measured by five major benchmarks. These include: 1) active and collaborative learning, 2) student effort, 3) academic challenge, 4) student-faculty interaction and, 5) support for learners. Over the last four years, this campus has struggled in improving the performance of these benchmarks, specifically in the area of active and collaborative learning. A number of the specific attributes that make up the active and collaborative learning benchmark measure could be impacted through the use of technology such as a social networking technology.

Being primarily a commuter campus, there is little gathering space for students. Typically students attend their courses for the day and leave campus. It is evident through the years of CCSSE research that students who are more engaged in their campus and campus life are likely to persist and complete their college work. The larger problem of getting enrolled students to complete their courses and persist to the following
semester could be solved by encouraging and fostering an environment focused on the students’ needs.

The social networking site was created to allow for social networking amongst students, faculty and staff and is focused on identifying pathways for students leading to degree completion and job placement. The information gained through the focus groups helped direct the design and implementation of the social networking site. The networking site incorporated the information needs of the students as well as incorporating familiar technology in order to more fully engage the students. The social networking site is the key mediating factor in this research.

The college developed the site through the use of the Ning platform. Ning is a commonly used platform for creating social networking websites for educational institutions, businesses and nonprofit organizations. The platform allows for community building and communication through user generated content. Similar to the features available on Facebook, the Ning site was organized to allow for collaboration via student posting of student-generated content and student-student and student-faculty communication. Other features, noted by Gray et al. (2010), include the ability to customize one’s profile, friends and electronic resources. One theme that emerged through the focus groups was the need for resources to be available via mobile technologies. For that reason, we designed the website, HCConnect, to be available via a mobile application.
The college created the HCConnect site and went live with student feedback in January 2012. It was designed by a website designer who worked closely with the faculty and students in developing features that would be most beneficial to the users. Once initially designed, the students of the student body government and student club leadership were tasked with evaluating the site. They provided feedback and suggestions about the content to be added, deleted or modified. The student driven feedback was incorporated into the finalized website. Keeping in line with the social media ecosystem concept, the designer used established strategies to design the website’s sphere of influence: 1) visualize the ecosystem as a whole; 2) identify and track key performance indicators, 3) tell your story by connecting with the user; and 4) be unique (Hanna et al., 2011).

After the launch of the site, the college held five training sessions for faculty and staff who would be utilizing the program. The training sessions were well attended and gave an opportunity for each member to get hands on help. One of the noted difficulties
with this project was persuading the staff who manage certain offices to update their sites on an ongoing basis. Additional discussion of this difficulty is contained in the final sections of this document.

Participants of the Study

The students participating in the embedded social networking technology as part of their course requirements were enrolled in Math 9, a developmental math course. The course is required for all students testing two-levels below college level math (Math 100). The course enrolls students of various backgrounds, work experiences, and ethnicities. Many of the students are first generation students—not having parents who attended college— and have a greater need for peer and faculty support. Thus, it is critical that students can relate and provide support to one another. The Math 9 course is a five-credit course that focuses on four credits of math work and one credit of study skills. Five sections of Math 9 were offered during the spring 2012 semester and five sections during the fall 2012 semester. For each of the semesters the sections were divided in order to create a control and treatment group utilizing the social networking platform. The use of the social networking technology was the design-based innovation deployed in each treatment group. Those students in sections identified as the control group were assigned their study skills course work in class and the content was delivered by a counselor. For the students enrolled in the treatment group, their study skills assignments were posted on HCConnect and they were required to post assignments under their profiles. The study skill assignments were assigned each Monday between weeks 2 and 12 of the course. A list of the specific assignments is available in Appendix D.
Instrument and Measures

Based upon the literature review, the constructs of (1) perceived sociability, (2) formal peer interaction, (3) informal peer interaction, and (4) self-efficacy are elements that are reported to impact student success in both online and face to face learning.

Using previously tested measures of the constructs referenced in the related literature (as seen in Appendix C), a survey instrument was created to collect data representing the constructs. The survey instrument was used to measure the students’ perceptions of the site’s perceived sociability, their perceptions of the formal and informal peer interactions and the student’s self-efficacy level. The survey was administered in Spring 2012, Summer 2012, and Fall 2012.

The dependent variables of student success and student retention were collected through the student information system. As described in the pilot study, the surveys distributed to the students were identifiable by university user names and their individual email addresses. This data was important to collect as it allowed us to collect student ID numbers. With the student ID number the researcher collected demographic data linking back to the student, which included ethnicity, financial aid status, gender and other demographic data.

Using the student ID numbers, data indicating the success or failure of Math 9 was collected at the end of the semester. The course carries a credit / no credit grading structure in which students who earned a 70% received credit for the course. The researcher then collected the same data the following semester after the drop/add period to measure retention. The retention variable is defined as a success if the student
reenrolled at the community college the following semester and remained enrolled at the
census date (fall 2012 semester for the spring 2012 pilot study and spring 2013 for the
fall 2012 research study).

Appendices E shows the actual survey as seen by the students using
SurveyMonkey. The sociability scale, the formal and informal peer interaction scales
were based upon previous research and used a 1-5 point Likert scale to collect the
responses of the students. The sociability scale was a 10-item scale (Kreijns et al., 2007),
the formal peer interaction was a 8-item scale and the informal peer interaction was a 5-
item scale (Meeuwisse et al., 2010).

Participants and Intervention

In order to measure the impact on students involved in the social networking
technologies, a treatment group and control group were identified within the Math 9
course offerings. The location for the research was a commuter community college
campus with an enrollment of approximately 4,200 students. The college enrolls
approximately 350 students each semester in remedial math. This specific math course
has an established study skills curriculum embedded into the course requirements.
Through work with the math faculty, a specific list of study skills, career readiness and
campus engagement activities were reviewed and revised as requirements for the study
skills portion of the course. These types included study skills activities, investigation of
campus support systems and career exploration activities as part of the required
coursework. These investigations or information gathering on the students’ part was
shared with their fellow students.
Half of the students enrolled in these math courses were identified as the treatment group. The selection of students in the treatment group versus the control group was based on specific sections of the math course. For instance, there were four sections used for the study (four different CRNs) with a maximum enrollment of 100 students per section. Two of the four sections were used as the treatment group and the other two sections as the control group. The students’ registration in these four sections was based upon their preference of time. Only one instructor was listed as the official instructor of record. The design and delivery of the curriculum for the course is consistent and commonly agreed upon by the math faculty. The four course times were 8:30am, 10:00am, 11:30am and 1:00pm. The four sections were managed by three full-time faculty and three senior lecturers.

The purpose of the Math 9 course is to prepare students with foundational mathematical skills. The skills taught in Math 9 are remedial in nature and were taught in primary and secondary school settings. Students entering at this level are defined as needing math remediation. Topic areas covered in Math 9 are prime and composite numbers, factorization, manipulation and problems solving with fractions, evaluating basic algebraic expressions and equations, and the use of percentages and ratios. The two primary methods of evaluating student progress in Math 9 are paper and pencil based work and the use of ALEKS software as an artificial intelligence learning system. The college implemented the use of ALEKS, Assessment and LEarning in Knowledge Spaces (http://www.aleks.com), as a teaching tool integrated into Math 9 in 2009. The system is unique as it uses adaptive questioning to assess a student’s math skills. The system then
customizes problem-solving lessons based on knowledge areas and periodically reassesses to ensure the topics are mastered and retained. The artificial intelligence engine is a successful teaching tool because it customizes a learning program for students and continuously evaluates their learning and retention of the knowledge.

The intervention of using the social networking platform, HCConnect, is designed to give students access to information and interaction that is not available in the face-to-face environment. One counselor was assigned to all sections of Math 9 to deliver the study skills portions of the course. This counselor was experienced in delivering the study skills lessons in a variety of environments. The assignments were designed to allow for students to conduct their own information seeking, as well as sharing of information among peers.

The organization of HCConnect allows for individual pages to be established, much like Facebook. It also includes the ability for users to organize their own groups, discussion forums and blogs. Math 9 groups within the social networking interface were established to house the assignments as they were submitted by students. Other media can be incorporated to include the posting of music and videos. The site was developed and managed as a Ning platform which is similar to other platforms used in social networking interfaces.

Participants’ Background

The final data set consisted of 287 students who were enrolled in spring (N = 115), summer (N = 9), and fall (N = 163). Due to the structure of the data collection over three time periods, they were combined for analysis. Of those students, 111 (38.7%) did
not receive credit for Math9 and 176 (61.3%) received credit. In terms of re-enrollment (or retention), 72 (25.1%) did not enroll and 215 (74.9%) re-enrolled the next semester. There were 113 females and 171 males in the study (3 individuals declined to state their gender). A chi-square test for possible differences in composition suggested that there was no difference in gender composition by treatment group ($p > .05$). Regarding ethnicity, there was no substantial difference in the distribution of nearly 20 ethnic groups across the treatment and control groups. There were also no differences in treatment and control membership due to Pell grant status, financial aid status, first semester status, or first math course status ($p > .05$). These analyses suggested the treatment and control groups were relatively similar in terms of student background.

<table>
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<th>Table 3.1 - Participant Summary</th>
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<td>Summer 2012</td>
</tr>
<tr>
<td>Fall 2012</td>
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</table>

The students within the treatment group were required to complete the study skills curriculum via the social networking technology. The goal was to identify whether students will use the social networking site to complete their required course assignments but also communicate and learn about other campus resources as well as collaborating with classmates. The control group remained as the current math course with the study skill assignment submitted via the typical paper format.

The community college used in this study recently underwent a complete reorganization process of counseling and advising services to provide more aggressive
advising and available counseling for students. In addition, developmental education in the form of remedial courses is currently required by the college. Even with these improvements in counseling, advising, and developmental education, remedial students have largely been unsuccessful in obtaining a degree.

Data Collection

The data collection using the survey measures occurred two weeks into the beginning of the course and again at the end of the course for fall 2012. By the second week of the semester the students had the opportunity to go to the social networking site and experience the features by creating a personal profile page. The survey was administered in both the treatment and control groups. This allowed for the analysis to provide feedback as to the intervention of the social networking requirement from pre to post intervention, as well as analysis between the control group and treatment group. The students in the treatment group were asked to evaluate the perceived sociability of the social networking site, using the sociability scale. The survey was done electronically using an easily administered program, Survey Monkey.

The survey format included the specific measures of perceived sociability by using the Sociability Scale developed by Kreijns et al. (2007). These included items such as: “The environment enables me to develop good working relationships with my teammates; I feel comfortable with the environment; The environment enables me to get a good impression of my team mates.” The peer interaction measures were divided into formal peer interaction, the interaction among students that were study related, and informal peer interaction regarding social and personal matters. The items for formal
peer interaction included questions such as: “Fellow students invite me to work together on school tasks; Student peers approach me to discuss study tasks; Student peers do not appreciate my feedback.” Items such as: “I hardly know anyone here; Fellow student often ask me to spend time with them; Student peers are involved with me,” were included in the informal peer interaction scale. The academic self-efficacy measure was based upon a combination of previously tested self-efficacy measures including those: 1) used to predict academic performance (Lent at al., 1986); 2) used to predict career and academic options leading to persistence and success in those specific options (Betz & Hackett, 1981) and 3) used to measure mathematics course self-efficacy (Betz & Hackett, 1983). The data evaluating student success was based upon the student’s final course grades, either a credit or no-credit grade. The student retention variable was defined as those students who re-enrolled for any course work in the following semester as tracked by the independent student banner identification number.

Source of Data

A datasheet in a statistical software application was built to house all the results of the survey information, enrollment information and student demographic information accessed from the University’s operational data store (ODS). The data collected included the student’s name, student’s university issued ID number, control or treatment group status, term of enrollment in the math course, successful completion of math course, determination of first-time freshman status or not, determination of first time attempting the math course or not, student retention data into the following semester, financial aid and Pell status, ethnicity and zip code. The categorical variables were coded by numeric
representations, e.g., first time enrollment by semester was coded as: 1=spring 2012, 2=summer 2012 and 3=fall 2012. The survey measures were also collected in the database as individual responses to the items in each construct and a total value for each construct. The first data set was collected as part of the spring 2012 pilot, the second as part of the summer 2012 and the third set as part of the fall 2012 project. A complete summary of this data is available Chapter 4 under Results.

Software Used for Analyses

SPSS® Statistics Version 21 was used for the statistical analyses that are described in the Results and Discussion section related to correlations, means comparisons, and multiple, ordinal and logistic regressions. A basic SPSS® Fifth edition manual for users was used as a reference in setting up the database of survey information and enrollment demographic information (Cronk, 2008). Mplus software was used to evaluate the path model. The path model analysis required an evaluation of the entire model to calculate the direct and indirect effects of the variables within the data set.

Analyses

Research in social sciences often requires the evaluation of three or more variables within one study. Similar to this study, the goal is to determine which variables have mediating effects on the outcome measures (student success and retention). The multivariate analysis approach allows the researcher to explore the relationship between two variables while holding other variables constant. Extraneous variables are then statistically controlled for their mediating effects. The process of holding one or more variables constant determines whether the mediating effects were fully mediated or
partially mediated. The multivariate analysis approach also allows the researcher to predict which variables have a greater effect on the outcome (Mueller, Schuessler, & Costner, 1977).

Because of the nature of the research questions, the data were analyzed in a series of steps, guided by the conceptual model. For outcomes measured on an interval scale, a combination of independent sample $t$-test, paired sample $t$-tests, and correlation analysis were used in preliminary analyses. For example, for the first research question, which examined differences in student engagement, a series of $t$-tests was used to examine differences between the two groups, as well as possible changes within the treatment group that took place over the semester. For Question 2, correlation was used to examine possible differences between groups in formal and informal peer interactions. For question 3, regression was used to examine possible differences in student background related to perceived sociability (as well as follow-up $t$-tests on the treatment group). This technique is useful in pooling together the entire data set, both control and treatment groups, and accounting for interaction among variables, as well as controlling for background variables of the sample population.

For the full model as summarized in Figure 3.1, path analysis was used to evaluate the impact of variables affecting student success as identified in the model. For analyses where the outcome is dichotomous, logistic regression was used when measuring the effects of independent variables on the dependent variable. Logistic regression allows the researcher to examine the relationship between a dichotomous dependent variable and a set of continuous or categorical predictors (Menard, 2010;
For analyses where the outcomes are continuous, path analysis was used to identify the causal and mediating relationships amongst the proposed variables: perceived sociability, formal peer interaction, informal peer interaction, and self-efficacy. Developed by Sewall Wright, path analysis may be used to evaluate whether a multivariate data set “fits” a proposed conceptual model (Pedhazur, 1982). These proposed relationships implied in the model are then estimated via a series of regression equations. Variables within the path analysis are defined as either exogenous variables or endogenous variables. Exogenous variables are assumed to have variance related to circumstances completely outside the stated model which are accounted for in terms of error (Mueller et al., 1977). Figure 3.1 illustrates perceived sociability, formal and informal peer interaction as the exogenous variables and the variance associated with these variables is assumed to be caused entirely by variables not identified in the model. The endogenous variables of the model, self-efficacy, student success, and retention, have variance assumed to be explained in part by other variables in the model (perceived sociability, formal and informal peer interaction). This model allows us to determine the values of the standardized regression coefficients—the amount that the Y variable will change with one unit change in the X variable—holding all other variables in the model constant.

In the current study, the endogenous variables are of primary interest since they are considered as mediating effects between the constructs of student success and student retention in the proposed model. A key part of this analysis is the evaluation of the total
direct and indirect effects on each variable (Singleton, Straits, & Straits, 1993). The analysis identifies causal structure by showing the interconnectedness of the variables (Mueller, 1977). In this case, the analysis may uncover relationships that are significant in impacting students’ success. More specifically, the analysis of the relationships will help address the way social networking sites should be organized and integrated into future academic course work to positively impact learning. In Figure 3.2 several key relationships are specified:

- Indirect effect of the perceived sociability on student success and retention
- Indirect effect of formal peer interaction on student success and retention
- Indirect effect of informal peer interaction on student success and retention
- Direct effect of formal peer interaction on informal peer interaction
- Direct effect of self-efficacy on student success
- Direct effect of student success on retention
- Indirect effect of self-efficacy on retention
Figure 3.2. Proposed model of student success and retention.
CHAPTER 4. RESULTS

The results in Chapter 4 are presented with respect to the research questions. In addition to the focus groups conducted at the beginning of the research design, a number of quantitative analyses were performed. These compared the differences and similarities between the treatment and control groups as well as predictive analyses amongst the constructs. The data analysis, as defined by Singleton (1993), is the process of comparison of theory and data to answer questions related to theoretical models leading to new directions in research fields.

Pilot Study Spring 2012

The campus launched the site in January 2012 in four sections of the remedial math course. For the spring 2012 semester there were five Math 9 courses offered: 8:00am, 10:00am, 1:00pm, 3:00pm and 5:00pm. In working with the lead math faculty, it was decided that the social networking interface would be used in the 8:00am and 1:00pm course sections. These two sections constituted the treatment group. The control group was defined as the 10:00am and 3:00pm courses. The 5:00pm course was not part considered part of the study. The demographics of students in the evening courses tend to have differences such as working adults, sometimes better prepared and more focused on completion than the general student population being evaluated.

The pilot study was a critical part of the research because it identified ways to improve the process and curriculum development to drive students to the social networking site. There was a considerable amount of resistance by the faculty throughout the course of this project. Faculty who were not familiar with social networking were
less engaged. Many were not even interested in participating in creating their own profiles on the site. Due to this resistance, it took longer to get the students up and running with the site. There was considerable confusion in how assignments were to be uploaded, where they would be posted, etc. The pilot period allowed for the researcher to work closely with the faculty to define a better schedule and clearer assignments for the actual study, which took place in fall 2012. Because of this confusion and slow start up for the students, only one survey was collected during the spring as a post-survey at the end of the fall 2012 semester.

The survey was electronically distributed to the students in the four groups of math 9. The total number of students that completed the surveys for the pilot group was 115, 70 in the treatment group and 45 in the control group. The survey created through Survey Monkey collected student responses to the constructs previously discussed: perceived sociability, formal peer interaction, informal peer interaction, and self-efficacy levels. The only difference in the survey was that the control group was not asked the question regarding perceived sociability of the HCConnect site, since they did not have access to the social networking tool. The survey was attached to the student university issued email address, which allowed the researcher to track the student through their student identification number. The analysis of the pilot study is reviewed in the analysis section.

Given the difficulties embracing the technology, the researcher continued the pilot study into the summer 2012 semester. Since enrollment numbers in the summer were
smaller, the entire student enrollment was treated in the same manner as the previous treatment group and social networking was incorporated into all summer 2012 sections.

Fall 2012

In keeping with the design-based research paradigm, the pilot study helped improve the study in several ways as it moved into the fall 2012 semester. It provided a timeframe for the faculty to become comfortable with the social networking exercises in the treatment group sections. The pilot study also allowed the researcher to better clarify assignments for students in the following semester, 2012. It identified an important time schedule to keep the surveys on track for proper data collection.

For the fall 2012 semester there were five Math 9 courses offered: 8:00am, 10:00am, 11:30am, 1:00pm, and 5:00pm. The researcher continued to work with the same lead math instructor and identified the 10:00am and 11:30am course sections as the treatment groups. The participating faculty, both full-time and part-time, were the same for both the spring and fall semesters. This benefited the continuous use of HCConnect in their courses. The 8:00am and 1:00pm course sections were identified as the control groups. As with the spring semester, the 5:00pm course section was not considered part of the study. The demographics of student in the evening courses tend to have differences such as working adults sometimes better prepared and more focused on completion than the general student population being evaluated.

The course assignments were well organized and delivered to the students on a weekly basis. A list of those activities is available in Appendix D. The survey was administered as both a pre-test and post-test survey for the control and treatment groups.
Research Questions

The first research question examined whether social networking technologies might increase student engagement through formal and informal interaction with peers.

RQ1: Can we effectively support student success and retention by using social networking technologies focused on increasing student engagement through formal and informal peer interaction? The investigation of RQ1 can be broken into the sub-questions below.

RQ1a: Will formal peer interaction increase under the condition of social networking? To answer the first research question, a pre-test and post-test analysis was conducted in the treatment group only to examine possible differences of means over the course of the semester. Paired sample t-tests showed that under the treatment condition (including social networking), formal peer interaction at the beginning of the semester and at the conclusion of the semester did not significantly change. There was no significant difference in the pre-test scores of formal peer interaction (M=23.29, SD=6.04) and the post-test scores of formal peer interaction (M=23.95, SD=6.43); t(162)=.656, p=.181.

RQ1b: Will informal peer interaction increase under the condition of social networking? An independent sample t-test was used to compare informal peer interaction among the participants in the control and treatment groups for the combined data over the three semesters. There was no significant difference between the scores for informal peer interaction between the control group (M=15.29, SD=4.36) and the treatment group (M=14.60, SD=4.58) conditions; t(285)= 1.29, p =.198.
RQ1c: Is formal peer interaction associated with informal peer interaction among students? To answer this question, a bivariate correlation was estimated using only the treatment group. The analysis showed that there is a significant correlation ($r = .740, p < .001$) between formal peer interaction and informal peer interaction. Moreover, the square of the correlation indicated 50% of the variance in informal peer interaction is explained by the variance in formal peer interaction. A similar correlation estimated using only the control group participants suggested there was a moderate correlation ($r = .527, p < .001$) between formal peer interaction and informal peer interaction. However, the strength of this correlation did not differ across groups ($F_{2,284} = 2.139, p > .05$). These estimations may be interpreted that there was no statistically significant difference in the strength of relationship between formal and informal peer interaction in the treatment group versus the control group.

RQ1d: When do students perceive the social networking environments to be most beneficial (i.e., orientation, first-year, second-year individual course level)? An informal examination of the comments posted by the students indicated that they have not become involved with other students or support services. Their feelings about HCConnect, the social networking site for the college, indicated it could be better utilized to find information and meet faculty, staff and other students.

The second research question examined whether sociability of social networking leads to stronger student self-efficacy feelings.
RQ2: Is perceived sociability of social networking environments associated with stronger levels of students’ academic self-efficacy (the degree to which students feel they can succeed in a course) leading to course completion and retention?

The investigation of RQ2 can be broken into the sub-questions below.

RQ2a: Is increased perceived sociability of social networking environments associated with increased levels of students’ academic self-efficacy? For this analysis, the control group is not included because students were not exposed to the social networking site and did not complete the questions related to perceived sociability. The correlation between sociability and self-efficacy within the treatment group (N = 158) indicated there was a significant correlation between the level of perceived sociability and the students’ self-efficacy levels ($r = .208, p = .009$). The size of the $r$ coefficient, however, suggests the relationship is weak.

RQ2b: Which students are more impacted by the perceived sociability of social networking environments? Student characteristic data were collected as descriptors of the individual students. These data points were not collected via the survey but accessed through the University’s operational data store (ODS). The source of the data was of two types: 1) self-reported information the student provided at the time of admittance to the college via their application for admissions, such as ethnicity, gender, etc. and 2) information relating to their status of enrollment, such as first semester, first math course, and financial aid status.

Multiple regression was used to examine the effect of student background variables (gender, Pell grant aid status, financial aid status, first time student, and first
attempt at the math course) on perceived sociability. Pell grant aid (Pell) was defined as those students showing financial need and currently receiving Federal Pell aid, financial aid status (FinAid) was determined by the students’ record of aid in the form of grants or scholarships, and first time students (FirstTime) was defined as the first time attending college and first time attempting the math course (FirstMath). In this analysis, only gender was significantly related to perceived sociability.

Table 4.1 – Coefficients of Post-Test Perceived Sociability

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<th>Standardized Coefficients</th>
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a. Dependent Variable: Post-Test Perceived Sociability (adjusted r-square = .044)

RQ3: Will the required participation in online social networking technologies increase students’ academic self-efficacy?

An ordinal regression controlling for student background was used to compare academic self-efficacy levels among those that participated in the control and treatment group conditions for the combined three semesters. Ordinal regression was required because the distribution of post self-efficacy beliefs was not normally distributed. A new ordinal variable was created (with 4 ordinal categories). This variable was employed in subsequent analyses. Results are interpreted in odds ratios, which provide the increase in
odds of being a higher versus lower category of the outcome. The results of this first analysis (not tabled) suggested there was no significant difference between self-efficacy scores of the treatment group and control group conditions (odds ratio = 1.371, \( p > .10 \)) although this result was in the expected direction. After adding students’ pretest self-efficacy scores to the model, the results in Table 4.2 suggested all students reported increases in self-efficacy (odds ratio = 1.161, \( p < .001 \)). Controlling for the other variables, the treatment group had somewhat higher self-efficacy scores, but the relationship was not statistically significant (odds ratio = 1.479, \( p > .10 \)).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Wald Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
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<td>.225</td>
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</tr>
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<td>4.974</td>
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<td>.026</td>
<td>2.525</td>
</tr>
<tr>
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<td>.116</td>
<td>1</td>
<td>.734</td>
<td>.825</td>
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<td>.3339</td>
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<td>1</td>
<td>.241</td>
<td>1.479</td>
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<tr>
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<td>28.450</td>
<td>1</td>
<td>.000</td>
<td>1.161</td>
</tr>
<tr>
<td>(Scale)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: Self-Efficacy(cat)

RQ3a: Among students in social networking environments, will formal peer interaction increase students’ self-efficacy levels?
An ordinal regression analysis was used to estimate the relation between formal peer interaction (IV) and its impact on academic self-efficacy levels (DV) for the students in the treatment and control groups. Table 4.3 shows that formal interactions of students were related to higher self-efficacy scores (odds ratio = 1.090, \( p < .013 \)), controlling for student background and treatment/control group membership. This implies that a one standard deviation increase in formal interactions would result in about a 9% increase in odds of being in a higher category versus combined lower categories of self efficacy. An interaction term, which tested whether the effect of peer formal interactions on self-efficacy beliefs were stronger in the treatment group compared to the control group, indicated there was no additional differential effect of formal interactions within the treatment group effect on self-efficacy scores (odds ratio = 1.001, \( p = .974 \)).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Wald Chi-Square</th>
<th>Hypothesis Test</th>
<th>Exp(B)</th>
</tr>
</thead>
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<tr>
<td>[selfeffcat=.00]</td>
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<td>.9495</td>
<td>.448</td>
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<td>.503</td>
</tr>
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<td>Threshold [selfeffcat=1.00]</td>
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<td>.9376</td>
<td>.749</td>
<td>1</td>
<td>.387</td>
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<td>.2489</td>
<td>2.097</td>
<td>1</td>
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</tr>
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<td>Finaid</td>
<td>.026</td>
<td>.2394</td>
<td>.012</td>
<td>1</td>
<td>.913</td>
</tr>
<tr>
<td>FirstTime</td>
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<td>.2909</td>
<td>5.883</td>
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<td>.015</td>
</tr>
<tr>
<td>Firstmath</td>
<td>-.265</td>
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<td>.642</td>
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<td>.423</td>
</tr>
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<td>HCConnect</td>
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<td>1.0712</td>
<td>.206</td>
<td>1</td>
<td>.650</td>
</tr>
<tr>
<td>Post formal peer</td>
<td>.086</td>
<td>.0350</td>
<td>6.108</td>
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<td>.013</td>
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<tr>
<td>Post formal*group (Scale)</td>
<td>.001</td>
<td>.0436</td>
<td>.001</td>
<td>1</td>
<td>.974</td>
</tr>
</tbody>
</table>

Dependent Variable: Self Efficacy(cat)
RQ3b: Among students in social networking environments, does informal peer interaction between students lead to an increase in students’ self-efficacy?

An ordinal regression analysis was also used to estimate the relationship between informal peer interaction (IV) and academic self-efficacy levels (DV) for the students in the treatment group. Controlling for student background, in Table 4.4 there was some evidence that informal peer relationships were positively related to students’ self-efficacy (odds ratio = 1.072, \( p = .012 \)). Students in the treatment group also reported higher self-efficacy scores (1.495, \( p < .092 \)). However, the interaction term (not tabled) indicated that there was no additional effect of informal peer relationships associated with group membership (odds ratio = 1.031, \( p = .585 \)).

| Table 4.4 Coefficients of Post Self-Efficacy with Informal Peer Interaction |
|-----------------------------|------------------|------------------|------------------|------------------|
| Parameter                  | B                | Std. Error       | Hypothesis Test  | Exp(B)           |
|                            |                  |                  | Wald Chi-Square  | df | Sig.  |
| [selfeffcat=.00]           | -1.710           | .5617            | 9.264            | 1  | .002  | .181  |
| Threshold                  |                  |                  |                  |                |                  |
| [selfeffcat=1.00]          | -.285            | .5274            | .292             | 1  | .589  | .752  |
| [selfeffcat=2.00]          | .894             | .5263            | 2.883            | 1  | .090  | 2.444 |
| Male                       | -.407            | .2468            | 2.715            | 1  | .099  | .666  |
| Finaid                     | .100             | .2355            | .182             | 1  | .670  | 1.106 |
| FirstTime                  | .650             | .2875            | 5.106            | 1  | .024  | 1.915 |
| FirstMath                  | -.271            | .3275            | .684             | 1  | .408  | .763  |
| HCCConnect                 | .402             | .2384            | 2.841            | 1  | .092  | 1.495 |
| Informal Peer (Scale)      | .070             | .0277            | 6.376            | 1  | .012  | 1.072 |

Dependent Variable: Self Efficacy(cat)
RQ3c: Which variable is most predictive of increasing academic self-efficacy (i.e. formal peer interaction, informal peer interaction or perceived sociability of the networking site)?

An ordinal regression analysis was performed to estimate the impact of formal peer interaction, informal peer interaction, and perceived sociability on self-efficacy levels. Table 4.5 suggests that, controlling for student background, formal peer interaction was the strongest predictor of the three variables (odds ratio = 1.840, \( p = .013 \)).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Wald Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[selfeffcat=.00]</td>
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<td>.8871</td>
<td>12.530</td>
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<td>.000</td>
<td>.043</td>
</tr>
<tr>
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<td>.8145</td>
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<td>.095</td>
<td>.256</td>
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<tr>
<td>[selfeffcat=2.00]</td>
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<td>.7991</td>
<td>.021</td>
<td>1</td>
<td>.884</td>
<td>1.123</td>
</tr>
<tr>
<td>Male</td>
<td>-.691</td>
<td>.3685</td>
<td>3.520</td>
<td>1</td>
<td>.061</td>
<td>.501</td>
</tr>
<tr>
<td>Finaid</td>
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<td>.3353</td>
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<td>.648</td>
<td>.858</td>
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<td>FirstTime</td>
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<td>.4061</td>
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</tr>
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<td>.638</td>
<td>.812</td>
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<tr>
<td>Formal Peer</td>
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<td>.2443</td>
<td>6.233</td>
<td>1</td>
<td>.013</td>
<td>1.840</td>
</tr>
<tr>
<td>Informal Peer</td>
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<td>.2640</td>
<td>.361</td>
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<td>.548</td>
<td>.853</td>
</tr>
<tr>
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<td>.0204</td>
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<td>1</td>
<td>.215</td>
<td>1.026</td>
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</tbody>
</table>

Dependent Variable: Self Efficacy(cat)
Given the pattern of results regarding formal peer interactions, informal interactions, and perceived sociability in Table 4.5, and summarized in Figure 4.1, a follow-up analysis was conducted to determine whether there might be possible multicollinearity between these variables. As shown in Table 4.6 below, the variables of formal and informal peer interaction had a Pearson correlation coefficient of 0.74, indicating they are highly correlated. This suggested that formal and informal interactions entered into the regression model together might bias the results due to their high correlation.
Table 4.6 – Correlation Coefficients

<table>
<thead>
<tr>
<th>Variable Correlations- Treatment</th>
<th>Per-Soc</th>
<th>Formal Peer</th>
<th>Informal Peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per-Soc</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation Sig. (2-tailed)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>158</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal Peer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation Sig. (2-tailed)</td>
<td>.431**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>158</td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>Informal Peer</td>
<td></td>
<td>.740**</td>
<td>1</td>
</tr>
<tr>
<td>Pearson Correlation Sig. (2-tailed)</td>
<td>.452**</td>
<td>.740**</td>
<td>1</td>
</tr>
<tr>
<td>N</td>
<td>158</td>
<td>158</td>
<td>158</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).

In an effort to control for the multicollinearity effect between the two peer interaction variables, as a first step, Table 4.7 shows the results of the regression examining the effect of formal interactions on self-efficacy within the treatment group only, conducted without the informal peer interaction variable, while holding the other background variables constant. The results indicate that the formal peer interaction variable has a significant impact on self-efficacy (odds ratio = 1.680, $p = .004$).
The results in Table 4.7, and also summarized in Figure 4.2, provide some preliminary evidence that formal peer interactions may influence students’ self-efficacy beliefs within the treatment group (with significance level below $p = .01$).
In order to examine the differential impact of the treatment and control group membership on self-efficacy beliefs, a logistic regression was next performed using the background variables, formal peer interaction, and group membership. Table 4.8 suggests that formal peer interaction had a significant impact on self-efficacy (odds ratio = 1.706, \( p = .001 \)). In addition, the treatment group members reported stronger levels of self-efficacy at the end of the semester (odds ratio = 1.683, \( p = .033 \)). An interaction term was also tested to see if the impact of formal interactions within the treatment group was stronger than in the control group, but the term was not significant (\( p > .10 \)), so it was dropped from the model in Table 4.8. Overall, these results imply that stronger student feelings of self-efficacy were created by the treatment, yet the exact mechanism accounting for this difference within the treatment group remains unknown.
Table 4.8 Regression Coefficients Explaining Self-Efficacy

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Hypothesis Test</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wald Chi-Square</td>
<td>df</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>[selfeffcat=.00]</td>
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<td>44.328</td>
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<td>.2488</td>
<td>2.096</td>
<td>1</td>
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<tr>
<td>Finaid</td>
<td>.027</td>
<td>.2388</td>
<td>.012</td>
<td>1</td>
</tr>
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<td>FirstSem</td>
<td>.705</td>
<td>.2896</td>
<td>5.921</td>
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<td>FirstMath</td>
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<td>.641</td>
<td>1</td>
</tr>
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<td>HCCConnect</td>
<td>.520</td>
<td>.2446</td>
<td>4.527</td>
<td>1</td>
</tr>
<tr>
<td>Formal Peer (Scale)</td>
<td>.534</td>
<td>.1281</td>
<td>17.361</td>
<td>1</td>
</tr>
</tbody>
</table>

Dependent Variable: Self Efficacy(cat)

RQ3d: Which students are more impacted by academic self-efficacy through social networking participation (e.g., gender, financial aid status)?

The regression model in Table 4.8 can also be used to answer this research question. The results indicated that a significant relationship exists between levels of self-efficacy students in the treatment group versus the control group (odds ratio = 1.683, $p = .033$) and there was evidence that students who were in their first semester had higher self-efficacy scores (odds ratio = 2.023, $p = .015$). The other demographic variables did not appear to have any influence on self-efficacy (e.g., gender, financial aid status, first math course).

RQ4: Do increased levels of self-efficacy via the social networking activities increase student success in a given course leading to retention into the next semester?
The next part of the analysis focuses on whether participation in the HCConnect group versus the control group and student self-efficacy had any impact on students’ likelihood of completing Math 9 and enrolling in the next semester. A series of separate logistic regression techniques were used to examine this research question. The first logistic regression analysis evaluated Math 9 as the dependent variable and the second analysis as re-enrollment as the dependent variable. These results are summarized in Table 4.9. The coefficients are odds ratio, which provide the increase in odds of passing Math 9 (coded 1) or re-enrolling (coded 1) for a one-unit increase in the predictor.

Table 4.9. Odds Ratios Explaining Likelihood of Passing and Re-enrolling

<table>
<thead>
<tr>
<th></th>
<th>Math9</th>
<th>Re-Enroll</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp(B)</td>
<td>Exp(B)</td>
</tr>
<tr>
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<td>0.858</td>
<td>0.688</td>
</tr>
<tr>
<td>Finaid</td>
<td>0.990</td>
<td>1.452</td>
</tr>
<tr>
<td>Firstsem</td>
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<td>0.758</td>
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<tr>
<td>FirstMath</td>
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<td>1.807</td>
</tr>
<tr>
<td>HCConnect</td>
<td>1.276</td>
<td>0.818</td>
</tr>
<tr>
<td>Self efficacy</td>
<td>3.061*</td>
<td>1.524*</td>
</tr>
<tr>
<td>Math9 credit</td>
<td>2.094*</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.113*</td>
<td>0.688*</td>
</tr>
</tbody>
</table>

Note: *p < .05

First, controlling for other variables in the model, the results in Table 4.9 indicated that higher self-efficacy scores were positively related with an increased probability of passing Math 9 (odds ratio = 3.061, p < .05), which was consistent with the proposed conceptual model. Second, increased levels of self-efficacy were also related to
the likelihood of enrolling in the next semester (odds ratio = 1.524, \( p < .05 \)). Passing Math9 also increased the odds of re-enrolling by about 2.1 times (odds ratio = 2.094, \( p < .05 \)). Treatment did not have a direct impact on either passing Math 9 or in re-enrolling subsequently. It is possible, however, that the treatment might indirectly affect likelihood of passing Math 9 or re-enrolling subsequently. This is considered in the final full model tested.

**Examining the Full Conceptual Model**

The last analysis examined the full conceptual model simultaneously. In order to provide this model test, the Mplus software program was utilized because it can provide a statistical test of both direct and indirect variable effects in path models where there may be both continuous and dichotomous or ordinal mediating and outcome variables (Muthén & Muthén, 1998-2004). Indirect effects are defined as effects of a predictor on an outcome that are mediated by another variable between the predictor and the outcome. Because previously this study determined that the treatment had a significant direct effect on students’ self-efficacy scores (but not a direct effect on Math9 scores nor on re-enrolling in a subsequent course), the key part of this final analysis was to determine whether the treatment might exert an indirect effect (through self-efficacy) on successfully passing Math 9 and on re-enrolling in a subsequent course. Testing the full conceptual model using Mplus provided a fully efficient test of all the variables in the proposed conceptual model simultaneously, which provides optimal estimates of model paths (Hox, 2010). As Hox notes, these types of sequences between variables cannot be shown by separate multiple regression and logistic regression models.
First, controlling for student background, the Mplus results in Figure 4.3 confirm that peer interactions and the treatment impact students’ self-efficacy levels. In turn, self-efficacy predicted likelihood of completing Math 9 ($b = 0.643, p < .05$) and indirectly affected likelihood of re-enrolling ($b = 0.281, p < .05$). Finally, Math 9 completion led to an increased likelihood of enrolling again ($b = 0.438, p < .05$).

![Figure 4.3. Standardized direct and indirect (dotted lines) effects (*$p < .05$).](image)

Note: Connect variable represents participation in the HCConnect social network.

Second, as Figure 4.3 indicates, the model indicated a small, significant indirect effect of the HCConnect treatment on the probability of receiving credit for Math 9 ($b = 0.110, p < .05$). Moreover, a small indirect effect was also discovered for the HCConnect treatment mediated through self-efficacy and Math 9 credit on likelihood to re-enroll the following semester ($b = 0.048, p < .05$).
Summary of Findings

In addition to answering the research questions discussed in this chapter, an exploratory research method was used to identify variables in the model that had significant relationships. This method was used to refine the final model proposed and tested. Through the evaluation of many preliminary quantitative models (some of which were presented in the chapter), the following relationships were discovered:

- There was a significant relationship between those who participated in the HCConnect environment and self-efficacy ($p<.05$).
- A significant relationship was found between formal and informal peer interaction and self-efficacy when modeled separately ($p<.05$).
- First semester was a predictor of higher self-efficacy levels ($p<.10$)
- Self-efficacy was a significant predictor of earning credit in Math 9 ($p < .05$). For a unit increase in self-efficacy, students were about 3 times more likely to earn credit for the course.
- Earning credit in Math 9 was a significant predictor of re-enrolling the subsequent semester by 2.09 times.
- There was not a direct significant impact of the treatment on either Math 9 completion or re-enrollment. However, there was a significant, but small, indirect effect of membership in the intervention group on Math 9 completion and on subsequent re-enrollment.

The implications of these findings are discussed in the following chapter.
CHAPTER 5. DISCUSSION, LIMITATIONS, CONCLUSION

Discussion of Findings

The major goal of this research study was to determine whether social networking embedded in remedial math coursework leads to increased levels of completion and re-enrollment. The results indicated that not all of the relationships predicted by the conceptual model exist under the conditions of the experiment. However, the results provide insight into several significant findings. Each of the relationships that resulted in significant findings is discussed below.

1) The role of peer involvement. The study concluded that regardless of the students’ membership group (control or treatment), formal peer interaction was a significant predictor of self-efficacy. The two originally proposed peer variables, informal and formal, were highly correlated and overlapping in measuring effect. The goal of the study was to show that HCConnect had the ability to increase the type of interaction that would impact student success. Researchers and numerous publications cite the use of social networking and its impact on student well-being (Kalpidou, Costin, & Morris, 2011; Skues et al., 2012), the relationship between faculty and students utilizing social networking (Roblyer et al., 2010), the trending reasons why students utilize social networking (Pempek et al., 2009), and how students are using social networking, such as Facebook, to support their learning (Gray et al., 2010). The impact of the social networking environment did not drive higher levels of peer involvement,
either formal or informal in this study. However, the results of the study include significant findings and support the literature that suggests peer involvement plays an important role in learning. Important to this study are the characteristics of working with others, learning and self and peer assessment (Boud, Cohen, & Sampson, 2001). Havnes (2008) argues that the social role of peer interaction is an important process for student learning and should go beyond classroom learning. Tinto’s model of retention (1975) uses integration at the academic and social levels as precursors of retention and success. Building methods to increase that level of involvement outside of the classroom can lead to strong levels of engagement.

The literature is divided as to what level of social networking is appropriate and accepted by both faculty and students (Roblyer et al., 2010). However, pedagogical changes that incorporate social networking as yet another support for learning will be key. The explosion of student acceptance of social networking in an effort to stay connected with current friends must be adapted as a communication technique to drive institutional engagement. The current study was successful in illustrating the previously established fact that peer involvement predicts significantly higher levels of self-efficacy, which in turn leads to higher probability of course completion.
As hypothesized in the conceptual model, formal peer interaction predicts academic self-efficacy in both membership groups. The formal peer interaction in this study is related to a student’s academic experience whereas informal peer interaction is related to the social aspect of a student’s academic experience. Numerous prior research studies have clearly noted the power of peer interaction in a student’s performance (Tinto, 2005), academic integration (Severiens & Wolff, 2008), sense of belonging (Meeuwisse et al., 2010), and as learning agents (Havnes, 2008). The results of this study further contribute to the evidence that changes in formal peer interaction, or academic integration with peers, will influence a student’s level of self-efficacy. The attempt to create an impact for this type of learning in the computer-mediated environment may need to be an experience of more depth. The 14-week experience utilizing the platform and the minimal number of required assignments may not have allowed for important bonds to be made in and outside the classroom which would then translate into student perceptions of peer interaction.

2) Impact of Perceived Sociability

The results indicated a significant correlation between the perceived sociability of the social networking interface and the student academic self-efficacy levels. The sociability of computer supported collaborative learning provides an “affective structure that entails a process of
affiliation, impression formation, and interpersonal attraction to induce and promote social relationships and group cohesion” (Kreijns et al., 2003, p. 33). The correlation in this experiment indicates that as student perceptions of the sociability of the networking site increase, their perceptions of their individual success in the course and future courses also increase. These findings show that the social network created and designed to support the college experience by allowing for additional interaction of students was successful. As noted by Kreijns et al. (2007), instruments such as the scale used in this study are critical to evaluating the ability to support social environments that lead to the feeling of a social presence online. Zhu’s (2012) research results indicate that learning with peers in a social online environment is important not only at the individual level but also at the group level. Additionally, learning with peers can enhance the performance of a team or group of students working towards a common project or goal. These findings are consistent with Zhu’s results. Perceived sociability however did not significantly predict self-efficacy level when evaluated through a linear regression analysis.

3) **Gender Differences in Sociability Results.** A significant difference was noted in how individuals rated the sociability of the site based on the gender of the participant. The male participants in the study had significantly higher ratings in this measure than the females in the study. This is consistent with other research results indicating that because
women are more likely to use vocal changes and body language cues in communicating, they have consistently higher levels of stress in utilizing Facebook. Thompson and Lougheed (2012) hypothesize that online communication for women is more stressful than for men because of the textual and static information built into this type of communication. The data results of this study also support the hypothesis made by Thompson and Lougheed (2012).

4) **Self-efficacy and Student Success**

The study confirmed that academic self-efficacy predicts the success of a student in a particular course and also predicts the success of a student re-enrolling the following semester. These finding are consistent with those of Multon et al. (1991), Lent et al. (1984) and Shunck (1981). This prior research found statistically significant positive relationships between self-efficacy and academic performance and persistence (Multon et al., 1991). Self-efficacy was predictive to grade performance and persistence in technical / scientific majors (Lent et al., 1984), and self-efficacy as a predictor of math performance (Schunk, 1981). Knowing that self-efficacy can drive students completing course work should affect the way institutions organize themselves in providing services to students. Understanding these important factors can help address weaknesses and essentially plan ways to interact with students to building their academic self-efficacy can improve student success.
5) **Course Completion and Re-enrollment**

Evidence found in this research study included the impact course completion has on re-enrollment into the following semester. The logistic regression analysis confirmed that students earning credit in the Math 9 course are almost 3 times more likely to re-enroll. For a campus battling with falling enrollment and poor persistence and completion rates, these results provide evidence that students that can complete this particular course will be more likely to continue.

6) **First Semester Students**

As part of the exploratory process of this research, the background variables were used to determine whether there were different mediating effects based upon student type. It was found through this process that students enrolled in the institution for the first time (first semester) had significantly higher self-efficacy beliefs. This is also a key piece of information in evaluating student success. It indicates how important the first semester of study is for a student as they come with higher levels of self-efficacy to complete. Colleges should evaluate the resources surrounding first time students as a target population to invest in support mechanisms, i.e. scholarships, intrusive advising, early alert system, as getting the first time student through their first semester is a likely factor to increase retention.

7) **Factors Affecting Earning Credit for Math 9**
Even though detected at small levels, the results of this study indicate there is a significant indirect effect of participating in the social networking environment on likelihood to receive credit for Math 9 through self-efficacy. Further, there is a significant indirect effect of participating in the social networking environment on likelihood to re-enroll through self-efficacy and Math 9 completion. The literature indicates there are mixed results when evaluating the effectiveness of online versus face to face peer interaction (Guiller, Durndell, & Ross, 2008). Some studies have argued that learning in online environments is as successful as face-to-face environments, but significantly stronger student satisfaction in face-to-face environments continue to be noted (Ocker & Yaverbaum, 1999). Others have found no significant difference in performance when comparing face-to-face to online groups, but differences in participation and ease of relating to one another is higher in face-to-face environments (Kamin, Glick, Hall, Quarantillo, & Merenstein, 2001). These results indicate there is some impact on students utilizing the social networking interface. As a new project to the college, this is evidence there should be more work done in this area to help facilitate student support. It is also important to note that the social networking interface does not replace the face-to-face interaction but enhances the student overall experience.

8) As part of the exploratory research conducted with the dataset to evaluate the model, several other significant relationships appeared. Peer
interactions and the HCConnect treatment impacted student’s self-efficacy levels, and self-efficacy predicted likelihood of completing Math 9 and indirectly affected likelihood of re-enrolling. The effect of HCConnect also indirectly impacted the probability of receiving credit for the Math 9 course. Indirect effects were also discovered for the treatment group mediated through self-efficacy and Math 9 credit on likelihood to re-enroll the following semester.

These finding are valuable as the college moves forward to integrating the social networking platform into other areas of the college. Another experiment is already underway in implementing the project with the college’s writing center and English sequence of courses.

Possible Limitations

There are several limitations to the study that should be noted. Persuading the faculty to accept and use the technology was a challenge. Several training sessions took place to outline for the faculty the purpose of the social networking site. These training sessions were met with considerable resistance. If the faculty are not positively engaged and competent in the use of the technology, the students’ perspectives about the technology could be impacted. It was assumed by the researcher that the faculty would be minimally involved in using the site, for example by building their own profile page and interacting with students by positing material or discussions about course work. Even though the statistical analysis provided evidence that embedding social networking exercises in course requirements had a positive effect, the challenge was (and will
continue to be) for participation in the social networking to become a regular practice for
the teaching faculty and support personnel on the campus. The current adoption of the
technology is at a lower-level of implementation and does not include all members of the
campus. Given the results of this study, further adoption of other areas of the campus
will help build the collaborative and participatory environment.

Another possible limitation could lie in the definition of the formal and informal
peer interaction measures because the population tested in the original construct
validation process was a Dutch majority population. The previous studies did not
indicate that minority students within this Dutch population having formal and informal
peer interaction had a positive relationship with grades, deep approach to learning
(Severiens & Wolff, 2008) or to sense of belonging (Meeuwisse et al., 2010).

Limitations in the self-efficacy scale were noted in the diagnostic analysis of the
regression model’s fit to the data. As stated by Field (2009), when conducting regression
analysis, one must ask two important questions: 1) Does the model fit the observed data
well, or is it influenced by a small number of cases? and 2) Can the model be generalized
to other samples? During the evaluation of the regression model’s fit, it was discovered
through the diagnostic analysis that the self-efficacy measure was a non-normal
distribution. Over 40% of the overall responses to that measure equaled 40 on the 40
point scale. This cause the skewedness and kurtosis measure to indicate a highly skewed
variable. To combat the issue of the non-normal distribution, the self-efficacy measure
was converted into a non-parametric measure. An ordinal variable was created with four
ordered categories. The ordinal variable was used in the analyses.
Another possible limitation, as noted by Multon et al. (1984), is the experience level of survey respondents and how those experiences impact their reported levels of self-efficacy. Multon et al. (1984) state that a parsimonious interpretation is that older students, who possess greater school experience and, presumably, more well-defined perceptions of their academic strengths and weaknesses, have a better basis for making accurate self-efficacy appraisals. The participants in this study are predominately first semester college students testing into remedial level math. It could be concluded that these students, some testing as low as third grade math levels, may not have the academic experiences necessary to make accurate self-efficacy appraisals. A possible next step for this study will be to test the social network with college-level students attempting 100-level course work.

Conclusion

The literature outlines the challenges occurring in the classroom on college campuses as educators struggle with engaging the digital-aged student. A larger problem for the nation is how we can once again become one of the top educated nations. Identifying the technologies that current students find valuable in completing their education should become an obvious goal of institutional support.

Previous research on building engagement in the classroom via online technologies is largely focused on online course research as opposed to supplemental instructional aids in face-to-face courses. This research study illustrated the importance of creating relationships and shared learning via technology in a face-to-face course. It is hoped that this research will provide data to support changes in the learning environment.
and assist other researchers in terms of preparing faculty and administrators to better plan for student success mechanisms driven by technology.

The complexity of learning continues to evolve as more and more attention is placed on student success. This research points to the importance of creating structures that focus on environments--both online and physically--that support peer interaction. Tinto (1993, 1998) identified both social and academic interactions as factors affecting persistence. Peer interaction in this research further supports the finding that peer interaction significantly predicts student self-efficacy. This result focuses largely on the importance of peer interactions that occur regarding university and study related matters, and how those interactions ultimately lead to increased student success. Meeuwisse et al. (2010) found that peer interaction around college and classroom matters significantly impacts the sense of belonging student have leading to study success. Severiens and Wolff (2008) also identified formal peer (social) interaction as significant to credits earned. Consistent with the research at hand, the peer interaction reported by students significantly predicts their self-efficacy levels, which in turn leads to predicting student success in the course. From a practical standpoint, researchers and educators must understand the importance of formal peer interaction and create environments to support those interactions. These environments can be structural or physical spaces allowing for collaborative interactions. An example of these physical spaces is learning common areas. Technology can also enhance these interactions by providing space online for collaboration, information seeking and peer interaction. This point is also noted by Havnes (2008) who showed that academic learning is often taking place beyond
classroom learning and the curriculum and is often taking place among peers. In this respect, peer learning can be more creative, employing other types of learning strategies, and be intrinsically more motivating.

Educators and administrators need to understand the effects of self-efficacy on student performance. Research has provided evidence that if students feel that they can succeed, they are more likely to actually achieve that success. Practical implications of these findings should revolve around defining areas that can affect student beliefs whether vicariously, formally or informally. Consistent with other research about self-efficacy beliefs, this research found self-efficacy as the independent variable accounts for only a small amount of the measured variance. However, identifying the indirect impact of the social networking treatment on student success through self-efficacy provides support for the overall conceptual model.

Evaluation of the proposed model identified in this project indicates that perceived sociability of the interface is important because it significantly correlates with self-efficacy levels. The sociability measure is used to determine whether the computer mediated environment has the ability to facilitate a social space for community learning and collaboration (Abedin et al., 2011).

Through a separate analysis of the data, a multiple regression analysis indicated that participation in HCConnect significantly predicts higher self-efficacy levels. Although having participated in social networking is not significant with formal peer interaction, however, both variables affect self-efficacy. Colleges must then identify methods to foster both peer interactions but not necessarily through only social networking.
Understanding the importance of creating these environments to support peer interaction is fundamental to increasing student success.

Completion of Math 9 was the strongest indicator of re-enrollment in both groups. As a remedial level course taken largely by students in their first semester, the students in this population had high levels of self-efficacy—the belief that they could complete the course. It is critical for students to succeed in the Math 9 course on their first attempt in an effort to keep them enrolled. As part of the design-based research approach, it is time to revise the approach of embedding the social media into the course by updating activities and assignments to focus more heavily on peer interactions. Fostering higher levels of peer interactions will drive stronger levels of self-efficacy.

*Revisiting Design-Based Research Outcomes*

In this section the design-based research outcomes are evaluated under the five guiding principles used by the Design-Based Research Collective (2003).

**Principle one:** Learning theory and learning environments are integrated. The design of the social networking site incorporated into course work was based upon the theories developed in the literature review to encourage stronger peer interaction and social settings to build self-efficacy with the hopes of leading to student success.

**Principle two:** Innovation and research work on a cycle of continuous improvement. The conceptual model was developed from a combination of educational learning theories. The initial plan was to develop and integrate the HCConnect social networking site into the remedial math course. The college will continue to develop the HCConnect social networking site and work with faculty and staff to adopt the communication and
engagement tool into their daily work practice. A broader and deeper evaluation of student success theories may find other mechanisms, like peer interaction, that can be used to further support students. One possibility in the next iteration will be the availability of real-time tutoring through HCConnect. As with peer interaction, peer tutors have the ability to impact student success. The theories of student engagement and involvement revolve around the student quality interactions with various components of the college. The current implementation plan of HCConnect will be evaluated and revised based on the findings of this study.

Principle three: Results are shared with practitioners and successful innovations are placed in other teaching environments. The implementation of the social networking technologies into other parts of the college has already begun. The English courses now have HCConnect access to all students and are working with curriculum design to determine how to incorporate the resource. The HCC Writing Center will provide access to tutoring through the private chat feature. More importantly, communication about all of the available services the college can provide can be more easily disseminated through postings on HCConnect. The software will next be placed into college level courses and measured in order to evaluate the success.

Principle four: Innovations can produce outcomes of success or failure while contributing to the practical outcomes related to theory development and revision. The exploratory nature of this research led to findings that were proposed under the original conceptual model. The two direct significant factors predicting self-efficacy
were the peer interactions and the use of the HCConnect site. The sociability of the site was not a significant factor in the model. From a theoretical standpoint it is necessary to expand the examination of the impact of peer interaction and the HCConnect site in different environments on campus. Clearly, the peer level interaction can have a direct and significant effect. The findings of the study support previous theories related to student engagement predicting student success. To increase the effectiveness of HCConnect, an investigation into the other engagement factors needs to be reviewed and incorporated into HCConnect. The constructivism approach to learning requires the students to be the active participant. The potential benefit for the social networking site at the campus level, not just course level integration, to support student success is vast.

Principle five: Delivery methods connect to the desired outcomes.

Implementation of the social networking site has resulted in the desired outcomes of helping students achieve success. The level of participation to create stronger engagement levels of students and faculty is the next step. Theory, as well as this research outcome, shows peer interaction can impact learning. Theory around faculty interaction also shows a potential impact on learning. Resources need to be committed to improving faculty adoption of the technology. The next steps of adoption will include identifying a faculty champion to influence and assist others in using the site. A one-year implementation plan for the campus is currently in place and will continue to be evaluated and revised as necessary at the campus-level.

Practices on how a college can best implement, communicate, and promote these technologies in the curriculum must be evaluated after initial implementation. The next
step in utilizing this platform will concentrate on user participation. The faculty and administrators will continue to refine and redesign the technologies based on the data collected regarding the success of the students and their comments concerning the system. Focus groups of student users have the potential to reveal pitfalls of the project that could be re-evaluated or redesigned before the next semester of use. It is critical to rethink the most appropriate place to include the social networking lessons taking into consideration the pedagogy of the specific course. Trying to drive more collaborative type of work online can be achieved by redesigning the assignments used in courses. In this study, the counselor in control of the assignments and interacting with the students online was likely too separated from the curriculum. The possible collaborative moments that could otherwise have been achieved were minimal beyond the limited scope of the assignments. To be fully effective, future assignments will be driven by the curriculum and student learning outcomes to build the collaborative and participatory process.

Future research in this area will need to identify if the peer interaction variables used in measuring the interaction with self-efficacy need to account for activities online or to even include behaviors observed through the lurking term. How do we begin to measure lurking and define how it helps students gain information they need to succeed? An examination of the overlapping impacts of formal and informal peer interactions on self-efficacy should be addressed in future research. When formal and informal peer interactions were evaluated separately in this study, the findings did not indicate a significant result. However, when formal and informal peer interactions are combined for analysis, a considerable impact is present in predicting self-efficacy. As the students
adopt the technology on campus, the researcher hopes the students will drive the use of HCConnect. Faculty, counselors and staff will begin to realize there are missed opportunities to connect with students and even a potential to communicate information that would otherwise necessitate a face-to-face contact. As an example, the financial aid office likely answers the same procedural question from students hundreds of times a month. Using HCConnect would allow the office staff to respond once to a student question and allow for the lurking effect to communicate this message to others seeking the same information. This type of structure for communication will also allow for a platform to measure the effect. Unfortunately, communication of this nature is not a normal or common activity for college employees. As we branch out from relying on phone and email communication, social networking will likely be more effective in reaching more individuals with less effort from the communicator.

The potential of harnessing this technology to make it a truly beneficial experience is easily achievable. As defined by Kuh (2009), resource theory involves assigning resources to create structures that allow for the highest levels of student engagement. This educational value-added networking tool can induce and enhance student engagement through increased communication, collaboration and participation, ultimately driving student retention and success.
References


on small groups. Social psychological applications to social issues, 4, 9-35. New York; Plenum Press.


Appendix A  
Focus Group I  
August 2011 - Student Focus Groups  
Dr. Gopal’s Ocn 201 course – 45 minutes (total 21 students)

Class composition: Twenty-one students were broken into four groups to report back on focus group questions after an overview framing the intent of the questions to gather information about technologies used by students, improvements that could be made, etc. Groups were given 20 minutes to discuss and answer questions which then led to an overall group discussion. As seen in the notes below, the discussion did allow for insight into other issues related to students’ use of technology and resources available for student use at the campus and system level.

(Discussion Questions)

1. What types of technologies are you comfortable using?

The student groups overwhelmingly use their smartphones as a primary communication link to technologies. Laptops came in a close second depending on the situation--where students are and what they have access to. Students also reported using iPads for school and Kindle reading devices.

One group reported the desire to have the school faculty work with publishers to have more text book material available via Kindle. The younger student population voiced much more confidence in no longer using the traditional text books. Clearly, the older student population is not ready to move away from the paper artifact. The non-verbal cues on the faces of about 5 of the 21 students readily communicated this. The younger generation of students in the room (less than 24 years old) voiced the issue of saving money through the purchase of text book material at a 40% discount compared to purchasing in the bookstore.

Students also voiced their comfortableness in using touch screen technologies such as iPads. Student comments on the availability of mobile devices and mobile applications to access were a concern. Students would like to have more access to iPads as a tool for school. I asked if each student should be required to have an iPad when they enter the college. If it is a requirement across the campus, then the cost of the iPad can be factored into the student’s financial aid package. Students felt this would benefit them.

2. How do you use technologies when you need to search for information?

When on the go, students mainly utilize their smartphones, but a major drawback noted was the availability of mobile applications. The information is available on the web, but students are unable to access given their primary preferred device.

Students would like to have more access to information available via a portal including financial aid, the location of buildings on campus (since the numbering of buildings is very unorganized from the students’ perspective), good courses to take, and good instructors to take. Students
noted that asking their peers about their experiences outweighed the confidence they had in accessing information online.

When communicating with family and friends, text and posts to social networking sites (like Facebook) are the most commonly used methods among the groups.

3. **While enrolled in school, have you used specific resources to access information to help you succeed in college?**

Some students read this question as where to find research material. They noted that a good portion of material in the library is out of date. The online resources available through the library are useful. Students noted that using EBSCO is a good resource. ERIC also has a great deal of information available, however one student noted a challenge in that he thought he had to pay for the resource.

Students utilize the computers when doing a larger information search, something not accessible by mobile technology. These searches occur with (as mentioned in order) students’ personal laptops, the computers in the library, the computers in the computer lab, and computers at home.

4. **What technologies are used to communicate with friends and classmates?**

5. **What motivates you to communicate with your classmates?** For example, group assignments, study groups, made friends through class, sharing information about school?

(These two questions were combined in the discussion.)

The main technologies used to communicate with friends and classmates is via text, and secondly, via phone. Email is used but doesn’t seem to have the same instant effect as texting. When asked about reasons for contacting students, it was mainly due to an assignment or project required for class. Students typically don’t engage with each other until they have seen each other in several courses and then they tend to talk. Only if there is a need to come together, will they share contact information. This group had a large diversity of students with regard to age, progress to degree completion, and majors. Interestingly, half of the students in this focus group were home institution students of other campuses (mainly Leeward). The students with Honolulu CC as their home institution were a younger group and tended to be the quieter of the groups.

6. **Have you had to use certain technologies in class?** Laulima, myUH (in small groups)

Laulima is a good resource if faculty would use it more. The main purpose of Laulima is to review information that was already discussed in class, review powerpoints, look at syllabi, but not necessarily to use as a tool to communicate with others.
One suggestion that the groups unanimously agreed upon was more real time information on their grades and how they are doing in the class. The students do not like waiting until grades are posted at the end of the semester. Students would like to view this information through their smartphones.

7. **If you could improve the technologies to help students find information about school or communicate easily with other students, what would that be?** For example, websites, mobile apps, informational boards, social networking sites, modes to communicate easier with faculty and staff.

Students voiced their satisfaction with using STAR. They would like STAR to be available to show them what assignments have not been completed, instead of what they have completed. For example, the students would like a recommended list of courses for the next semester based upon their past courses and courses currently being taken toward their degree requirements. They would also like to use STAR to access other information and would like to see the UH portal be more friendly to use, like STAR. They would like to see STAR offer groups of recommendations for students to use. For instance, if a course availability site could categorize and pull up courses that can be used to fulfill two or three requirements. This is known as double and triple dipping. Also instead of listing all courses within a discipline, the students would prefer a link that lists classes by specific categories such as all night classes being grouped together.

A site that would allow students to access a variety of information in one place was desired. Students expressed their concern about finding the appropriate information on the web.

If students are enrolled on several campuses, they would like a feature that would show them their registration choices and how that translates into their final exam schedule. They have to plan for their physical attendance at each final, and those finals will be on different campuses.
Appendix B
Focus Group II

August 2011 - Student Focus Groups

Student Life and Development Group – 50 minutes (total 11 students)

Group composition: Eleven students belonging to the Student Life and Development group were interviewed and asked the focus group questions below. Nine of the eleven students are currently employed by the Student Life department as student help. Their responsibilities range from helping to facilitate the college’s new student orientation, manning the Student Life and Development office and providing new student support. This group is unique in that these students provide advice to new students, and one would expect them to be the most experienced in utilizing technology resources on campus.

(Discussion Questions)

1. What types of technologies are you comfortable using?

The students describe their smartphones as a “connection on their bodies.” Without that phone, they feel isolated. They utilize their phones to access information and communicate with friends and family. The second most used technology is the laptop and then iPads. As employees, these students also described their use of STAR and the MyUH portal as technologies they use on a daily basis and also teach new incoming students how to use these resources to navigate through their educational experience.

2. How do you use technologies when you need to search for information?

Typically the students will utilize their smart phones to access information. They felt that communicating by text is the best way to get and receive information. They described compatibility issues with carriers such as a Mobi. Students’ primary sources for searching for information are using text, email and Facebook.

They would like to get more information from the college by text messages, not just when there is a security alert but for daily items. An example of the type of information they are seeking would be a text message notifying students that Parking Lot I is closed for the day. The students mentioned that the UHportal should have better mobile access to information.

Students mentioned that STAR and the UHportal could be better utilized to search for information. For instance, a drop down menu that would allow students to find data easier would improve the systems.

The student group did reference the electronic resources as a source of information searching. They also used the rental system in the book store. They felt the rental system was a much better alternative since sometimes books are only used for a fraction of the courses. One student expressed his frustration of finding his resources prior to the start of the class. He suggested that
if students are not required to purchase books or equipment, that information should be posted. (This particular student seemed to have frustration in finding information in general).

3. While enrolled in school, have you used specific resources to access information to help you succeed in college?

Students try to access more information via the QR reader feature. They participate in campus activities to gain information first hand. They typically utilize STAR but would like to see better transparency between articulations of courses and ensuring that the courses they take are the courses they need for their degree completion.

They would like to have some type of shared desktop feature so students can get access to help as they are using a particular system, STAR or MyUH. Students employed at the Student Life office deal with many students needing help just navigating the site. They also mentioned that the students they are dealing with really need financial assistance. They often get caught in a situation where they don’t have any idea what their financial aid award will be, and they don’t want to take on the financial obligation without knowing their award amount. In addition, students have very little information on signing up for the payment plan or the technology that could be used more effectively to communicate about their financial aid package. A list of these resources should be better communicated.

There is apparently a syllabi repository that the students asked to have created in 2009. This information is seriously out of date; one syllabus was from 2004. Students would like to access information like this while choosing their classes.

The college catalog needs to come out in a more timely manner. Trying to advise students without having that “bible of rules” available is not in the students’ best interest.

4. What technologies are used to communicate with friends and classmates?

Text messages and phone calls are the commonly used technologies. Typically students have a smart phone devise or PDA available to communicate with others. Students keep in contact with those they work with, coordinating schedules, student life coverage hours, and communication about supporting each other.

5. What motivates you to communicate with your classmates? For example, group assignments, study groups, made friends through class, sharing information about school?

Group projects as assignments are usually the main reason for coming together. To coordinate these meetings, students use text messaging, Facebook, or email. The technologies that are not highly used in their meetings in preparing the group work are technologies such as Skype and others. These meetings are coordinated and held as face to face meetings. Other reasons for reaching out to classmates would be when a student is absent and needs the homework
assignment. One student mentioned that they would reach out to another student when a class is missed or collaboration on note taking is necessary.

6. Have you had to use certain technologies in class? Laulima, myUH (in small groups)

As an employed group of students, they are required to complete paper work such as timesheets and other employment forms for the university. If these forms could be completed and approved via mobile devices, using their iPhone and Android would be ideal.

Half the students have faculty using Laulima and they find it very useful if the faculty post powerpoints, lecturer notes and syllabi. If faculty don’t continuously update the information with course work updates or by having chat rooms, then there is no point for the students to engage as much. The other half of the students had only a few faculty members that used Laulima. In those cases, the student wished faculty would be required to post course materials online so they can access them at later times when necessary to study or answer related questions for the courses.

These students wished that within Laulima, the faculty would share their grades with them live. Once an assignment is graded and posted in the grade book, the students could immediately see their progress in the course. This would also help students make decisions about staying in the class or not. One student relayed a story about having had several assignments due prior to the drop date, but the students never got feedback about his performance on those assignments. The student asked the faculty about his grade after the deadline to drop had passed, and the faculty member said the highest grade the student could get would be a “D”. The student felt that if he could have watched his progress in real time, then he would have been able to make a better decision.

Students would like to access a listing of the events and activities on campus (including UHM athletic events) easily on a mobile device.

7. If you could improve the technologies to help students find information about school or communicate easily with other students, what would that be? For example, websites, mobile apps, informational boards, social networking sites, modes to communicate easier with faculty and staff?

Students like the use of the QR readers now being used and wish there were more of these accessible. One student mentioned that STAR is great, however, sometimes you need to ask a real person a question. Having a counselor live on line and able to answer questions would be ideal.

Also utilizing the shared desktop options would help with the navigation of Star; oftentimes the information is there but difficult to understand. One student felt having a desktop sharing experience would be helpful to walk through course choices or the use of technologies like Laulima.
Appendix C

Measures

**Sociability Scale** – adapted measures from Kreijins et al., 2005.

**Formal Peer Interaction** – *Interaction among students regarding university and study-related matters* (measures from Severiens et al. 2006, Meeuwisse et al. 2010).


**Academic Self-efficacy** - *The student belief they can pass Math 9 and re-enroll the following semester.* (measures from Hackett and Betz 1984, Lent et al. 1986)

**Student Success** – data collected based upon student completion of the course with a “C” or better. (A, B, C)

**Student Retention** – connect the students to individual identification number to determine whether they re-enrolled for course work for the following semester. (yes/no)
Appendix D

MATH 9: HCConnect Assignments  
FALL 2012  
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<tr>
<th>DATES:</th>
<th>DESCRIPTION OF ASSIGNMENTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday, August 23</td>
<td>Log on to your UH webmail and accept the invitation to join HCConnect. Create your account and request to join the Math 9 group.</td>
</tr>
<tr>
<td><strong>DUE: Friday, August 24</strong></td>
<td></td>
</tr>
<tr>
<td>1. Monday, August 27 (assignment given)</td>
<td>Post a description of your career aspirations on the Math 9 HCConnect page. Why are you at Honolulu Community College? What are you planning to major in? What type of career do you plan to enter when you are done at HCC? Why have you chosen that academic or career path?</td>
</tr>
<tr>
<td><strong>DUE: Friday, August 31</strong></td>
<td></td>
</tr>
<tr>
<td>2. Tuesday, September 04</td>
<td>Sometime during the week of September 4th you will receive a link on your HCConnect page to complete a survey for the course. The survey will help HCC determine what will help you in school and how we can organize resources to support you education.</td>
</tr>
<tr>
<td><strong>DUE: Complete the Survey by Friday, September 07</strong></td>
<td></td>
</tr>
<tr>
<td>3. Monday, September 10</td>
<td>Read through your classmates posting of their career choices and descriptions posted on the Math 9 HCConnect group site. Write to at least 4 students in your classes and ask them questions about their career choices? Question such as 1) why have you chosen that career path? 2) where do you want to work? 3) how much do people make in that line of work? 4) how will college help you achieve those career goals?</td>
</tr>
</tbody>
</table>
Due: Friday, September 14

4. Monday, September 17

Go to the HCConnect site. You will find a link to the STAR advising system on the right side of the home page. Click on that link to take you to your log in page. Log in with your UH username and password (same for your email and UH portal). Explore the “academic journey,” “the planner” and look at option of majors at the “what if journey.”

The program will tell you exactly what you have left to take for graduation. Use the planner feature to pick your classes for next semester. Then post something on the Math 9 HCConnect on what you learned by using STAR.

DUE: Friday, September 21

5. Monday, September 24

Go to your HCConnect site and log on to the STAR advising system. Log on with your UH username and password. Follow the scholarship tab and investigate the scholarships you would be eligible for. Many of the scholarships are available in the Spring, but there are other sites that will allow you to search for a wide variety of other scholarships.

Check out these sites:

- Honolulu CC Financial Aid site – Honolulu.hawaii.edu
- My Future Hawaii – www.myfutuerhawaii.com
- Hawaii Community Foundation – www.hawaiicommunityfoundation.org

There are lots of scholarship money out there...you just gotta apply? Send Erika Lacro a private message if you decide to apply.

DUE: Friday, September 28

6. Monday, October 01

Post onto the Math 9 HCConnect 4 usefully things at HCC that you think people should know about. These should be things, people or
services that have helped you navigate through getting to HCC. This could include meeting with counselors, scholarship opportunities, career services, etc.

**DUE: Friday, October 05**

7. Monday, October 08

Log on to HCConnect and go to the College Success Tips Link. Complete the Developing the Schedule exercise. After you have completed the exercise, write down on the HCConnect Math 9 discussion: Did you have enough time to spend on the activities you listed? How will you arrange your day so that you can make time for classes and studying? Remember, creating a schedule helps you keep on task!

**DUE: Friday, October 12**

8. Monday, October 15

**Math 9 Group Discussion & Announcements:**

Assignment: Log on to HCConnect and go to the Effective Study Habits link.

Complete the short quiz on “Checking My Study Habits”

When you are done, read the outcome of your test score and other suggestions on how you can succeed in your studies.

Share your effective study techniques on the discussion board.

**DUE: Friday, October 19**

9. Monday, October 22

**Math 9 Group Discussion & Announcements:**

Click on the “when to take notes” link and read through the article.

After reading this article, share on the HCConnect Math 9 discussion:

What is the most effective method that you use to take notes?
DUE: Friday, October 26
10. Monday, October 29
Math 9 Group Discussion & Announcements:

Click on: “Mastering One Test”

After reading this article, share on the HCCConnect Math 9 discussion:

What is the most effective method that you use to prepare for your tests?

DUE: Friday, November 02
11. Monday, November 05
Investigate ASUH Clubs by clicking on the GROUPS link. Post on the Math 9 HCCConnect page which 3 Clubs on campus you found to be of interest and why.

DUE: Friday, November 09

12. Monday, November 12
It’s almost the end of the semester!! Post on the Math 9 HCCConnect page what you think about using HCCConnect. Is it useful? Did you get to know your classmates, tutors, teachers? Would you recommend others using HCCConnect?

DUE: Friday, November 16

13. Monday, November 19
Sometime during the week of November 19th you will receive a link on your HCCConnect page to complete a survey for the course. The survey will help HCC determine what will help you in school and how we can organize resources to support you education.

DUE: Complete the Survey by Friday, November 30
### Appendix E
Survey Instrument

#### *1. Rate the following statements about your confidence using the scale provided.*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Lowest (1)</th>
<th></th>
<th></th>
<th>Highest (10)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I am <strong>CONFIDENT</strong> I can complete the in-class assignments for this course (Math 9).</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
<td></td>
</tr>
<tr>
<td>I am <strong>CONFIDENT</strong> I can complete the online assignments (ALEKS) for this course.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
<td></td>
</tr>
<tr>
<td>I am <strong>CONFIDENT</strong> I can successfully pass this class (Math 9).</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
<td></td>
</tr>
<tr>
<td>I am <strong>CONFIDENT</strong> I can graduate from HCC.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
<td></td>
</tr>
</tbody>
</table>

#### *2. Rate the following statements about HCConnect using the scale provided.*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The HCConnect environment enables me to easily contact my student peers.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>I do not feel lonely in this HCConnect environment.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>The HCConnect environment enables me to get a good impression of my student peers.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>The HCConnect environment allows spontaneous informal conversations.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>This HCConnect environment enables us to develop into a well performing team</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>The HCConnect environment enables me to develop good working relationships with my student peers.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>The HCConnect environment enables me to identify myself with my student peers.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>I feel comfortable with the HCConnect environment.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>The HCConnect environment allows for non-task-related conversation.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>The HCConnect environment enables me to make close friendships with my student peers.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
</tbody>
</table>

#### *3. Rate the following statements using the scale provided.*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fellow students invite me to work together on school tasks.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>It is difficult to find a group of students to collaborate with.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>In this program, students work on their own.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>Student peers approach me to discuss study tasks.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>Student peers do not appreciate my feedback.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>Student Peers listen to my remarks.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>My interpersonal relationships with fellow students have a positive influence on my study performance.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>I collaborate well with fellow students.</td>
<td>c</td>
<td>c</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
</tbody>
</table>
**4. Rate the following statements using the scale provided.**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I hardly know anyone here.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Fellow students are interested in me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Fellow students often ask me to spend time with them.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Student peers are involved with me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I have close interpersonal relationships with fellow students.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**5. Rate the following statements using the scale provided.**

<table>
<thead>
<tr>
<th>Statement</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>I <strong>BELIEVE</strong> I can successfully complete the in-class math assignments of this class.</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I <strong>BELIEVE</strong> I can successfully finish the online assessments on ALEKS.</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I <strong>BELIEVE</strong> I can successfully earn credit for this course (Math 9).</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I <strong>BELIEVE</strong> I can successfully complete the graduation requirements for my major at HCC.</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Appendix F
Math 9 Course Description

MATH 09 - Fundamentals Of Mathematics

Course Description

The purpose of this course is to prepare students with the necessary foundation in mathematical skills to enter Career Technical and Liberal Arts programs. It also provides the students who are already in these programs an opportunity to strengthen their backgrounds. Graded on a CR/N basis.

8 hrs lect./lab. per week

Student Learning Outcomes

Upon successful completion of MATH 09, the student will be able to:

• Define prime and composite numbers

• Find the prime factorization of a number

• Find the greatest common factor and the least common multiple of two numbers

• Manipulate fractions: simplify, add, subtract, multiply, divide, compare, and express as a mixed number or as an improper fraction

• Solve problems involving fractions

• Manipulate fractions written in decimal form: round to a given place value

• Manipulate signed numbers: relative values, absolute values, add, subtract, multiply and divide

• Simplify and evaluate algebraic expressions

• Solve basic linear algebraic equations

• Solve word problems using algebra

• Manipulate percentages: convert fractions to percents, solve the percent equation, calculate simple interest

• Work with ratios; work with proportions