STUDENTS' PERCEPTIONS OF COMMUNICATIONS PROVIDED BY FACULTY AND PEER LEADERS, COURSE MOTIVATION, AND FINAL PROJECT INNOVATIVENESS IN CAPSTONE COURSES

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DEDICATION

I come from a long line of love

When the times get hard, we don't give up

Forever in my heart and in my blood

You see I come from a long line of love.

-- Michael Martin Murphy

This work is dedicated to my family who has always loved and supported me.

AKNOWLEDGEMENTS

Appreciation is a wonderful thing.

It makes what is excellent in others belong to us as well.

-- Voltaire

Thank you for sharing your excellence with me. I have been blest to have the opportunity to learn from you.

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CHAPTER I

INTRODUCTION

Fierce global competition has resulted in a need for institutions of higher education to provide college students opportunities to engage in innovation experiences (Xu & Chen, 2010). Innovation is the process of creating or improving a service or product in the areas of marketing, manufacturing, and management (Qinqin, Dan, & Mingbo, 2010). Similarly, Carlson and Wilmont (2006), wrote that "innovation is the process of creating and delivering new customer value in the marketplace" (p. 6).

According to Popkin and Kobe (2006), America's innovation process is vital to promoting economic growth, and constant innovation is the only way to increase prosperity. World-wide "there seems to be an insatiable appetite… for understanding the process and outcomes of innovation solutions…" (Ettlie, Groves, & Vance, 2011, p. 1). Innovation is important because it is a primary driver of competitiveness in the global economy (Qinqin, Dan, & Mingbo, 2010). Innovation is crucial in our society because it leads to a higher quality of life (Carlson & Wilmont, 2006).

Innovation is essential to the future of our society, and as a result of the need to prepare college students to succeed in business organizations, it has become increasingly important to investigate the factors which enhance or discourage creativity and innovation (Tierney, Farmer, & Graen, 1999; Shalley & Gilson, 2004; Zhang & Bartol,

2010). Realizing that creativity and innovation are the lifeblood of many professional areas (Althuizen, Wierenga, & Rossiter, 2010) it is obvious that to prepare students for career success in a changing global society educators must consider the role of creativity and innovation in the classroom. The connection between creativity and fostering innovations and change is clear, because being creative is most fundamentally about advancing change (Harding, 2010). The factors impacting individuals to engage in innovative behavior are increasingly attracting more interest from colleges and corporations (Aijun, Weirong, & Jun, 2010).

For example, the National Academy of Engineering has reported that creativity, innovation and leadership are among the essential attributes of future engineers (Doboli et al., 2010). Researchers have identified innovation skills to include the ability to successfully engage in leadership and communications (de Jong & Hartog, 2007). According to Farace, Monge, and Russell (1977), innovation is a function of communications that includes the generation of new ideas, practices and behaviors for improving society. Realizing this need, identifying the skills and abilities, which impact innovative ability has become increasingly important to both researchers and educators (Xu & Chen, 2010).

Additionally, personal motivation has been identified as a key element in idea generation and creativity (Sosik, Kahai, & Avolio, 1998). Motivation is different from ability. Ability refers to what students "can do" while motivation refers to what they "will do" (Marra & Wheeler, 2000). According to Carlson and Wilmont (2006), "innovation is inspired by fundamental needs that motivate" and three basic human needs make up the *Motivation Mantra*: "achievement, empowerment, involvement" (p.

221). It is important to understand the role of motivation in developing innovations-based learning experiences (Marra & Wheeler, 2000).

Background and Setting

One such classroom innovation learning experience is the OSU innovations course. Since 2008, more than ninety students have participated in the innovations experience (C. S. Blackwell, personal communications, May 18, 2011). Based upon the initial grant proposal for the project this multidisciplinary innovations course was developed to meet society's need for work-force ready graduates prepared to succeed in innovations (Tilley et al., 2007). Understanding the need to provide innovative learning experiences in the undergraduate curriculum, faculty from Oklahoma State University (OSU), in collaboration with colleagues at California Polytechnic State University, and the University of Nebraska procured a United States Department of Agriculture Higher Education Challenge grant to develop educational programming designed to prepare graduates to become leaders in innovation (Tilley et al., 2007).

According to the grant proposal (2007), "There is an immediate need for programs to teach future professionals to address innovation problems…" (Tilley et al., 2007, p. 5). The course was developed to meet this societal need by teaching students about the innovations process. The purpose of the course, according to the course syllabi, was to provide students learning experiences related to innovative technical assistance, marketing, communications and business planning (Tilley, Weckler, Holcomb, Blackwell, 2010) The educator team developed learning experiences designed to enable students to work with real-world clients in the development of innovative products (C. S. Blackwell, personal communication, May 2, 2011). Students were then encouraged to

actively engage in the innovations process. Students worked in teams and engaged in the following stages: a) learning the basic components of the innovations process; b) brainstorming possible solutions for real-world business problems; c) developing solutions; d) implementing solutions; and e) marketing final innovations (Tilley et al., 2010).

Innovation Course Logistics

At OSU, educators from three academic disciplines team taught the innovations course. The course was comprised of educators and students from Agricultural Economics, Agricultural Communication, and Agricultural and Biosystems Engineering. Two of the educators also served as the faculty leaders for their respective single disciplinary capstone courses in agricultural economics and the agricultural communications. Students were recruited to take the innovations course by the team of collaborating educators (C. S. Blackwell, personal communication, May 2, 2011). Students enrolled in the course with the understanding that the innovations experience was a two-semester long commitment. Engineering students engaged in the two semester innovations capstone course as a requirement of their degree plan. However, when the students elected to take the innovations course in agricultural economics and communications, the faculty advisors substituted six hours of senior level capstone experiences and enrolled the students in the two-semester innovations course (C. S. Blackwell, personal communication, May 2, 2011).

Throughout the course, students worked in multidisciplinary teams led by both faculty mentors and peer leaders. In addition to the innovations curriculum, students were taught about leadership, communications, and motivation as it relates to innovation

through a combination of methods. Educators used lecture, hands-on learning opportunities, and personal conversations to guide the learning process. The course textbook, *Innovations,* written by Carlson and Wilmont (2006), includes sections specifically relating to innovations, motivation and communications.

Students engaged in real-world innovation projects while working in multidisciplinary teams. In addition to the hands-on learning experience, students also completed weekly coursework and project reflection memos. Each team was paired with an industry client with whom the teams work closely. Then students were asked to develop an innovations product as well as a business, marketing, and communications plan as a requirement of the course (C. S. Blackwell, personal communication, May 2, 2011). At the end of the fall semester, an update presentation was conducted. Then the final deliverables were presented to the innovation client at the end of the second semester in this capstone course.

Rationale of Senior Capstone Experience

The rationale behind developing capstone courses is to enable students to reflect on their academic experiences and apply what they have learned in a professional setting (Goldstein & Fernald, 2008). Similarly Jenkins et al. (2002) wrote, "The capstone course focuses on how to accomplish the construction of technical designs in the face of real-world constraints" (p. 78). The primary goal of a capstone course is to design an opportunity that enables students to participate in real-world learning with the support of the classroom environment (Goldstein & Fernald, 2008).

One key concern for educators teaching senior capstone experiences is understanding students' motivation for retrieving knowledge and implementing learning

into real-world projects (Payne, Flynn, & Whitfield, 2008). Motivational theory is important when considering students' success in capstone experiences (Johari & Bradshaw, 2008). Encouraging communication based upon positive relationships has been shown to impact students' motivation and achievement in capstone experiences (Johari & Bradshaw, 2008).

Statement of the Problem

According to Carlson and Wilmont (2006), it is "time for society to be empowered by innovation…" (p. 291). They wrote that only through innovation can society achieve prosperity and the role of nations is to create the highest possible value for societal stakeholders (Carlson & Wilmont, 2006).

Our nation's wealth is directly related to its human capital that includes the level of training and education of our national labor force (Popkin & Kobe, 2006). Therefore, more research is needed about innovation-based learning experiences. Educators must understand the factors that impact innovation in the classroom in order to improve student learning in innovation experiences (Schunk et al., 2008). Education is important and improvements are needed "…to build the highly proficient and skilled labor force the United States will need" (Popkin & Kobe, 2006, p. 59).

Therefore, educators must understand the factors that impact innovation and creativity in the classroom in order to improve classroom innovation experiences. It is important to understand the factors in capstone courses currently influencing the innovativeness of students' final projects. This project focuses on the factors of communication and motivation specifically (C. S. Blackwell, personal communication, June 2, 2011).

Significance of the Study

This study was significant because it adds to the innovations in the classroom literature base and investigates the relationship between communications provided by faculty and peer leaders, motivation, and the innovativeness of the final project in the classroom environment. This study sought to acquire information related to the perceptions of students working collaboratively on a year-long project with real-world clients in multidisciplinary teams and provided a foundation for future initiatives to improve student learning opportunities related to innovation.

Purpose of the Study

The purpose of this study was to assess students' perceptions of communications provided by faculty and peer leaders in relationship to both students' perceptions of their course motivation as well as their perceptions of the innovativeness of their final project in single and multidisciplinary capstone courses.

Research Questions

The following research questions guided this study:

1. What are the demographic characteristics of students in the identified capstone courses, including major, academic level, and sex?
2. What are students' perceptions of the communications provided by their faculty leaders in capstone courses?
3. What are students' perceptions of the communications provided by their peer leaders in capstone courses?

4. What are students' perceptions of their course motivation in capstone courses?
5. What are students' perceptions of the innovativeness of their final project in capstone courses?
6. What relationship exists between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation in capstone courses?
7. What relationship exists between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation in capstone courses?
8. What relationship exists between students' perceptions of their course motivation and students' perceptions of the innovativeness of their final project in capstone courses?

Limitations of the Study

1. This study was conducted using self-report data.
2. It was impossible to control for outside factors that may have caused students to self select into the single or multidisciplinary courses in economics and communications. However, the engineering students did not have an option and all were enrolled in the multidisciplinary innovations course.
3. The varying lengths of the single versus multidisciplinary courses could have also provided an impact that could not be controlled for given the parameters of the study.
4. The scope of this study was limited to the investigation of the research variables as they relate to four specific capstone courses.

5. The generalizability of the results from this study is limited to this specific population, although the methodology may be employed in future studies.

Assumptions of the Study

1. The instrument used in the research measured the variables studied.
2. Participants in the single or multidisciplinary courses were not significantly different before the capstone learning experiences.
3. Differences in students' perceptions can be attributed to differences in the single or multidisciplinary courses.
4. Participants in the single or multidisciplinary courses did not interact or share experiences.
5. The interpretation of the data reflected the students' perceptions.

Definition of Terms

The following defines the key terms used throughout this study:

Communication is "the process through which messages, both intentional and unintentional create meaning." (Baldwin, Perry, & Moffitt, 2004, p. 5)

Creativity is a high-level intellectual activity which results in a new idea (Badran, 2007).

Innovations "is the process of creating and delivering new customer value in the marketplace" (Carlson & Wilmont, 2006).

Multidisciplinary innovations course is an educational opportunity which is designed to produce workplace-ready graduates capable of participating in and eventually leading private sector innovation (Tilley et al., 2007).

Leadership includes communication between leaders and followers. (Northouse, 2009). This view states that leaders must be fully aware of followers' motivations and understand that leadership is an interactive event (Northouse, 2009).

Motivation is the process which includes the instigating and sustaining of goal-directed activity (Schunk, Pintrich, & Meece, 2008).

Multidisciplinary teams are made up of students from multiple collaborating departments (Thigpen, Glakpe, Gomes, & McCloud, 2004).

Summary

The factors related to innovative behavior are increasingly attracting more interest from colleges and corporations (Aijun, Weirong, & Jun, 2010). Researchers have endeavored to study possible factors related to innovation. In order to prepare students for the future, research is needed which explores students' perceptions of communications provided by faculty and peer leaders in relationship to both students' perceptions of their course motivation, as well as their perceptions of the innovativeness of their final project in single and multidisciplinary capstone courses.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to assess students' perceptions in single and multidisciplinary capstone courses. Chapter I addressed the background of the study as well as the statement of the problem and the significance of the study. Chapter I also provided the research questions, limitations, and assumptions of this study.

This review of literature focused on findings related to previous research in the relationships between the constructs of communications provided by faculty and peer leaders, course motivation, and innovation.

Innovation in the Classroom

According to Horibe (2001), "radical innovation, the kind inconsistent with our present strategy, is no longer an option but an imperative" (p. 3). This need has resulted in studies to identify methods of improving companies' innovativeness (Tucker, 2008). For example, according to Tucker (2008), in order to encourage innovation in a business organization, it is important to accomplish the following: "1) Spell out expectations regarding innovative behavior; 2) Publicize and promote the kind of behavior you seek; 3) Create a curriculum of innovation; 4) Provide basic training in creativity; and 5) Provide more advanced innovation training in select groups" (p. 49).

These guidelines provide a helpful explanation for innovations in a business environment. Unfortunately, less is known about innovations in the classroom. As a result, few educational opportunities exist which teach students about the innovations process (Tilley, 2007).

In the Carlson and Wilmont (2006) student textbook used in the innovations course, the authors gave a definition which included adding value for customers. However, it is important to note that innovations and the value customers perceive from innovations can take many forms. For example, the figure below expresses a systematic definition of innovation.

Figure 1

Systematic definition of innovation from Carlson and Wilmont (p. 306)

Innovation is the…
introduction and commercial sale of new or improved products.
introduction and commercial use of a new method of production.
introduction of a new form of business organization
new uses for existing products
new markets for existing products
new distribution channels

Viewing the figure, it is clear that the concept of innovations is complex and multifaceted. However, the role of educator in stimulating and developing the multidisciplinary innovations course is currently unknown. Carlson and Wilmont (2006) wrote that innovation needs to be made into a discipline and systematically understood and taught as a specific subject.

Creativity's role in Innovation

The terms creativity and innovation are not the same; however, they are often used interchangeably (Badran, 2007). According to Amabile (1996), creativity is the development of novel and useful ideas which occur in the early stages of innovation. Innovation is often referred to as the concept of taking exceptional ideas and transforming them into something that is tangible for others to use (Richards, 2003).

Business experts point out that innovation is more than a creative new idea or gadget (Carlson & Wilmont, 2006). This perspective is based upon the concept that innovation is a useful business process which takes a creative idea and implements it in a useful application (Carlson & Wilmont, 2006). Creativity is a phase of innovation, and according to Richards (2003), "The goal of creativity is exploration and invention. The goal of innovation is transformation and implementation" (p. 14).

According to Xiang, Qian, Nini, and Lei (2010) transforming creativity into innovative behavior is an important goal of business leaders. In their study of 273 employees, they compared individuals' self-rated creativity with supervisor-rated innovation behavior and found weak transformation of creative ideas into innovative behavior. Richards (2003) explained that creativity and innovation have divergent goals and are really two separate activities which require different mindsets and skill sets. According to Richards (2003), "Creativity looks outside experience for ideas. Innovation brings ideas back into experience" (p.14).

Therefore it is clear that creativity, which occurs in the early stages of innovation (Amabile, 1996), is an important step. However, it is essential to realize that

successful innovation is the result of harnessing creative ideas for the purpose of implementation which benefits society (Richards, 2003).

Understanding the differences between creativity and innovation is a responsibility of leaders (Gryskiewicz, 2000). Leaders are change agents responsible for supporting followers to bridge the gap between creative thought and successful implication of ideas (Yao et al., 2010). Leaders, as the directors of operational activities, are responsible for providing persuasive communications which encourage and support growth (Patterson, 2009). The driving force to improve creativity and innovation in our society comes from the efforts of leaders (Basadur, 2004).

Multidisciplinary Initiatives in Innovation

Leaders in higher education should focus on the benefits of multidisciplinary learning (Scheider, 2011). Multidisciplinary learning in innovation includes projects in which "students may practice the process of envisioning, framing, planning and implementing innovation" across disciplines (Benedetto et al, 2010, p. 10). According to Van der Vegt and Bunderson (2005), benefits of expertise diversity are realized through the cross-fertilization of ideas. One benefit of multidisciplinary projects is the diversity of expertise which "refers to differences in the knowledge and skill domains in which members of a group are specialized as a result of their work experience and education" (Van der Vegt & Bunderson, 2005, p. 533).

In a study of 180 students, Ivins (1997) found that multidisciplinary teams resulted in tangible and intangible benefits. The tangible benefits included the rapid development of marketable products; while, the intangible benefits included

advancements in interpersonal skills and motivation (Ivins, 1997). Similarly, Alves, Marques, Saur, and Marques (2007) wrote that idea generation necessary in innovation is most fruitful in collaborative multidisciplinary environments.

Understanding the potential benefits, it becomes important that leaders encourage the development of successful multidisciplinary teams (Van der Vegt & Bunderson, 2005). Leaders need to encourage multidisciplinary learning because true innovation requires individuals capable of working across disciplines (Scheider, 2011).

Conceptual Framework

According to Carlson and Wilmont (2006), innovation is the successful creation and delivery of new or improved products or services that provides value. Understanding the attributes of innovation is important in developing a conceptual framework that explains the relationship between variables that are associated with successful innovation. Unfortunately, no one existing theory explains the factors which impact innovation in the classroom. In an effort to study innovation in the classroom, it would be necessary to combine literature from the business, engineering, and communications academic disciplines with current educational research theories.

Carlson and Wilmont (2006) proposed that collaborative communications impact motivation and innovation. Building upon this concept the foundation of the conceptual framework for this study is based upon innovations research findings in corporate and academic settings. For example, Monge, Cozzens, and Contractor (1992), wrote about the relationship between communication, motivation, and organizational innovations. In their study the researchers were able to use measurements of communications and motivation

variables to predict the innovativeness of individuals. The researchers used these variables to forecast the amount of individual innovation within 77 and 86 percent in researched cases (Monge, Cozzens, & Contractor, 1992).

Similarly, Tang (1999) developed an inventory of effective organizational innovativeness. In this inventory, the researcher found significant relationships between the variables of communications, motivation, and innovation. Tang proposed a complex relationship between variables that ultimately impact organizational innovativeness (1999). In addition, Abu Bakar, Mustaffa and Mohamad (2008), have also researched the impact of communications on team-oriented commitment. They found that positive communications impact successful outcomes.

Realizing that improving and increasing innovation are societal needs (Popkin & Kobe, 2006), it becomes clear that researchers must not only study the innovations process but also the factors related to successful innovations-based learning experiences. Studies of innovations in commercial settings have identified a relationship between communications, motivation, and innovation. Unfortunately, little is known about students' experiences and perceptions of classroom innovation learning experiences.

Faculty Leadership in the Classroom

According to Schunk, Pintrich, and Meece (2008), teaching is leadership within the classroom, and it impacts students' motivation and classroom behaviors. One factor often cited in innovation and creativity literature is the influence of leadership (Zhang & Bartol, 2010). The concept of leaders focused on encouraging others to think innovatively has been referred to as creative leadership (Basadur, 2004). Engaging in creative leadership has the end result of motivating followers to embrace creativity and

innovation (Harding, 2010) and is especially important in the classroom. According to Basadur (2004), effective leaders are those who can lead others to think in innovative ways to drive successful change. Therefore, it is clear that success in the classroom will result when educators gain a stronger understanding of their leadership role and overall impact on student motivation (Sass, 1989) related to creativity and innovation.

According to Schunk et. al. (2008), three types of leadership exists in the classroom and these include democratic, autocratic, and laissez-faire styles. Research has proven that democratic leadership is the most successful in motivating positive student behavior, because "democratic leadership has the added benefit of teaching the group to collaborate on projects and function independently in the leader's absence" (Schunk et. al., 2008, p. 313). In contrast, autocratic and laissez-fair leadership cause unnecessary tension and anxiety in the classroom and create a negative classroom environment, which has been shown to negatively impact student motivation (Schunk et. al., 2008, p. 313). Understanding the role of teachers as leaders in the classroom will enable educators to improve the quality of the learning experience for students. More research is needed to understand the connection between democratic leadership and the role of teachers in the classroom.

Researchers have shown it is necessary to understand the educators' leadership role within the classroom and its impact on students' motivation (Filak & Sheldon, 2008). According to Basadur (2004), effective leaders are those who can lead others to think in innovative ways to drive successful change. Therefore it is clear that success in the classroom will result when educators gain a stronger understanding of their impact on student motivation (Sass, 1989) related to creativity and innovation.

One way leaders inspire followers to work towards achieving organizational goals is through motivation (Barbuto, Fritz, & Marx, 2002). Previous research has shown that leaders can impact followers' creativity and effectiveness in a team setting (Ching-Wen, Chang-Tseh, Kai-Tang, & Menefee, 2009). In a study of 50 undergraduate students working in virtual teams it was found that motivating language of leaders impacted creative results (Ching-Wen et al., 2009). The researchers used an experimental design to test multiple types of motivating language provided by leaders. The findings indicated that the most ideas were expressed in the teams whose leaders demonstrated an empathetic approach to motivational language.

Research has also shown that when leaders involve followers in innovative experiences, the result is a positive impact in motivation (Basadur, 2004). Educators can use this finding when leading students. For example, educators can promote greater motivation for classroom assignments by making learning more relevant, interesting, and accessible to students (Thompson & Thornton, 2002).

Student Leadership in the Classroom

In comparison, researchers have also found that the communication activity of team leaders plays an important role in the innovations process (Barczak & Wilemon, 1991). Often team leaders are expected to fulfill the role of change agent and take on the responsibilities for empowering others to work toward a common organizational goal (Kolb, 2003).

In a study of engineering student team leaders, researchers found that participating in team leadership activities increased student leaders' self-confidence,

communication skills, and ability to think under pressure (Johnson & Loui, 2009). Researchers have found that poor team situations are often a result of students being underprepared in the basic skills related to team dynamics, training, and skills (Goodwin, Campbell, & Wolter, 1997). However, in a study of student teams in an engineering design course it was found that the attitudes of team members about leadership strongly impact the final team projects (Knecht, 2002).

In a study of technology teams, the team members believed that important roles for a team leader included initiating structure, providing autonomy, exhibiting personal commitment, and showing consideration (Kolb, 2003). However, research has shown that students are generally underprepared to successfully work in teams (Goodwin, Campbell, & Wolter, 1997). According to Knecht (2002), it would be beneficial to have students participate in interpersonal skills-building experiences to create a successful environment that encourages team interactions and idea generation.

Communications in the Classroom

The call for communications and innovation skills can be heard loudly on university campuses around the globe (Xu & Chen, 2010; McAleer & Szakas, 2006). Administrators, professors, and students have been asked to join this newest education revolution. In this new era of innovation education, students need to be taught to engage in innovation activities and develop strong organizational communications skills to compete in the global economy which requires employees to engage in knowledge creation activities (McAleer & Szakas, 2006).

Identifying the connection between innovations and communications is imperative. Miller (2009) proposed that relationship-based communication plays a key role in encouraging, supporting, and maintaining innovation. Realizing that innovation is a primary function of communication (Farace, Monge, & Russell, 1977), it becomes clear that to truly understand the innovation process researchers must understand the relationship between communications and innovation.

Rogers (2003) explained that communication is a process in which participants create and share information with others to successfully innovate. In Rogers (2003), diffusion of innovations research, he often highlighted the role of communication channels in the adoption of innovations. He also discussed the role of opinion leaders and change agents who share experiences and communicate with potential adopters (Rogers, 2003).

It is important to note that communication includes messages that occur between two or more interdependent members of a community and are offered to initiate, define, maintain, or further a relationship (Dainton & Zelley, 2011). Similarly, communications has been defined as "the process through which messages, both intentional and unintentional create meaning" (Baldwin, Perry, & Moffitt, 2004, p. 5).

Organizational communication has also been used to describe the nature of relationships and the process of sharing messages. According to Stacks and Salwen (2009), organizational communications refers to the systematic theoretical approach of communications used to control behaviors in organizations. Organizational communications is a three-step process consisting of 1) ordering and directing; 2) monitoring members' responses, and 3) rewarding desired behavior (Stacks & Salwen,

2009). These theories focus on the understanding of both the content and the purpose of messages that support communication.

According to Thomas and Busby (2003), communications is generally accepted as the most important skill for students to develop during learning experiences and includes the ability to communicate meaning in an appropriate manner. Researchers also proposed that students gain independent innovative abilities by engaging in experiences that strengthen their communications skills (Xu & Chen, 2010).

Communications skills are vital in the innovation process as individuals participate in communication activities that stimulate knowledge diffusion, provide vision, delegate tasks, and provide support for innovation (de Jong & Hartog, 2007). As a result, universities have increasingly experienced pressure from stakeholders to provide opportunities for students to acquire and develop communications, and innovation skills as needed in industry (Thomas & Busby, 2003).

Therefore, it is clear that at the heart of this new education revolution is a need for learning experiences which enable students to practice their innovation and communications skills. However, despite the obvious need for students to become innovative thinkers with strong communications skills very little research exists regarding educational experiences designed to enable students to develop and practice their organizational communications skills in an innovations environment.

Leader communication has been shown to be a critical factor in individual motivation and performance (Mayfield & Mayfield, 2002). The communications of leaders are imperative to successful team interactions and individual motivation (Zerfass & Huck, 2007). Effective communication is an important determinate of

creativity in modern innovation activities (Kratzer, Leenders, & Van Engelen, 2004). Consequently, understanding the impact of leader motivational communication on an individual's desire to engage in creative and innovative projects should be a goal of researchers (Mayfield & Mayfield, 2006). "Motivational communication … is communication with the intended instrumental goal of energizing, directing, or sustaining the behavior of another" (Zorn & Ruccio, 1998, p. 469). According to Kratzer et al. (2004), in a study of 243 team members representing 44 innovation teams, problem-solving communications was found to positively impact the creative functioning of innovative teams. This is an important finding that ties together the idea that the communications of leaders impacts the creativity and innovation of teams. It is clear that connections exist; however, more research is needed to better understand the relationships between the variables (Kratzer, et al., 2004).

One theory, which encompasses the impact of motivational communications, is the theory of motivational language. According to the theory of motivating language (Sullivan, 1988). the communications of leaders impact follower attitudes, performance and innovation (Mayfield & Mayfield, 2006). Within the theory, three forms of motivational language are described including direction-giving language, empathetic language, and meaning-making language (Mayfield & Mayfield, 2006). According to a study of college students participating in a business innovations team experience, the communications of leaders that focused on direction-giving and empathetic language resulted in improved student participation and accuracy in implementation (Ching-Wen, et al., 2009).

Similarly, Carlson and Wilmont (2006) wrote that continuous, respectful communications are needed in the innovations process. According to a study of professionals working in technology business, it is possible to impact internal motivation through recognition; in addition, positive leader communications have a powerful impact on an individual's innovative behavior (Aijun, et al., 2010). This finding is supported in another business study, which reported that group communication can increase innovation when leaders plan regular and sustained efforts to encourage individuals' motivation to innovate (Monge, Cozzens, & Contractor, 1992).

Communications Provided by Faculty Leaders in the Classroom

The communications between professors and students impacts student success (Sass, 1989). Professors are an influencing agent for student motivation and encourage students by providing enthusiastic feedback and cultivating a positive classroom environment (Rugutt & Chemosit, 2009). Researchers have shown it is necessary to understand leadership and communications roles within the classroom and their impact on students' motivation (Filak & Sheldon, 2008). According to Schunk et. al. (2008), four important forms of feedback include performance, motivational, attribution, and strategy which play a key role in impacting student behavior. The most productive form is strategy feedback, which is based on recognizing student effort in the learning process; strategic feedback promotes student motivation and self efficacy by informing students how well they are applying a strategy to improve their work (Schunk et. al., 2008). Understanding the role of feedback in increasing student motivation, it becomes possible for professors to improve the strategic quality of their communications in an

effort to provide a learning environment designed to support student creativity and innovation (Schunk et al., 2008).

According to Simmons and Page (2010), students' motivation is impacted by the classroom environment. McCombs (1994) reported several strategies which can be implemented to establish a classroom environment designed to support students' natural motivation.

> These strategies are: (a) finding ways to help students take increasing responsibility for their own learning and meeting the need for self-determination through student choice and control; (b) helping students become academic risk takers through modeling, skill training, and self-assessment strategies; and (c) understanding yourself and how these qualities relate to establishing a positive climate for learning (McCombs & Pope, 1994, pg. 123)

These strategies demonstrate the influence the educator has to impact the classroom environment through positive communications which increase the students' motivation for learning (McCombs & Pope, 1994). Research shows that professors who respect their students' abilities and endeavor to empower students' academic decision making through positive communications are more likely to provide a learning environment which encourages student creativity (Simmons & Page, 2010).

Communications Provided by Student Peer Leaders in the Classroom

Research shows that students benefit from working in teams, especially in the area of communications and leadership (Hansen, 2006). However, the communications of student leaders is often limited to procedural leadership and includes the organization of

team member duties (Heckman & Misiolek, 2005). Problems related to student peer leadership in business classrooms include: 1) lack of communications; 2) lack of team development; 3) free-riding; and 4) social loafing (Hansen, 2006). Understanding these problems and supporting peer leaders as they overcome difficulties is important (Hansen, 2006). Training team leaders in business courses resulted in stronger communications within teams as well as fostering respect and trust among team leaders (Markulis, Jassawalla, & Sashittal, 2006).

In a study of engineering students, researchers examined communications patterns for strong and weak teams (Heckman & Misiolek, 2005). The researchers found that strong team leaders initiated and received significantly more social and task related communications than teams with weak leaders (Heckman & Misiolek, 2005). More research regarding team leader communications is needed and should be systematically assessed (Markulis, Jassawalla, & Sashittal, 2006).

Motivation in the Classroom

According to Lei (2010), "Motivation often determines whether and to what extent students actually learn a challenging task, especially if the cognitive and behavioral processes necessary for learning are voluntary and under their control" (p. 159). Realizing the essential role of motivation related to student success it is imperative to better understand the factors which encourage and support students' behaviors related to creativity and innovation. According to recent studies, leaders have the opportunity to encourage followers to think creatively which simultaneously impacts intrinsic motivation (Basadur, 2004).

In order to advance change, it becomes necessary to understand factors including leadership and communication, which motivate students' creativity and innovation. One of the more important forms of human capital is creativity (Runco, 2007), and motivation is recognized in virtually all contemporary definitions of creativity (Schunk, Pintrich, & Meece, 2008). Runco (2007) also reported that an individual's extrinsic incentives, intrinsic motivation, and psychological needs impact creativity.

The connection between motivation, engagement and psychological needs is often cited in the motivation literature. For example Lei (2010), found that there was a connection between motivation and student engagement. "Intrinsic and extrinsic motivation are two major categories with which college students are engaged in the process of learning new knowledge and skills" (Lei, 2010, p. 159). Psychological needs also impact motivation.

Educators must take students' needs into consideration, because when students' needs are satisfied during activities they are more likely to value and persist in the learning experience (Filak & Sheldon, 2008). According to Elliott and Dweck (2008), students have a need to feel competent, autonomous, related, and purposeful. Understanding basic needs will enable educators to improve their interactions with students (Pomerantz, Fei-Yin Ng, & Wang, 2008).

Specifically in the innovation process, business experts Carlson and Wilmont (p. 221-226, 2006), discussed the 'Motivation Mantra' which includes achievement, empowerment, and involvement as shown in the figure on the next page.

Figure 2

Motivation Mantra Carlson and Wilmont (2006, p. 221-226)

Needs	**Descriptions**
Achievement	People want to learn new skills, become more valuable, and be recognized and appreciated.
Empowerment	People want freedom to work creatively and do their jobs.
Involvement	People want to feel included and respected.

However, researchers have not investigated the Motivation Mantra concept within an innovations classroom. Although capstone courses are often referred to as real-world learning" (Kerrigan & Jhaj, 2007), it is unclear what motivational similarities and differences exist between the classroom and the working professional world.

Business expert Tucker (2008) reported that a business's innovation strategy should address efforts to reward and encourage innovation. In his book, Tucker points out that business should reward intrinsically and extrinsically (2008). One area that he highlights is the importance of relevance (Tucker, 2008).

The relevance of classroom projects is a commonly researched student motivator which can be related to students' intrinsic and extrinsic motivation (Schunk, et. al., 2008). The idea of seeking to make learning relevant to the real-world can be best described through the expectancy-value theories of motivation. Expectancy-value theories of motivation stress two key cognitive influences; people's expectancies and the value which they place on the task (Weiner, 1985). In the expectancy-value theories of motivation, the expectancies and values components are both factors in

understanding students' future motivation and success (Schunk, et. al., 2008). Understanding the basic drivers of student success is imperative to motivating students.

In addition, educators have reported that motivation plays a key role in student success, and that intrinsically motivated students demonstrate greater learning and achievement than extrinsically motivated students (Lei, 2010). It has also been shown that extrinsic motivation is based primarily on classroom performance goals, whereas intrinsic motivation is based on mastery goals (Schunk, et al., 2008). As classroom leaders, it is imperative that educators realize that over emphasizing extrinsic rewards tends to weaken intrinsic motivation and discourage student success (Lowman, 1990).

In a study of leaders' impact on motivation, Barbuto, et al. (2010) reported five sources of motivation that impact the relationship between leaders and followers including intrinsic process, instrumental, self-concept external, self-concept internal, and goal internalization. This study which included 80 elected official and 388 of their direct reports found that intrinsic motivation positively impact a leader's ability to successfully communicate with followers (Barbuto, et al., 2010).

According to Schunk, et al. (2008) "… intrinsic motivation refers to motivation to engage in an activity for its own sake" (p. 236). It is the basic idea that people are motivated by tasks because they find the task enjoyable. Barbuto, et al. (2010) reported, that researchers have proposed a relationship between leaders' intrinsic motivation and their ability to encourage followers' motivation.

Another important factor of motivation reported by Barbuto et al. (2010) is instrumental motivation. Instrumental behavior is a theory based upon the idea that

followers receive positive reinforcement based upon their imitation of leaders' performance; they are motivated to mimic behavior by external rewards (Schunk, et al., 2008). "It is evident when individuals engage in behaviors to receive material gains such as pay, promotions, and bonuses" (Barbuto, 2010, p. 179).

Self-concept and identity are interrelated and have a powerful impact on students' competency and motivation (Elliot & Dweck, 2005). This idea plays a role in understanding the relationship between leaders and followers. If followers engage in activities with the desire to gain positive responses from their leaders then they are seeking to gain external validation of their self-concept (Barbuto et al, 2010). In contrast, self-concept internal is related to the idea that people have internal beliefs about their identities.

According to Barbuto, et al., (2010), when individuals engage in activities to reinforce their self image, then it is evident that they demonstrate self-concept internally. There are four sources of self efficacy which include mastery experience, vicarious experience, social persuasions, and somatic and emotional states (Schunk, et al., 2008). Understanding these four sources of self efficacy can improve educators' ability to develop learning experiences designed to support the positive growth of self efficacy. According to Barbuto, et al. (2010), self efficacy is a major component in the relationship between leaders and followers. Another important form of motivation between leaders and followers is goal internationalization, which is demonstrated when individuals demonstrate an internal value-based desire to succeed (Barbuto, et al., 2010). This is a powerful form of intrinsic motivation and occurs when followers internalize the mission and objectives of the organization (Barbuto, et al., 2010).

Some researchers suggest that student engagement is directly related to a motivation theory referred to as flow. According to theory author Csikszentmihalyi (1988), flow is an experience of engagement when students participate in an activity that is so intrinsically enjoyable that students experience a merging of action and awareness, a strong sense of control, and an altered sense of time (Elliot & Dweck, 2005). Figure 1 illustrates the concept of flow and shows how the flow channel separates the emotions of anxiety and boredom. The level of the challenge and skill needed to succeed at the task impacts the students' learning experience. In the figure, it is clear the greater the level of challenge the greater the need for skill. However, projects with a lower level of challenge require less skill.

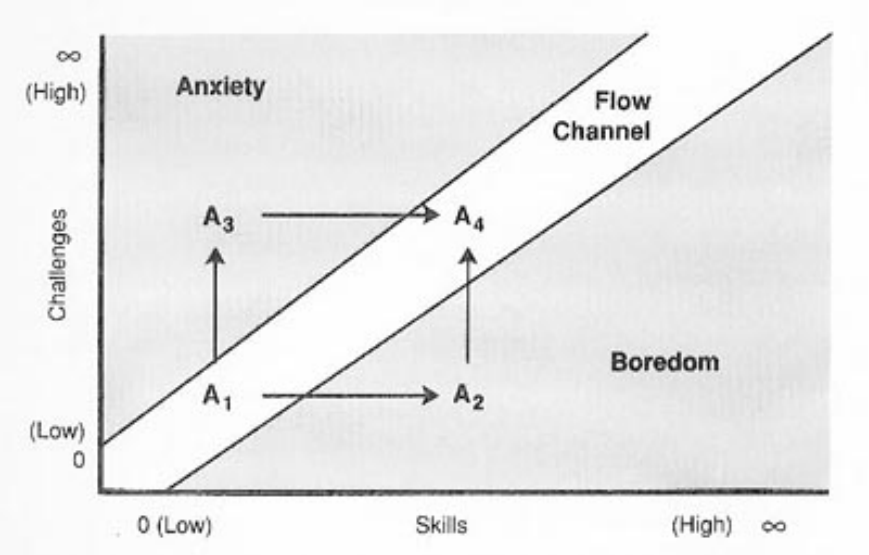

Figure 1: Csikszentmihalyi's Theory of Flow

Therefore, students who are encouraged to participate in tasks which are well suited to their skill level are more likely to experience flow within the classroom.

"However, providing opportunities for interaction and participation appropriate for each student's ability level may be particularly challenging with students who have diverse interest and learning needs" (Csikszentmihalyi, 1988, p. 160).

Many researchers have pointed to the idea of using goal theory to support student engagement and flow in the classroom (Elliot & Dweck, 2005). Realizing the need for attainable student goals as illustrated in the flow model, many researchers have studied the impact of educators' roles in supporting students' development of personal goals with the end result of increasing their engagement in flow.

Goal theory, as describe by Schunk et al. (2008), consists of the ideas of goal content which includes the actual content of the goal; goal orientation which expresses the general purpose for engaging in tasks; and goal setting which includes the process of establishing a standard or objective to serve as the aim of one's actions. Understanding these three aspects of goal theory is imperative in the effort to support students' needs for attainable goals. Educators play a role in supporting students as they engage in setting, elaborating, and reflecting on personal academic goals (Morisano, Hirsh, Peterson, Pihl, & Shore, 2010). It has been found that goal interventions can produce improvements in academic success when students are encouraged to determine the content, orientation, and setting of their own goals in an effort to improve their academic prospects (Morisano, et al., 2010). Goal setting can be used to effectively enhance creativity when a creativity goal is assigned (Shalley, 1991).

In a study of 270 undergraduates in an introductory business class, students were given productivity and creativity goals, the researchers found that goal setting effectively

enhanced performance (Shalley, 1991). The concept that goal theory impacts flow and creativity could prove very beneficial in the classroom. It has been found that goal intentions are key predictors of student motivation and behavior (Smith, Jayasuriya, Caputi, & Hammer, 2008). Specifically achievement goal theory has been successfully used in the classroom. Research shows that the most positive motivation and learning patterns are evident in student outcomes when educators emphasize mastery, understanding, and improving skills and knowledge (Meece, Anderman, & Anderman, 2006).

Summary

This summary of literature was compiled in an effort to establish a foundation for the variables related to the concept of innovation. It is possible to use innovations research conducted in business settings combined with the existing educational research to work toward developing a conceptual framework for understanding innovations courses. This study focused on existing single and multidisciplinary innovations capstone courses and will enable researchers and educators to better understand students' perceptions of their experiences in these specific cases. A real need exists to better understand the relationship between the communications of classroom faculty and peer leaders, students' course motivation, and the innovativeness of final projects.

CHAPTER III

METHODOLOGY

Introduction

Chapter III contains an explanation of the mixed methods research approach and procedures used in this study, as well as the research questions, questionnaire development, data collection procedures, and methods of data analysis.

Purpose of the Study

The purpose of this study was to assess students' perceptions of communications provided by faculty and peer leaders in relationship to both students' perceptions of their course motivation as well as their perceptions of the innovativeness of their final project in single and multidisciplinary capstone courses.

Research Questions

The following research questions guided this study:

1. What are the demographic characteristics of students in the identified capstone courses, including major, academic level, and sex?
2. What are students' perceptions of the communications provided by their faculty leaders in capstone courses?

3. What are students' perceptions of the communications provided by their peer leaders in capstone courses?
4. What are students' perceptions of their course motivation in capstone courses?
5. What are students' perceptions of the innovativeness of their final project in capstone courses?
6. What relationship exists between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation in capstone courses?
7. What relationship exists between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation in capstone courses?
8. What relationship exists between students' perceptions of their course motivation and students' perceptions of the innovativeness of their final project in capstone courses?

Research Design

This study employed a mixed methods approach, including both quantitative and qualitative research methods. According to Gay (2009), a mixed method approach "allows the researcher to build on the synergy and strength that exists between quantitative and qualitative research methods to understand a phenomenon more fully than is possible using either quantitative or qualitative methods alone" (p. 462).

According to Greene, Caracelli, and Graham (1989), specific reasons researchers should consider using mixed methods include benefits from triangulation and expansion.

Integrating both quantitative and qualitative research methods in this study enabled the researcher to triangulate the data. Triangulation enables researchers to get a more complete picture of what is being studied and to cross-check information by using multiple data collection strategies and data sources (Gay et al., 2009). Expansion as described by Green et al. (1989, p. 259) extends "the breadth and range of the inquiry."

The quantitative component of the study implemented a descriptive-correlational, survey research design to assess the perceptions of students in capstone courses. According to Gay et al. (2009), descriptive research involves collecting numerical data to answer questions and describe phenomenon. In comparison, correlational research involves collecting data to determine whether and to what degree a relationship exists between two quantifiable variables (Gay et al., 2009). Correlational research can be very useful "when a need exists to study a problem requiring the identification of the direction and degree of association between two sets of scores" (Creswell 2000, p. 379). As well, correlational research also helps explain complex relationships between multiple factors that explain an outcome (Gay et al., 2009). However, researchers must realize that correlation does not prove causation instead it indicates a relationship (Creswell, 2000).

The qualitative data was analyzed using data coding. According to Gay et al. (2009), coding qualitative data includes three steps reading/memoing, describing, and classifying. In this study, the data was coded into the following classifications: communications provided by faculty leaders and student peer leaders, motivation, and innovativeness of the final project. This data was gathered from the additional comments section in the final section of the survey.

Population

The population for this study consisted of students participating in single disciplinary (agricultural communications, agricultural economics, and electrical and computer engineering) and multidisciplinary (innovations) capstone courses.

An overlap between the educators from the multidisciplinary innovations course and the single disciplinary agricultural communications and agricultural economics was a benefit to the study and made it possible to investigate comparable capstone learning experiences. Unfortunately, there was not a single-disciplinary course alternative for the Biosystems and Agricultural Engineering students at Oklahoma State University. Therefore, the researcher identified an engineering senior design course that offered enough participants and a comparative senior design process to make comparisons. The electrical engineering course was selected as it represented a capstone learning project that requires students to work on "real-world" projects.

Studying the entire population in a census study is beneficial when the researcher is endeavoring to learn about or understand a specific phenomenon (Creswell, 2000). In this situation the researcher focused on these four specific cases of single disciplinary and multidisciplinary capstone courses. Ideally when studying correlations, researchers should seek populations larger than 30 which will result in less error variance (Creswell, 2000). In an effort to reach this population size the researcher made a change early in the research to include a larger engineering course. This modification was approved by the IRB committee see Appendix A.

Students registered in the following single disciplinary capstone courses were surveyed: Planning Campaigns for Agriculture and Natural Resources AGCM 4403

(N=32), Advanced Agribusiness Management AGEC 4423 (N=31), and Senior Design I ECEN 4012 (N=30), during the fall 2010 semester. In the spring 2011 semester, the researcher surveyed students in the *Innovations Capstone Course* sections including AGCM 4403-002 (N=6), AGEC 4990-122 (N=5), and BAE 4012-001 (N=13). The total number of students eligible to participate in the study was 117. One agricultural economics student and one agricultural communications student did not complete the questionnaire. The findings are based upon the 115 participants that completed the questionnaire.

Institutional Review Board Approval

Before initiating the data collection procedure, the researcher submitted an Institutional Review Board Application to the Oklahoma State University Office of University Research Services. The application expressed the researcher's intention to protect the rights and welfare of human subjects involved in this behavioral research. This study was formally approved on November 16, 2010, and received the following IRB code: AG-10-46. A copy of the approval is presented in Appendix D.

Survey Instrument

The *Capstone Course Experience Questionnaire* was developed by modifying existing instruments with the support of a panel of experts representing agricultural communications, economics and engineering and was based upon a comprehensive review of literature. The questionnaire included six sections designed to collect the following data: a) students' perceptions of communications provided by faculty leaders, b) students' perceptions of communications provided by peer leaders c) students' perceptions of their course motivation, d) students' perceptions of the innovativeness of

their final project, e) students' demographic characteristics, and f) students' additional written comments. The final questionnaire included 54 questions related to the constructs, four demographic questions, and an additional comments section.

The students' perceptions of communications provided by faculty and peer leaders scales was developed based upon the selection and modification of instrument items used by Tang (1999) and Abu Bakar, Mustaffa, and Mohamad (2009). The student's perception of course motivation scale was modified to fit the needs of a classroom environment from instrument items used by Tang (1999) and Aijun et al. (2010). In addition, the innovativeness of the final project scale was based on Tang's instrument (1999) and modified by the panel of experts to fit the capstone classroom situation. A five-point Likert scale was used with the following response choices: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree. The real limits for the scaled responses were defined as 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree. Finally, an additional comments section at the end of the instrument allowed for the collection of qualitative data. A copy of the questionnaire is displayed in Appendix F.

Validity and Reliability

Validity and reliability are two important considerations in developing and conducting research. According to Creswell (2002), validity refers to the strength of a researchers' conclusion and can be described as how accurately the research instrument measures the content that is intended to be measured. In comparison, reliability refers to the consistency of the measurement tool (Creswell, 2002).

According to Gay et al. (2009), face validity describes the appearance that the instruments measure what they claim to measure, while the construct validity refers to the significance or meaning of the instrument. A panel of subject matter experts from agricultural communications, economics, and engineering determined the validity of the instrument. Both the face and construct validity of the instrument were considered and approved. Then the experts approved the questionnaire after minor revisions for readability. For example, the items were edited to include cases when the course included single versus multiple leaders. The organization of the statements was changed so that each statement in the construct started with the same lead.

The reliability of the *Capstone Course Experience Questionnaire* was measured using a pilot test of a capstone course in the college of engineering. According to Gay et al. (2009), a reliable research instrument is constructed of items which are composed of constructs that are clear, accurate and generally garner consistent results. The reliability of this research instrument was measured using Cronbach's alpha reliability test. This test is the general formula for measuring how all items on a test relate to other items in the total construct (Gay et al., 2009).

The pilot test was conducted using the full IRB protocol on Nov. 17 through 19, 2010, with 30 students from the College of Engineering, Architecture, and Technology. The Cronbach's alpha coefficients for the items in the pilot test group according to the research constructs were as follows: students' perceptions of communications provided by faculty leaders was.87, students' perceptions of communications provided by peer leaders was.81, students' perceptions of their course motivation was.90, and students' perceptions of the innovativeness of their final project was.86. These reliability estimates

were found to be acceptable as all of the Cronbach alpha coefficients are above .7 (Pallant, 2001, p. 6).

Data Collection

After approval from the IRB committee, appointments were made to administer questionnaires. The researcher used an IRB approved script which included an introductory statement and specific instructions regarding completion of the instrument. The researcher also distributed consent forms approved by the institutional review board to explain students' rights as participants in the research study. Questionnaires were administered to participants in the single disciplinary courses during the week of November 22, 2010 through November 24, 2010. Participants in the multidisciplinary course completed the questionnaires during the week of March 28, 2011 through April 1, 2011. Questionnaires were administered in the students' original classrooms and were distributed and collected by the researcher. The questionnaire yielded a 98% response rate. Of the 115 students survey 30 chose to also add additional written comments at the end of the survey.

Data Analysis

The data collected were analyzed using the Statistical Package for the Social Sciences ® (SPSS) version 17 software. The goal of this research was to quantitatively describe the data through the use of parameters. According to Gay et al. (2009), parameters are defined as numerical characteristics of a population. As parameters were used to analyze the data the Greek symbols were used in representations of the data.

Data associated with the first five research questions were analyzed using basic descriptive parameters including measures of central tendency and measures of variability. The data were analyzed using means, frequencies, percentages and standard deviations.

Data associated with the sixth, seventh, and eight research questions were analyzed using the Pearson Product Moment Correlation. Relationships between the four research constructs of questionnaires completed by students in single disciplinary (agricultural communications, agricultural economics, and electrical and computer engineering) and multidisciplinary (innovations) capstone courses were analyzed. The strengths of relationships were described using Davis' (1971) magnitude of the correlation coefficient (r) conventions: $.01 \geq r \geq .09$ = "Negligible," $.10 \geq r \geq .29$ = "Low," $.30 \geq r \geq .49$ = "Moderate," $.50 \geq r \geq .69$ = "Substantial," $.70 \geq r \geq .99$ = "Very High," $r \geq .1.00$ = "Perfect."

Thirty students opted to write comments in the final section of the survey. This data was transcribed into a word document and used to support the quantitative component of this study. A team of researchers then organized the comments based upon connections with the research questions and the classification of either (+) positive, (-) negative, (+/-) mixed or (*) neutral.

CHAPTER IV

FINDINGS

This chapter presents the findings of the study based on data analyzed to address the eight research questions using a mixed methods research approach. The findings were organized in order of the research questions and were presented in both a narrative and tabular form.

Purpose of the Study

The purpose of this study was to assess students' perceptions of communications provided by faculty and peer leaders in relationship to both students' perceptions of their course motivation as well as their perceptions of the innovativeness of their final project in single and multidisciplinary capstone courses.

Population

The population for this study included students participating in single disciplinary (agricultural communications, agricultural economics, and electrical and computer engineering) and multidisciplinary (innovations) capstone courses. Studying the entire population in a census study is beneficial when the researcher is endeavoring to learn about or understand a specific phenomenon (Creswell, 2000). In this situation the researcher focused on these four specific cases of single disciplinary and multidisciplinary capstone courses.

Research Questions

The following research questions guided this study:

1. What are the demographic characteristics of students in the identified capstone courses, including major, academic level, and sex?
2. What are students' perceptions of the communications provided by their faculty leaders in capstone courses?
3. What are students' perceptions of the communications provided by their peer leaders in capstone courses?
4. What are students' perceptions of their course motivation in capstone courses?
5. What are students' perceptions of the innovativeness of their final project in capstone courses?
6. What relationship exists between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation in capstone courses?
7. What relationship exists between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation in capstone courses?
8. What relationship exists between students' perceptions of their course motivation and students' perceptions of the innovativeness of their final project in capstone courses?

Findings Related to Research Question One

The first research question sought to describe selected demographic characteristics of students (N = 115) in the identified capstone courses. Specifically, data including students' major, academic level and sex were examined using frequencies and percentages. Table 1 summarizes the findings.

Table 1

Demographic Characteristics of Students in Capstone Courses

Characteristics	*f*	*%*
Major		
Engineering	43	37.4
Economics	34	29.6
Communications	38	33.0
Academic level		
Juniors	5	4.3
Seniors	106	92.2
Graduate	4	3.5
Sex		
Male	71	61.7
Female	44	38.3

Of the 115 students who completed the questionnaire, 37.4% (n=43) respondents were engineering majors, 29.6% (n=34) respondents were economics majors, and 33% (n=38) respondents were communications majors. More than 90% (71) of students in the capstone courses were seniors, while 4.3% were junior level students and 3.5% were graduate students. The greatest majority of students (61.7%) were male and 38.3% were female.

Findings Related to Research Question Two

The second research question sought to determine students' perceptions of the communications provided by their faculty leaders in capstone courses. This construct was comprised of 15 items which students ranked using a five-point Likert scale. These ordinal data were analyzed and means and standard deviations were reported. Table 2 shows the frequencies that represent students' level of agreement or disagreement. Table 3 shows the mean findings by course surveyed. Table 4 gives the *communications provided by faculty leaders* average construct scores. Table 5 gives the additional comments as written by the respondents related to the research question.

Table 2

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding the Communications Provided by their Faculty Leaders

The faculty leader(s) . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
encourage(s) communication.					
Engineering		6.7(2)	3.3(1)	56.7(17)	33.3(10)
Economics		3.3(1)	10.0(3)	40.0(12)	46.7(14)
Communications				32.3(10)	67.7(21)
Innovations			4.2(1)	58.3(14)	37.5(9)
challenge(s) us to be resourceful.					
Engineering		3.3(1)	10.0(3)	46.7(14)	40.0(12)
Economics			6.7(2)	43.3(13)	50.0(15)
Communications			6.5(2)	22.6(7)	71.0(22)
Innovations			12.5(3)	54.2(13)	33.3(8)
show(s) enthusiasm.					
Engineering			20.0(6)	43.3(13)	36.7(11)
Economics		3.3(1)	3.3(1)	40.0(12)	53.3(16)
Communications				45.2(14)	54.8(17)
Innovations			4.2(1)	62.5(15)	33.3(8)
value(s) students' opinions.					
Engineering		6.7(2)	23.3(7)	36.7(11)	33.3(10)
Economics		3.3(1)	13.3 (4)	66.7(20)	16.7(5)
Communications		3.2(1)	9.7(3)	41.9(13)	45.2(14)

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding the Communications Provided by their Faculty Leaders

The faculty leader(s) . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
Innovations		12.5(3)	8.3(2)	66.7(16)	12.5(3)
give(s) recognition for good work.					
Engineering		13.3(4)	16.7(5)	50.0(15)	20.0(6)
Economics			6.7(2)	63.3(19)	30.0(9)
Communications		3.2(1)	6.5(2)	32.3(10)	58.1(18)
Innovations	4.2(1)	12.5(3)	16.7(4)	58.3(14)	8.3(2)
explain(s) changes in assignments.					
Engineering		10.0(3)	23.3(7)	56.7(17)	10.0(3)
Economics		10.0(3)	20.0(6)	56.7(17)	13.3(4)
Communications		19.4(6)	9.7(3)	32.3(10)	38.7(12)
Innovations	8.3(2)	16.7(4)	33.3(8)	33.3(8)	8.3(2)
keep(s) informed of project. deadlines.					
Engineering		20.0(6)	26.7(8)	33.3(10)	20.0(6)
Economics		20.0(6)	20.0(6)	46.7(14)	13.3(4)
Communications		12.9(4)	22.6(7)	32.3(10)	32.3(10)
Innovations	4.2(1)	16.7(4)	33.3(8)	29.2(7)	16.7(4)
provide(s) clear instructions to us.					
Engineering		10.0(3)	36.7(11)	40.0(12)	13.3(4)
Economics		16.7(5)	20.0(6)	53.3(16)	10.0(3)
Communications	9.7(3)	19.4(6)	35.5(11)	9.7(3)	25.8(8)
Innovations	8.3(2)	25.0(6)	37.5(9)	20.8(5)	8.3(2)
inform(s) about future plans.					
Engineering		6.7(2)	26.7(8)	56.7(17)	10.0(3)
Economics		3.3(1)	10.0(3)	70.0(21)	16.7(5)
Communications	3.2(1)	6.5(2)	9.7(3)	58.1(18)	22.6(7)
Innovations	4.2(1)	8.3(2)	29.2(7)	54.8(13)	4.2(1)
tell(s) reasons for work schedules.					
Engineering		16.7(5)	13.3(4)	63.3(19)	6.7(2)
Economics		3.3(1)	26.7(8)	60.0(18)	10.0(3)
Communications		9.7(3)	9.7(3)	45.2(14)	35.5(11)
Innovations		16.7(4)	20.8(5)	54.2(13)	8.3(2)
joke(s) good-naturedly with us.					
Engineering		3.3(1)	16.7(5)	60.0(18)	20.0(6)
Economics			10.0(3)	43.3(13)	46.7(14)
Communications		6.5(2)	3.2(1)	38.7(12)	51.6(16)
Innovations		4.2(1)	16.7(4)	41.7(10)	37.5(9)

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding the Communications Provided by their Faculty Leaders

The faculty leader(s) . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
ask(s) suggestions for tasks.					
Engineering	3.3(1)	6.7(2)	26.7(8)	50.0(15)	13.3(4)
Economics		3.3(1)	6.7(2)	66.7(20)	23.3(7)
Communications		9.7(3)	6.5(2)	54.8(17)	29.0(9)
Innovations	8.3(2)	8.3(2)	33.3(8)	41.7(10)	8.3(2)
seek(s) input on important decisions.					
Engineering		6.7(2)	26.7(8)	50.0(15)	16.7(5)
Economics		6.7(2)	6.7(2)	60.0(18)	26.7(8)
Communications		6.5(2)	9.7(3)	45.2(14)	38.7(12)
Innovations	12.5(3)	4.2(1)	25.0(6)	50.0(12)	8.3(2)
strike(s) up casual conversations.					
Engineering			33.3(10)	50.0(15)	16.7(5)
Economics		3.3(1)	3.3(1)	43.3(13)	50.0(15)
Communications		3.2(1)	3.2(1)	35.5(11)	58.1(18)
Innovations		8.3(2)		62.5(15)	29.2(7)
ask(s) suggestions for improvement.					
Engineering		3.3(1)	10.0(3)	60.0(18)	26.7(8)
Economics	3.3(1)	6.7(2)	3.3(1)	60.0(18)	26.7(8)
Communications		6.5(2)	6.5(2)	48.4(15)	38.7(12)
Innovations	4.2(1)	4.2(1)	29.2(7)	41.7(10)	20.8(5)

Note. 1= Strongly Disagree; 2 = Disagree; 3 Undecided; 4 = Agree; and 5 = Strongly Agree.

Table 2 shows the frequencies for students' level of agreement or disagreement with statements regarding the communications provided by their faculty leaders. The agricultural communications course consistently had the highest percentage of items in the Strongly Agree category. The items with a mode of Strongly Agree ratings were "challenge(s) us to be resourceful" and "encourages communication."

In 11 of the 15 items the multidisciplinary innovations course had the fewest items in the Strongly Agree category. The items with the fewest responses categorized as Strongly Agree was "inform(s) about future plans" for the innovations class. The

multidisciplinary innovations course also had the largest number in the Strongly Disagree category with eight items.

The economics course only had one item which received a Strongly Disagree from one student in the area of "ask(s) suggestions for improvement." Otherwise no other students selected Strongly Disagree in any areas. In the engineering course, only one student selected Strongly Disagree in the area of "ask(s) suggestions for tasks." Otherwise all other items were rated between Disagree and Strongly Agree.

Table 3 shows the means and standard deviations for each item within the construct. The mean and standard deviations are noted using Greek symbols. The mean is noted as (μ) and the standard deviations as (σ).

Table 3

Students' Perceptions of the Communications Provided by their Faculty Leaders

	C-1		C-2		C-3		C-4	
The faculty leader(s) . . .	μ	σ	μ	σ	μ	σ	μ	σ
encourage(s) communication	4.17	0.79	4.30	0.79	4.68	0.48	4.33	0.56
challenge (s) us to be resourceful	4.23	0.77	4.43	0.63	4.65	0.61	4.21	0.66
show(s) enthusiasm	4.17	0.75	4.43	0.73	4.55	0.51	4.29	0.55
value(s) students' opinions	3.97	0.93	3.97	0.67	4.30	0.78	3.80	0.83
give(s) recognition for good work.	3.77	0.94	4.23	0.57	4.45	0.77	3.54	0.98
explain(s) changes in assignments.	3.67	0.80	3.73	0.83	3.90	1.14	3.17	1.09
keep(s) informed of project deadlines	3.53	1.04	3.53	0.97	3.84	1.04	3.38	1.10
provide(s) clear instructions to us.	3.57	0.85	3.57	0.90	3.22	1.31	2.96	1.08
inform(s) about future plans for group	3.70	0.75	4.00	0.64	3.90	0.94	3.46	0.88
tell(s) reasons for work schedules	3.60	0.86	3.77	0.68	4.06	0.93	3.54	0.88
joke(s) good-naturedly with us.	3.97	0.72	4.37	0.67	4.35	0.84	4.13	0.85
ask(s) suggestions for completing tasks.	3.63	0.93	4.10	0.66	4.03	0.87	3.33	1.05
seek(s) input on important decisions.	3.77	0.82	4.07	0.78	4.16	0.86	3.38	1.13
strike(s) up casual conversations	3.83	0.70	4.40	0.72	4.48	0.72	4.13	0.80
ask(s) suggestions for improvement.	4.10	0.71	4.00	0.95	4.19	0.83	3.71	1.00

Note. C-1 = Engineering; C-2 = Economics; C-3 = Communications; C-4 = Innovations. Likert scale: *Note.* 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

In the engineering course there were no communications items that rated in the Strongly Agree range. Instead, all other items were in the Agree range of 3.50 to 4.49. The lowest score of 3.53, still in the Agreement range, was "keep(s) informed of project deadlines."

The highest rating of 4.17 was given for the areas of "encourage(s) communication" and "show(s) enthusiasm." The standard deviations ranged from 0.70 to 1.04 with the smallest deviation being "strike(s) up casual conversations" and the largest deviation being in the area of "keep(s) informed of project deadlines."

In the economics course, none of the scores were in the Strongly Agree range. All items were in the Agree range from 3.50 to 4.49. The highest scores in the Agree range were 4.43, with the items of "show(s) enthusiasm" and "challenge(s) us to be more resourceful." The lowest score of 3.53 was "keep(s) us informed about project deadlines." The standard deviations ranged from 0.57 to 0.97, with the smallest standard deviation being in the item of "give(s) recognition for good work" and the largest deviation being in the item of "keep(s) informed of project deadlines."

In the communications course, three items were in the Strongly Agree range with a mean of 4.68 for "encourage(s) communication," 4.65 for "challenge(s) us to be resourceful," and 4.55 for "show(s) enthusiasm." Eleven items were in the Agree range of 3.50 to 4.49. The lowest score in the Agree range was 3.84 in "keep(s) informed of project deadlines." The highest score was 4.48 in "strike(s) up casual conversations." One score was in the Undecided range, with a score of 3.22 for "provide(s) clear instructions

to us." The standard deviations ranged from 0.48 to 1.31 with the smallest standard deviation being in the item of "encourage(s) communication" and the largest deviation being in the item of "provide(s) clear instructions to us."

In the multidisciplinary innovations course, none of the scores were in the Strongly Agree range. However, nine were in the Agree range with the highest agree score being 4.33 in "encourage(s) communications." The lowest scores in the Agree range were 3.54 for "gives recognition for good work" and "tell(s) reasons for work schedules." Six items were in the Undecided range of 2.50 to 3.49. The highest scores in the Undecided range were 3.38 for "keep(s) informed of project deadlines" and "seek(s) input on important decisions." The lowest score in the Undecided range was 2.96 for "provide(s) clear instruction to us." The standard deviations ranged from 0.55 to 1.13 with the smallest standard deviation being in the item of "show(s) enthusiasm" and the largest deviation being in the item of "seek(s) input on important decisions."

Table 4

Average Construct Scores for Students' Perceptions of the Communications Provided by their Faculty Leaders in Capstone Courses

Courses	μ	σ
Single Disciplinary		
Engineering	3.84	.55
Economics	4.06	.46
Communications	4.18	.56
Multidisciplinary		
Innovations	3.69	.64

Note. 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

The mean score by capstone course in this construct, which measured students' perceptions of faculty communications, was found to be as follows: engineering μ =

3.84, economics μ = 4.06, communications μ =4.18, and innovations μ = 3.69. The communications course had the highest mean, and multidisciplinary innovations course had the lowest mean. The greatest standard deviation of 0.64 represented was in the multidisciplinary innovations course, and the lowest standard deviation of 0.46 was in the economics course.

Qualitative data gathered from the students' written comments also relates to this research question. The following table includes the students' comments.

Table 5

Students' Written Comments related to Communications provided by their Faculty Leaders in Capstone Courses.

Courses	Ratings	Comments
Single Disciplinary		
Engineering		N/C
Economics		N/C
Communications	+/-	9) It is a good course. Frustrating at times, but not the professor's fault. It is difficult working with some people but you learn a lot.
	-	13) Sometimes it is hard to know what exactly is expected from us and how the assignment is supposed to be completed. Most of the time we were left in the dark on trying to figure out how to complete an assignment.
Multidisciplinary		
Innovations	+/-	7) The instructors are some of the best in the department and for the most part help students when they can.

Note. N/C indicates no comments were made in these classes relating to communications provided by faculty leaders. Every student was assigned a number identification in their respective classes in order to protect student anonymity and report comments. The rating system is as follows (+) positive (-) negative (+/-) mixed (*) neutral.

Only three students made comments related to faculty communications. In the engineering and economics classes, no comments were made. In the communications

course there were two comments; one comment was mixed and indicated positive and negative perceptions the other comment indicated negative perceptions of faculty communications. In the multidisciplinary course, the comment related to mixed perceptions of communication.

Findings Related to Research Question Three

The third research question sought to determine students' perceptions of the communications provided by their peer leaders in capstone courses. This construct comprised 15 items which students ranked using a five-point Likert scale. These interval data were analyzed and means and standard deviations were reported. Table 6 shows the frequencies which represent students' level of agreement or disagreement. Table 7 shows the findings by course surveyed. Table 8 gives the communications provided by student leaders average construct score. Table 9 gives the additional comments as written by the respondents related to the research question.

Table 6

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding the Communications Provided by their Student Peer Leaders

	1	2	3	4	5
The student leader(s) . . .	*%(f)*	*%(f)*	*%(f)*	*%(f)*	*%(f)*
encourage(s) communication.					
Engineering		10.0(3)	10.0(3)	66.7(20)	13.3(4)
Economics		3.3(1)		60(18)	36.7(11)
Communications			3.2(1)	54.8(17)	41.9(13)
Innovations			16.7(4)	54.2(13)	29.2(7)
challenge(s) us to be resourceful.					
Engineering	3.3(1)	10.0(3)	13.3(4)	56.7(17)	16.7(5)
Economics			6.7(2)	56.7(17)	36.7(11)
Communications		3.2(1)	32.3(3)	38.7(12)	25.8(8)
Innovations		8.3(2)	16.7(4)	58.3(14)	16.7(4)

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding the Communications Provided by their Student Peer Leaders

The student leader(s) . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
show(s) enthusiasm.					
Engineering	3.3(1)	13.3(4)	36.7(11)	40.0(12)	6.7(2)
Economics		3.3(1)		53.3(16)	43.3(13)
Communications			22.6(7)	48.4(15)	29.0(9)
Innovations		8.3(2)	12.5(3)	54.2(13)	25.0(6)
value(s) students' opinions.					
Engineering		13.3(4)	16.7(5)	56.7(17)	13.3(4)
Economics		3.3 (1)	6.7 (2)	40.0(12)	50.0(15)
Communications			6.5(2)	58.1(18)	35.5(11)
Innovations			12.5(3)	37.5(9)	50.0(12)
give(s) recognition for good work.					
Engineering	3.3(1)	6.7(2)	16.7(5)	60.0(18)	13.3(4)
Economics			10.0(3)	56.7(17)	33.3(10)
Communications			12.9(4)	54.8(17)	32.3(10)
Innovations		4.2(1)	12.5(3)	50.0(12)	33.3(8)
explain(s) changes in assignments.					
Engineering	3.3(1)	6.7(2)	33.3(10)	50.0(15)	6.7(2)
Economics			10.0(3)	63.3(19)	26.7(8)
Communications		3.2(1)	6.5(2)	61.3(19)	29.0(9)
Innovations		16.7(4)	16.7(4)	54.2(13)	12.5(3)
keep(s) informed of project. deadlines.					
Engineering		6.7(2)	16.7(5)	60.0(18)	16.7(5)
Economics		10.0(3)	3.3(1)	56.7(17)	30.0(9)
Communications		3.2(1)	9.7(3)	54.8(17)	32.3(10)
Innovations		8.3(2)	12.5(3)	45.8(11)	33.3(8)
provide(s) clear instructions to us.					
Engineering	3.3(1)	20.0(6)	16.7(5)	60.0(18)	
Economics		13.3(4)	3.3(1)	60.0(18)	23.3(7)
Communications	3.2(1)	9.7(3)	22.6(7)	35.5(11)	29.0(9)
Innovations		8.3(2)	25.0(6)	54.2(13)	12.5(3)
inform(s) about future plans.					
Engineering	3.3(1)		30.0(9)	60.0(18)	6.7(2)
Economics			10.0(3)	63.3(19)	26.7(8)
Communications		3.2(1)	12.9(4)	61.3(19)	22.6(7)
Innovations		8.3(2)	20.8(5)	45.8(11)	25.0(6)
tell(s) reasons for work schedules.					
Engineering		3.3(1)	20.0(6)	76.7(23)	
Economics		6.7(2)	16.7(5)	46.7(14)	30.0(9)

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding the Communications Provided by their Student Peer Leaders

The student leader(s) . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
Communications		12.9(4)	29.0(9)	38.7(12)	19.4(6)
Innovations	4.2(1)	8.3(2)	20.8(5)	45.8(11)	20.8(5)
joke(s) good-naturedly with us.					
Engineering	3.3(1)	6.7(2)	26.7(8)	50.0(15)	13.3(4)
Economics			3.3(1)	43.3(13)	53.3(16)
Communications		6.5(2)	9.7(3)	35.5(11)	48.4(15)
Innovations		4.2(1)	4.2(1)	37.5(9)	54.2(13)
ask(s) suggestions for tasks.					
Engineering	3.3(1)	6.7(2)	33.3(10)	50.0(15)	6.7(2)
Economics		3.3(1)	6.7(2)	53.3(16)	36.7(11)
Communications		3.2(1)	12.9(4)	51.6(16)	32.3(10)
Innovations		4.2(1)	12.5(3)	54.2(13)	29.2(7)
seek(s) input on important decisions.					
Engineering		3.3(1)	26.7(8)	60.0(18)	10.0(3)
Economics		3.3(1)	10.0(3)	50.0(15)	36.7(11)
Communications			9.7(3)	51.6(16)	38.7(12)
Innovations		4.2(1)	8.3(2)	25.0(6)	62.5(15)
strike(s) up casual conversations.					
Engineering	3.3(1)	13.3(4)	10.0(3)	56.7(17)	16.7(5)
Economics		3.3(1)	10.0(3)	36.7(11)	50.0(15)
Communications			3.2(1)	45.2(14)	51.6(16)
Innovations			8.3(2)	37.5(9)	54.2(13)
ask(s) suggestions for improvement.					
Engineering		13.3(4)	20.0(6)	60.0(18)	6.7(2)
Economics		3.3(1)	16.7(5)	40.0(12)	40.0(12)
Communications			6.5(2)	45.2(14)	48.4(15)
Innovations		4.2(1)	4.2(1)	54.2(13)	37.5(9)

Note. 1= Strongly Disagree; 2 = Disagree; 3 Undecided; 4 = Agree; and 5 = Strongly Agree.

Table 6 shows the frequencies for students' level of agreement or disagreement with statements regarding the communications provided by their student peer leaders. There was not a course that consistently demonstrated the highest percentage of Strongly Agree ratings in multiple items.

In the economics course, the highest number of strongly agree ratings were in "value(s) stundents' opinions," and "shows enthusiasm."

However, in the engineering course, there were the fewest Strongly Agree ratings. In fourteen of the fifteen items, the economics course had the least number of Strongly Agrees. The course also had one student strongly disagree in eight items. The items with the greatest frequency of Strongly Agree ratings in the combined courses were "joke(s) good-naturedly with us." and "strike(s) up casual conversations."

Table 7 shows the means and standard deviations for each item within the construct. The mean and standard deviations are noted using Greek symbols. The mean is noted as (μ) and the standard deviations as (σ).

Table 7

Students' Perceptions of the Communications Provided by their Student Peer Leaders

	C-1		C-2		C-3		C-4	
The student leader(s) . . .	μ	σ	μ	σ	μ	σ	μ	σ
encourage(s) communication	3.83	0.79	4.30	0.65	4.39	0.56	4.13	0.68
challenge (s) us to be resourceful	3.73	0.98	4.30	0.60	3.87	0.85	3.83	0.82
show(s) enthusiasm	3.33	0.92	4.37	0.67	4.06	0.73	3.96	0.86
value(s) students' opinions	3.70	0.88	4.37	0.76	4.29	0.59	4.38	0.71
give(s) recognition for good work.	3.73	0.91	4.23	0.63	4.19	0.65	4.13	0.80
explain(s) changes in assignments.	3.50	0.86	4.17	0.59	4.16	0.69	3.63	0.92
keep(s) informed of project deadlines	3.87	0.78	4.07	0.87	4.16	0.73	4.04	0.91
provide(s) clear instructions to us.	3.33	0.92	3.93	0.91	3.77	1.08	3.71	0.81
inform(s) about future plans for group	3.67	0.76	4.17	0.59	4.03	0.71	3.88	0.90
tell(s) reasons for work schedules	3.73	0.52	4.00	0.87	3.65	0.95	3.71	1.04
joke(s) good-naturedly with us.	3.63	0.93	4.50	0.57	4.26	0.89	4.42	0.78
ask(s) suggestions for completing tasks.	3.50	0.86	4.23	0.73	4.13	0.76	4.08	0.78
seek(s) input on important decisions.	3.77	0.68	4.20	0.76	4.29	0.64	4.46	0.83
strike(s) up casual conversations	3.70	1.02	4.33	0.80	4.49	0.57	4.46	0.66

ask(s) suggestions for improvement.	3.60	0.81	4.17	0.83	4.42	0.62	4.25	0.74

Note. C-1 = Engineering; C-2 = Economics; C-3 = Communications; C-4 = Innovations. Likert scale: 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

In the engineering course, none of the communications items were in the Strongly Agree range of 4.50 to 5.00. Instead, thirteen items were in the Agree range of 3.50 to 4.49. The lowest scores of 3.50 in the Agreement range were "explain(s) changes in assignments" and "ask(s) suggestions for completing tasks." The highest score of 3.87 was given for the area of "keep(s) informed of project deadlines." Two items were in the undecided range of 3.50 to 4.49. The items both scored 3.33 for "show(s) enthusiasm" and "provide(s) clear instruction to us."

The standard deviations ranged from 0.52 to 1.02, with the lowest standard deviation being in the item of "tell(s) reasons for work schedules" and the greatest deviation being in the area of "strike(s) up casual conversations."

In the economics course, one score was in the Strongly Agree range with a 4.50 in the area of "joke(s) good naturedly with us." The other items were in the Agree range from 3.50 to 4.49. The lowest score of 3.93 was "provide(s) clear instructions to us." The highest scores in the Agree range was 4.37 with the items of "show(s) enthusiasm" and "value(s) students' opinions." The standard deviations ranged from 0.57 to 0.91 with the lowest standard deviation being in the item of "joke(s) good-naturedly with us" and the greatest deviation being in the item of "provide(s) clear instructions to us."

In the communications course, none of the items were in the Strongly Agree range. All items were in the Agree range of 3.50 to 4.49. The highest score in the Agree range was 4.49 for "strike(s) up casual conversations" and the lowest score was 3.65 for

"tell(s) reasons for work schedules." The standard deviations ranged from 0.56 to 1.08 with the lowest standard deviation being in the item of "encourage(s) communication" and the greatest deviation being in the item of "provide(s) clear instructions to us."

In the multidisciplinary innovations course, none of the scores were in the Strongly Agree range. All items were in the Agree range with the highest Agree scores being 4.46 in "seek(s) input on important decisions," and "strike(s) up casual conversations." The lowest score in the Agree range was 3.63 for "explain(s) changes in assignments." The standard deviations ranged from 0.66 to 1.04 with the smallest standard deviation being in the item of "strike(s) up casual conversations" and the largest deviation being in the item of "tell(s) reasons for work schedules."

Table 8

Average Construct Scores for Students' Perceptions of the Communications Provided by their Student Peer Leaders in Capstone Courses

Courses	μ	σ
Single Disciplinary		
Engineering	*3.64*	*.51*
Economics	*4.22*	*.50*
Communications	*4.14*	*.40*
Multidisciplinary		
Innovations	*4.07*	*.53*

Note. 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

The mean score by capstone course in this construct, which measured students' perceptions of peer communications, was found to be as follows: engineering μ = 3.64, economics μ = 4.22, communications μ =4.14, and innovations μ = 4.07. The economics course had the highest mean and engineering course had the lowest mean. Lowest standard deviation was in the communications course.

Table 9

Students' Written Comments related to Communications provided by their Peer Leaders in Capstone Courses.

Courses	Comments
Single Disciplinary	
Engineering	4) The (student leaders) really could have been more approachable and supportive. I do not mean giving too much help but a lot of times they were unapproachable and tended to mock our ideas or lack of insight. 11) Sometimes the (student leaders) would provide conflicting information which led to confusion among our team.
Economics	N/C
Communications	N/C
Multidisciplinary	
Innovations	N/C

Note. N/C indicates no comments were made in these classes relating to communications provided by student peer leaders. Every student was assigned a number identification in their respective classes in order to protect student anonymity and report comments. The rating system is as follows (+) positive (-) negative (+/-) mixed (*) neutral.

Only two students made comments related to this research question. The students were both in the engineering course and made comments related to negative perceptions of communications provided by student peer leaders.

Findings Related to Research Question Four

The fourth research question sought to determine students' perceptions of their course motivation in capstone courses. This construct comprised 12 items which students ranked using a five-point Likert scale. These interval data were analyzed and means and standard deviations were reported. Table 10 shows the frequencies which represent students' level of agreement or disagreement. Table 11 shows the findings by the individual instrument items for each course surveyed. Table 12 shows the average construct score for students'

perceptions of their course motivation. Table 13 gives the additional comments as written by the respondents related to the research question.

Table 10

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding Perceptions of their Motivation in Capstone Courses

The course . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
supports students to see ideas to fruition.					
Engineering	3.3(1)		30.0(9)	56.7(17)	10.0(3)
Economics			6.7(2)	50.0(15)	43.3(13)
Communications		3.2(1)	6.5(2)	54.8(17)	35.5(11)
Innovations		4.2(1)		70.8(17)	25.0(6)
provides students challenging tasks.					
Engineering			3.3(1)	63.3(19)	33.3(10)
Economics				33.3(10)	66.7(20)
Communications				38.7(12)	61.3(19)
Innovations			4.2(1)	41.7(10)	54.2(13)
provides students useful feedback.					
Engineering		13.3(4)	30.0(9)	50.0(15)	6.7(2)
Economics		3.3(1)	10.0(3)	53.3(16)	33.3(10)
Communications		19.4(6)	12.9(4)	35.5(11)	32.3(10)
Innovations	4.2(1)	12.5(3)	37.5(9)	37.5(9)	8.3(2)
offers freedom, flexibility & resources.					
Engineering		13.3(4)	20.0(6)	63.3(19)	3.3(1)
Economics		3.3(1)	3.3(1)	46.7(14)	46.7(14)
Communications		3.2(1)		41.9(13)	54.8(17)
Innovations		4.2(1)	12.5(3)	62.5(15)	20.8(5)
recognizes students' achievements.					
Engineering		6.7(2)	33.3(10)	53.3(16)	6.7(2)
Economics		6.7(2)	6.7(2)	56.7(17)	30.0(9)
Communications		6.5(2)	12.9(4)	32.3(10)	48.4(15)
Innovations		16.7(4)	16.7(4)	54.2(13)	12.5(3)
provides innovative goals.					
Engineering			26.7(8)	70.0(21)	3.3(1)
Economics			6.7(2)	63.3(19)	30.0(9)
Communications			3.2(1)	58.1(18)	38.7(12)

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding Perceptions of their Motivation in Capstone Courses

The course . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
Innovations		4.2(1)	16.7(4)	58.3(14)	20.8(5)
encourages interpersonal communication.					
Engineering			13.3(4)	63.3(19)	23.3(7)
Economics			6.7(2)	50.0(15)	43.3(13)
Communications				51.6(16)	48.4(15)
Innovations			8.3(2)	41.7(10)	50.0(12)
provides stimulating course work.					
Engineering			16.7(5)	70.0(21)	13.3(4)
Economics		3.3(1)	3.3(1)	63.3(19)	30.0(9)
Communications		9.7(3)	12.9(4)	38.7(12)	38.7(12)
Innovations	4.2(1)	20.8(5)	8.3(2)	50.0(12)	16.7(4)
provides exploration of ideas.					
Engineering		6.7(2)	16.7(5)	66.7(20)	10.0(3)
Economics		3.3(1)		46.7(14)	50.0(15)
Communications				48.4(15)	51.6(16)
Innovations			20.8(5)	54.2(13)	25.0(6)
offers non-routine challenging work.					
Engineering		6.7(2)	10.0(3)	73.3(22)	10.0(3)
Economics				46.7(14)	53.3(16)
Communications			3.2(1)	38.7(12)	58.1(18)
Innovations		8.3(2)	4.2(1)	45.8(11)	41.7(10)
requires imagination and creativity.					
Engineering		3.3(1)	16.7(5)	60.0(18)	20.0(6)
Economics			3.3(1)	36.7(11)	60.0(18)
Communications				32.3(10)	67.7(21)
Innovations		4.2(1)	12.5(3)	41.7(10)	41.7(10)
provides opportunities for knowledge.					
Engineering			10.0(3)	63.3(19)	26.7(8)
Economics			3.3(1)	50.0(15)	46.7(14)
Communications		3.2(1)	16.1(5)	22.6(7)	58.1(18)
Innovations		4.2(1)	4.2(1)	50.0(12)	41.7(10)

Note. 1= Strongly Disagree; 2 = Disagree; 3 Undecided; 4 = Agree; and 5 = Strongly Agree.

Table 10 shows the frequencies for students' level of agreement or disagreement with statements regarding students' perceptions of their motivation in capstone courses.

The economics and communications courses consistently demonstrated the highest percentage of Strongly Agree ratings in all fifteen items. In the economics and communications courses the highest number of strongly agree ratings were in "provide(s) students challenging tasks." and "require(s) imagination and creativity." However, the innovations and engineering courses had fewer Strongly Agrees in these items.

Table 11 shows the means and standard deviations for each item within the construct. The mean and standard deviations are noted using Greek symbols. The mean is noted as (μ) and the standard deviations as (σ).

Table 11

Students' Perceptions of their Motivation in Capstone Courses

	C-1		C-2		C-3		C-4	
The course . . .	μ	σ	μ	σ	μ	σ	μ	σ
supports students see ideas to fruition.	3.70	0.79	4.37	0.61	4.23	0.72	4.17	0.64
provides students challenging tasks.	4.30	0.53	4.67	0.48	4.61	0.50	4.50	0.59
provides students useful feedback.	3.50	0.82	4.17	0.75	3.80	1.11	3.33	0.96
offers freedom, flexibility & resources.	3.57	0.77	4.37	0.72	4.48	0.68	4.00	0.72
recognizes students' achievements.	3.60	0.72	4.10	0.80	4.23	0.92	3.63	0.92
provides innovative goals.	3.77	0.50	4.23	0.57	4.35	0.55	3.96	0.75
encourages interpersonal comm.	4.10	0.61	4.37	0.61	4.48	0.51	4.40	0.65
provides stimulating course work.	3.97	0.56	4.20	0.66	4.06	0.96	3.50	1.14
provides exploration of ideas.	3.80	0.71	4.43	0.68	4.52	0.51	4.04	0.69
offers non-routine challenging work.	3.87	0.68	4.53	0.51	4.55	0.57	4.20	0.88
requires imagination and creativity.	3.97	0.72	4.57	0.57	4.67	0.48	4.20	0.83
provides opportunities for knowledge.	4.17	0.59	4.43	0.57	4.35	0.88	4.29	0.75

Note. C-1 = Engineering; C-2 = Economics; C-3 = Communications; C-4 = Innovations. Likert scale: 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

In the engineering course, none of the motivation items were in the Strongly Agree range of 4.50 to 5.00. Instead, all items were in the Agree range of 3.50 to 4.49. The lowest scores of 3.50 in the Agreement range was "provide(s) students useful feedback." The highest score of 4.30 was given for the area of "provides students challenging tasks." The standard deviations ranged from 0.50 to 0.82, with the lowest standard deviation being in the item of "provides innovative goals" and the greatest deviation being in the area of "provides students useful feedback."

In the economics course, three scores were in the Strongly Agree range with a 4.67 in the area of "provides students challenging tasks," and a score of 4.57 in "requires imagination and creativity," and a score of 4.53 in "offers non-routine challenging work." The other items were in the Agree range from 3.50 to 4.49. The lowest score of 4.10 was "recognizes student's achievements." The highest scores in the Agree range were 4.43 within the items of "provides opportunities for exploration of ideas," and "provides opportunities to increase knowledge." The standard deviations ranged from 0.48 to 0.80 with the lowest standard deviation being in the item of "provides students challenging tasks," and the greatest deviation being in the item of "recognizes student's achievements."

In the communications course, four of the items were in the Strongly Agree range with the highest score being 4.67 for "require imagination and creativity," and 4.61 for "provides students challenging tasks," and 4.55 for "offers non-routine challenging work," and 4.52 for "provides opportunities for exploration of ideas." All other items were in the Agree range of 3.50 to 4.49. The highest scores in the Agree range were 4.48 for "offers freedom, flexibility, and resources" and "encourages interpersonal

communications." The lowest score was 3.80 for "provides students useful feedback." The standard deviations ranged from 0.48 to 1.11, with the lowest standard deviation being in the item of "requires imagination and creativity" and the greatest deviation being in the item of "provides useful feedback."

In the multidisciplinary innovations course, one item was in the Strongly Agree range with a score of 4.50 was the item "provides students challenging tasks." Ten items were in the Agree range with the highest Agree scores being 4.40 in "encourages interpersonal communications." The lowest score in the Agree range was 3.50 in "provides stimulating work." One score was in the Undecided range with a score of 3.33 and was the item "provides students useful feedback." The standard deviations ranged from 0.59 to 1.14, with the smallest standard deviation being in the item of "provides students challenging tasks" and the largest deviation being in the item of "provides stimulating work."

Table 12

Average Construct Scores for Students' Perceptions of Motivation in Capstone Courses

Courses	μ	σ
Single Disciplinary		
Engineering	*3.86*	*.39*
Economics	*4.37*	*.42*
Communications	*4.36*	*.49*
Multidisciplinary		
Innovations	*4.02*	*.55*

Note. 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

The mean score by capstone course in this construct, which measured students' perceptions of their course motivation, was found to be as follows: engineering μ = 3.86,

economics μ = 4.37, communications μ =4.36, and innovations μ = 4.02. The two highest means were found in the economics and communications class, while the lowest mean was found in the engineering course. The lowest standard deviation was found in the engineering course and the highest standard deviation was in the innovations course.

Table 13

Students' Written Comments related to Perceptions of Motivation in Capstone Courses

Courses	Rating	Comments
Single Disciplinary		
Engineering	+/-	2) It sucks but I have learned a lot.
	-	7) The course would have been much better if there was documentation about past systems. That was the most frustrating part of the course.
	-	9) I felt parts of the course were too structured. In many cases it was like pulling teeth to get a simple block diagram changed.
	-	22) More than likely 99% of all Senior Design projects will end up in the project graveyard. Not much incentive other than personal interest and desire to pass the class.
Economics	*	3) Performance and product viability varies greatly from product to product and team to team.
	+	10) This was an outstanding experience to have with a real world setting.
	+	19) Worthwhile course.
	+	24) Loved the "real world" aspect of the course!
	+	25) It was a wonderful class and an outstanding project.
	+	28) Love the hands on experience and one on one with clients that you get from this course.
Communications	+	4) This is a great course. It was very beneficial.
	+/-	5) This course was great. I was very hesitant in the beginning, but it ended up being worthwhile.
	-	6) It would be awesome if we had examples of what we were supposed to do for each assignment.
	-	8) At times, it seems a waste of time, but who knows, it is not over with yet. It could always get worse.
	+/-	9) Its a good course. Frustrating at times, but not the professor's fault. It's difficult working with some people but you learn a lot. I enjoyed working with my group, we get along great.
	+	11) This course gives a taste of what it is like to work with a real world client. I like the flexibility it gives to

Students' Written Comments related to Perceptions of Motivation in Capstone Courses

Courses	Rating	Comments
		work as a team and make decisions.
	-	13) Sometimes it is hard to know what exactly is expected from us and how the assignment is supposed to be completed. Most of the time we were left in the dark on trying to figure out how to complete an assignment.
	-	14) I had difficulty working with a group. I felt like I was left out.
	+	17) This was a very challenging course with real world experience. It allows students to work creatively with little guidance.
	-	18) Too much busy work, had no idea what to do on half of the assignments, very frustrating. I thought it was a pain and not beneficial at all.
	+/-	26) Working in groups is great, but grade wise, it would have been better if we had turn in our own grades as in every member of the team turns in homework.
	+	27) It has been a fun course to see our teams ideas become a reality.
Multidisciplinary Innovations	+	7) A very useful and educational course shows the importance of innovation and the steps that create it. The instructors are some of the best in the department and for the most part help students when they can. The communication with client and team really shows a work experience that no other class can teach.
	+	10) Really enjoyable and able to put what we learn in other class to use.
	+	21) Overall, this course has been a good experience. My team had some trouble with our idea and low feedback from our sponsor, but I feel confident about the idea. The class has been very useful.
	+	23) I have truly enjoyed working in this course.

Note. Every student was assigned a number identification in their respective classes in order to protect student anonymity and report comments. The rating system is as follows (+) positive (-) negative (+/-) mixed (*) neutral.

The largest majority of comments were made related to course motivation. Four engineering students made comments. All of their comments were related to negative course attributes. In the economics course, six comments were made. Five of those

comments were positive. One comment was a statement of fact and neither positive or negative. Twelve comments were made in the communications course of those comments four were positive, five were negative, and three were mixed.

Findings Related to Research Question Five

The fifth research question sought to determine students' perceptions of the innovativeness of their final project in capstone courses. This construct comprised 12 items which students ranked using a five-point Likert scale. These interval data were analyzed and means and standard deviations were reported. Table 14 shows the frequencies which represent students' level of agreement or disagreement. Table 15 shows the findings by the individual instrument items for each course surveyed. Table 16 shows the average construct score for students' perceptions of their final project innovativeness. No additional comments written by the respondents related to the research question; therefore, a table will not be included.

Table 14

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding Perceptions of Final Project Innovativeness by Capstone Course

The final team project will . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
result in an innovative product.					
Engineering			16.7(5)	73.3(22)	10.0(3)
Economics		3.3(1)	3.3(1)	56.7(17)	36.7(11)
Communications		9.7(3)	9.7(3)	45.2(14)	35.5(11)
Innovations	4.2(1)		20.8(5)	33.3(8)	41.7(10)
meet the client's expectations.					
Engineering		3.3(1)	13.3(4)	66.7(20)	16.7(5)
Economics		6.7(2)	26.7(8)	30.0(9)	36.7(11)
Communications		6.5(2)	19.4(6)	35.5(11)	38.7(12)
Innovations		4.2(1)	16.7(4)	37.5(9)	41.7(10)
result in product that benefits society.					
Engineering	10.0(3)	20.0(6)	26.7(8)	36.7(11)	6.7(2)
Economics		10.0(3)	33.3(10)	26.7(8)	30.0(9)
Communications		6.5(2)	19.4(6)	48.4(15)	25.8(8)
Innovations		4.2(1)	45.8(11)	20.8(5)	29.2(7)
result in a patent.					
Engineering	20.0(6)	26.7(8)	40.0(12)	6.7(2)	6.7(2)
Economics	16.7(5)	20.0(6)	33.3(10)	16.7(5)	13.3(4)
Communications	25.8(8)	16.1 (5)	25.8(8)	25.8(8)	6.5(2)
Innovations	8.3(2)	37.5(9)	37.5(9)	8.3(2)	8.3(2)
result in a product that goes to market.					
Engineering	20.0(6)	26.7(8)	40.0(12)	10.0(3)	3.3(1)
Economics		6.7(2)	10.0(3)	43.3(13)	40.0(12)
Communications	16.1(5)	6.5(2)	9.7(3)	48.4(15)	19.4(6)
Innovations	4.2(1)	12.5(3)	20.8(5)	37.5(9)	25.0(6)
result in product consumers will buy.					
Engineering	13.3(4)	26.7(8)	30.0(9)	23.3(7)	6.7(2)
Economics		3.3(1)	6.7(2)	46.7(14)	43.3(13)
Communications	19.4(6)	12.9(4)	12.9(4)	35.5(11)	19.4(6)
Innovations		4.2(1)	37.5(9)	33.3(8)	25.0(6)
be the best of many possible solutions.					
Engineering		6.7(2)	23.3(7)	60.0(18)	10.0(3)

Frequencies for Students' Level of Agreement or Disagreement with Statements Regarding Perceptions of Final Project Innovativeness by Capstone Course

The final team project will . . .	1 *%(f)*	2 *%(f)*	3 *%(f)*	4 *%(f)*	5 *%(f)*
Economics		3.3(1)	13.3(4)	53.3(16)	30.0(9)
Communications		9.7(3)	22.6(7)	38.7(12)	29.0(9)
Innovations	4.2(1)	4.2(1)	25.0(6)	33.3(8)	33.3(8)
meet or exceed course requirements.					
Engineering		6.7(2)	16.7(5)	56.7(12)	20.0(6)
Economics			10.0(3)	50.0(15)	40.0(12)
Communications		3.2(1)	19.4(6)	38.7(12)	38.7(12)
Innovations	4.2(1)		16.7(4)	54.2(13)	25.0(6)
be on or ahead of schedule.					
Engineering	3.3(1)	13.3(4)	33.3(10)	40.0(12)	10.0(3)
Economics		13.3(4)	20.0(6)	40.0(12)	26.7(8)
Communications	3.2(1)	9.7(3)	9.7(3)	41.9(13)	35.5(11)
Innovations	4.2(1)	16.7(4)	20.8(5)	33.3(8)	25.0(6)
be at or below projected cost.					
Engineering	3.3(1)	13.3(4)	33.3(10)	40.0(12)	10.0(3)
Economics		10.0(3)	40.0(12)	36.7(11)	13.3(4)
Communications		3.2(1)	29.0(9)	35.5(11)	32.3(10)
Innovations		4.2(1)	33.3(8)	58.3(14)	4.2(1)
be worth continuing.					
Engineering	3.3(1)	10.0(3)	26.7(8)	53.3(16)	6.7(2)
Economics	3.3(1)	6.7(2)	16.7(5)	40.0(12)	33.3(10)
Communications	3.2(1)	12.9(4)	12.9(4)	22.6(7)	48.4(15)
Innovations	4.2(1)	4.2(1)	29.2(7)	37.5(9)	25.0(6)
be considered innovative by experts.					
Engineering	6.7(2)	23.3(7)	30.0(9)	33.3(10)	6.7(2)
Economics	3.3(1)	6.7(2)	23.3(7)	43.3(13)	23.3(7)
Communications	3.2(1)	16.1(5)	22.6(7)	32.3(10)	25.8(8)
Innovations	12.5(3)		37.5(9)	33.3(8)	16.7(4)

Note. 1= Strongly Disagree; 2 = Disagree; 3 Undecided; 4 = Agree; and 5 = Strongly Agree.

Table 14 shows the frequencies for students' level of agreement or disagreement with statements regarding students' perceptions of final project innovativeness by capstone course. The economics course had the largest number of Strongly Agrees in the areas of "result in a product that goes to market" and "result in a product consumers will buy." Whereas the engineering course has the lowest number of Strongly Agrees in these

areas. In all the courses combined the fewest Strongly Agrees occurred in the area of "result in a patent" with only 10 of 115 students. This item also received the largest numbers of Strongly Disagrees with 21 of 115 students. The engineering students had the fewest total number of items selected with Strongly Agrees in 14 of 15 cases. In the item of "result in a product that goes to market" only four engineering students Agreed or Strongly Agreed with 40% of students Undecided, and 26.7% Disagreed and 20% Strongly Disagreed.

Table 15 shows the means and standard deviations for each item within the construct. The mean and standard deviations are noted using Greek symbols. The mean is noted as (μ) and the standard deviations as (σ).

Table 15

Students' Perceptions Final Project Innovativeness by Capstone Course

	C-1		C-2		C-3		C-4	
The final team project will . . .	μ	σ	μ	σ	μ	σ	μ	σ
result in an innovative product.	3.93	0.52	4.27	0.69	4.06	0.93	4.08	1.02
meet the client's expectations.	3.97	0.67	3.97	0.96	4.06	0.93	4.17	0.87
result in product that benefits society.	3.10	1.12	3.77	1.01	3.94	0.85	3.75	0.94
result in a patent.	2.53	1.11	2.90	1.27	2.71	1.30	2.70	1.04
result in a product that goes to market.	2.50	1.04	4.17	0.87	3.48	1.34	3.67	1.13
result in product consumers will buy.	2.83	1.14	4.30	0.75	3.23	1.43	3.80	0.88
be the best of many possible solutions.	3.73	0.74	4.10	0.76	3.87	0.96	3.88	1.08
meet or exceed course requirements.	3.90	0.80	4.30	0.65	4.13	0.85	3.96	0.91
be on or ahead of schedule.	3.40	0.97	3.80	1.00	3.97	1.08	3.59	1.18
be at or below projected cost.	3.40	0.97	3.53	0.86	3.97	0.87	3.63	0.65
be worth continuing.	3.50	0.90	3.93	1.05	4.00	1.21	3.75	1.03
be considered innovative by experts.	3.10	1.06	3.77	1.01	3.61	1.14	3.42	1.18

Note. C-1 = Engineering; C-2 = Economics; C-3 = Communications; C-4 = Innovations. Likert scale: 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

In the engineering course, none of perceptions of final project innovativeness items were in the Strongly Agree range of 4.50 to 5.00. Five items were in the Agree range of 3.50 to 4.49. The lowest scores of 3.50 in the Agreement range was “will be worth continuing.”

The highest score of 3.93 was given for the area of “result in an innovative project.” Seven items were in the Undecided range. The lowest item was 2.50 in “result in a product that goes to market.” The highest items in the Undecided range scored 3.40 and were in “be on or ahead of schedule” and “be at or below projected cost.” The standard deviations ranged from 0.52 to 1.14 with the lowest standard deviation being in the item of “result in an innovative product” and the greatest deviation being in the area of “result in a product consumers buy.” In the economics course, none of the scores were in the Strongly Agree range. Eleven items were in the Agree range from 3.50 to 4.49. The lowest score in the Agree range with a score of 3.53 was “will be at or below projected cost.” The highest score in the Agree range was 4.30 in “will meet or exceed course requirements.”The standard deviations ranged from 0.65 to 1.27 with the lowest standard deviation being in the item of “will meet or exceed course requirements,” and the greatest deviation being in the item of “will result in a patent.” In the communications course, none of the items were in the Strongly Agree range. Ten items were in the Agree range of 3.50 to 4.49. The highest score in the Agree range was 4.12 for “meet or exceed course requirements.” The lowest score in the Agree range 3.61 for “will be considered innovative by experts.” Four items were in the Undecided range from 2.50 to 3.49. The highest score in the Undecided range was 3.61 for “considered innovative by experts.” The lowest score in the Undecided range was 2.70 for “result in a patent.”

The standard deviations ranged from 0.85 to 1.43 with the lowest standard deviation being in the item of "meet or exceed course requirements," and the greatest deviation being in the item of "result in product consumers will buy."

In the multidisciplinary innovations course, no item was in the Strongly Agree range. Ten items were in the Agree range with the highest Agree scores being 4.17 in "meet client's expectations." The lowest score in the Agree range was 3.59 in "be on or ahead of schedule." Two scores were in the Undecided range with a score of 3.42 for "provides students useful feedback," and 2.70 for "result in a patent." The standard deviations ranged from 0.65 to 1.18 with the smallest standard deviation being in the item of "be at or below project costs" and the largest deviation being in the item of "be considered innovative by experts."

Table 16

Average Construct Scores for Students' Perceptions of Innovativeness of Final Project in Capstone Courses

Courses	μ	σ
Single Disciplinary		
Engineering	*3.33*	*.60*
Economics	*3.90*	*.66*
Communications	*3.75*	*.62*
Multidisciplinary		
Innovations	*3.70*	*.73*

Note. 1.00 – 1.49 = Strongly Disagree; 1.50 – 2.49 = Disagree; 2.50 – 3.49 Undecided; 3.50 – 4.49 = Agree; and 4.50 – 5.00 = Strongly Agree.

The mean score by capstone course in this construct, which measured students' perceptions of the innovativeness of their final project, was found to be as follows: engineering μ = 3.33, economics μ = 3.90, communications μ =3.75, and innovations μ = 3.70. The course with the highest mean was in the economics course and the lowest

mean was in engineering course. The largest standard deviation of 0.73 was found in the innovations course. The smallest standard deviation of 0.58 was in engineering course.

Findings Related to Research Question Six

The sixth research question sought to describe the relationships between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation in capstone courses. The Pearson Product-Moment Correlation Coefficient was utilized as these were interval data. Relationships were classified according to Davis (1971) convention which is used to describe the magnitude of correlation coefficients. Table 17 summarizes the findings.

Table 17

Pearson Product-Moment Correlations between Students' Perceptions of the Communications Provided by Their Faculty Leaders and Students' Perceptions of their Course Motivation in the Capstone Courses

Courses	ρ	α
Single Disciplinary		
Engineering	*.58***	*.00*
Economics	*.69***	*.00*
Communications	*.72***	*.00*
Multidisciplinary		
Innovations	*.69***	*.00*

Note. Pearson Product-Moment Correlation Coefficient; ** $\alpha < .01$

The correlation coefficients by capstone course in this table are representative of the relationships between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation. In terms of the correlation between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation the strongest

correlations was found in the communications course (ρ = .72) and the weakest correlation was found in the engineering course (ρ = .58). While the correlations for the economics and innovations course were both found to be (ρ = .69).

Findings Related to Research Question Seven

The seventh research question sought to describe the relationships between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation in capstone courses. The Pearson Product-Moment Correlation Coefficient was utilized as these were interval data. Relationships were classified according to Davis (1971) convention which is used to describe the magnitude of correlation coefficients. Table 18 summarizes the findings.

Table 18

Pearson Product-Moment Correlations between Students' Perceptions of the Communications Provided by Their Peer Leaders and Students' Perceptions of Their Course Motivation in Capstone Courses

Courses	ρ	α
Single Disciplinary		
Engineering	*.18*	*.34*
Economics	*.81***	*.00*
Communications	*.40***	*.03*
Multidisciplinary		
Innovations	*.29*	*.16*

Note. Pearson Product-Moment Correlation Coefficient; ** α < .05

The correlation coefficients by capstone course in this table are representative of the relationships between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation in capstone courses. In terms of the correlation between students' perceptions of the communications provided

by their peer leaders and students' perceptions of their course motivation in capstone courses the strongest correlations was found in the economics course (ρ = .81) and the weakest correlation was found in the engineering course (ρ = .18).

Findings Related to Research Question Eight

The eighth research question sought to describe relationships between students' perceptions of their course motivation and students' perceptions of the innovativeness of their final project in capstone courses. The Pearson Product-Moment Correlation Coefficient was utilized as these were interval data. Relationships were classified according to Davis (1971) convention which is used to describe the magnitude of correlation coefficients. Table 19 summarizes the findings.

Table 19

Pearson Product-Moment Correlations between Students' Perceptions of Their Course Motivation and Students' Perceptions of the Innovativeness of Their Final Project in Capstone Courses

Courses	ρ	α
Single Disciplinary		
Engineering	*.26*	*.16*
Economics	*.47***	*.01*
Communications	*.59***	*.00*
Multidisciplinary		
Innovations	*.31*	*.15*

Note. Pearson Product-Moment Correlation Coefficient; ** α < .01

In terms of the correlation between students' perceptions of their course motivation and students' perceptions of the innovativeness of their final project in capstone courses the strongest correlations was found in the economics course (ρ = .59) and the weakest correlation was found in the engineering course (ρ = .26)..

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

Chapter five provides a summary of the research study and shares the conclusions, implications, and recommendations based upon the eight research questions. The purpose of this study was to assess students' perceptions of communications provided by faculty and peer leaders in relationship to both students' perceptions of their course motivation as well as their perceptions of the innovativeness of their final project in single and multidisciplinary capstone courses.

Research Questions

The following research questions guided this study:

1. What are the demographic characteristics of students in the identified capstone courses, including academic major, academic level, and sex?
2. What are students' perceptions of the communications provided by their faculty leaders in capstone courses?
3. What are students' perceptions of the communications provided by their peer leaders in capstone courses?
4. What are students' perceptions of their course motivation in capstone courses?

5. What are students' perceptions of the innovativeness of their final project in capstone courses?
6. What relationship exists between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation in capstone courses?
7. What relationship exists between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation in capstone courses?
8. What relationship exists between students' perceptions of their course motivation and students' perceptions of the innovativeness of their final project in capstone courses?

Limitations of the Study

1. This study was conducted using self-report data.
2. It was impossible to control for outside factors which may have caused students to self select into the single or multidisciplinary courses.
3. The varying lengths of the single versus multidisciplinary courses could have also provided an impact that could not be controlled for given the parameters of the study.
4. The scope of this study was limited to the investigation of the research variables as they relate to four specific capstone courses.
5. The generalizability of this study is limited to this specific population.

Assumptions of the Study

1. The instrument used in the research measured the variables studied.
2. Participants in the single or multidisciplinary courses were not significantly different before the capstone learning experiences.
3. Differences in students' perceptions can be attributed to differences in the single or multidisciplinary courses.
4. Participants in the single or multidisciplinary courses did not interact or share experiences.
5. The interpretation of the data reflected the students' perceptions.

Research Design

This study implemented a descriptive-correlational, survey research design to assess the perceptions of students in capstone courses. According to Gay et al. (2009), descriptive research involves collecting numerical data to answer questions and describe phenomenon. In comparison, correlational research involves collecting data to determine whether and to what degree a relationship exists between two quantifiable variables (Gay et al., 2009). Correlational research can be very useful "when a need exists to study a problem requiring the identification of the direction and degree of association between two sets of scores" (Creswell, 2000, p. 379). Correlational research also helps explain complex relationships between multiple factors that explain an outcome (Gay, 2009). However, researchers must realize that correlation does not prove causation instead it indicates a relationship (Creswell, 2000).

Population

The population for this study included students participating in single disciplinary (agricultural communications, agricultural economics, and electrical and computer engineering) and multidisciplinary (innovations) capstone courses. Studying the entire population in a census study is beneficial when the researcher is endeavoring to learn about or understand a specific phenomenon (Creswell, 2000). In this situation the researcher focused on these four specific cases of single disciplinary and multidisciplinary capstone courses.

Ideally, the group size needed to use the correlational statistic is 30 and larger sizes contribute to less error variance (Creswell, 2000). With that goal in mind the researcher surveyed students registered in the following single disciplinary capstone courses: AGCM 4403 (N=32), AGEC 4423 (N=31), ECEN 4012 (N=30) during the fall 2010 semester. In the spring 2011 semester, the researcher surveyed students in the *Innovations Capstone Course* sections including AGCM 4403-002 (N=6), AGEC 4990-122 (N=5), and BAE 4012-001 (N=13). The total number of students eligible to participate in the study was 117. One agricultural economics student and one agricultural communications student did not complete the survey. The findings are based upon the 115 participants who completed the questionnaire.

Survey Instrument

The *Capstone Course Experience Questionnaire* was developed by modifying existing instruments with the support of a team of five researchers representing agricultural communications, economics and engineering and was based upon a comprehensive review of literature and derived from other instruments described in

chapter three. The questionnaire included five sections designed to study the following: 1) students' perceptions of communications provided by faculty leaders, 2) students' perceptions of communications provided by peer leaders 3) students' perceptions of their course motivation, 4) students' perceptions of the innovativeness of their final project, 5) students' demographic characteristics. The final questionnaire included 54 questions with 270 scaled items and four demographic questions.

Data Collection

After approval from the IRB committee, appointments were made to administer questionnaires. The researcher read an IRB approved script which included an introductory statement and specific instructions regarding completion of the instrument. The researcher also distributed consent forms approved by the institutional review board to explain students' rights as participants in the research study. Questionnaires were administered to participants in the single disciplinary courses during the week of November 22, 2010 through November 24, 2010. Participants in the multidisciplinary course completed the questionnaires during the week of March 28, 2011 through April 1, 2011. Questionnaires were administered in the students' original classrooms and were distributed and collected by the researcher. The questionnaire yielded a 98% response rate.

Data Analysis

The data collected were analyzed using the Statistical Package for the Social Sciences ® (SPSS) version 17 software. The goal of this research was to quantitatively describe the data through the use of parameters. According to Gay et al. (2009),

parameters are defined as numerical characteristics of a population. As parameters were used to analyze the data the Greek symbols were used in representations of the data. The mean is noted as (μ) and the standard deviations as (σ).

Research questions one, two, three, four, and five were answered using basic descriptive parameters including measures of central tendency and measures of variability. The data were analyzed using means, frequencies, percentages, and standard deviations. Research questions six, seven, and eight were answered using the Pearson Product Moment Correlation. The researcher then analyzed the correlations between the four research constructs of questionnaires completed by students in single disciplinary (agricultural communications, agricultural economics, and electrical and computer engineering) and multidisciplinary (innovations) capstone courses. The strength of relationships was described using Davis' (1971) magnitude of the correlation coefficient (r) conventions: $.01 \geq r \geq .09$ = "Negligible," $.10 \geq r \geq .29$ = "Low," $.30 \geq r \geq .49$ = "Moderate," $.50 \geq r \geq .69$ = "Substantial," $.70 \geq r \geq .99$ = "Very High," $r \geq .1.00$ = "Perfect."

A small number of written additional comments were made by the respondents. This qualitative data was transcribed into a word document and used to support the quantitative component of this study.

Summary of Findings, Conclusions, Implications, and Recommendations

Research Question One

Data from questionnaires administered to 115 students were used in the study. Specifically, 43 respondents (37.4%) were engineering majors, 34 respondents (29.6%)

were economics majors, and 38 respondents (33%) were communications majors. Most of the students in the capstone courses were seniors with 106 respondents representing 92.2% of the study. However, of those who responded 5 students (4.3%) were junior level students and 4 (3.5%) of the subjects were graduate students. The greatest majority of students , 71 students (61.7%) were male, and in contrast, 44 representing (38.3%) of the total students were female.

Conclusions and Implications

The first research question sought to determine selected demographic characteristics of students in the identified capstone courses. Specifically, data including students' major, academic level and sex were examined using frequencies and percentages. The number of students in each of the majors included in the study was uneven. Although the three single disciplinary courses had a nearly equal number of students, overall the study included a disproportionally large number of engineers. This is a result of large majority of the students in the multidisciplinary innovations course being engineering students. As a result, there were four percent more engineers than economics majors and eight percent more engineers than communications majors. While this conclusion clearly represents the current situation, this uneven distribution of engineering student in the multidisciplinary innovations course should be considered. According to researchers, educators should endeavor when possible to make teams balanced in an effort to ensure that various collaborative skills are present (Ingram & Parker, 2002). If one group is over represented, the tendency is for the project to be pulled in the direction of the dominate group (Ingram & Parker, 2002).

As expected, most of the students in the capstone courses were seniors. However, almost eight percent of students were either juniors or graduate students. This finding indicates that not all students have the same academic preparation when participating in the capstone experience. This difference in academic preparation should be considered.

The majority of students in this study (61.7 %) are male. This inequity is most apparent in the engineering students. While the large percentage of male students in the engineering discipline is expected, educators and researchers should consider the possible impact of this gender inequity, especially in the multidisciplinary innovations course. Researchers have found that gender homophily impacts students' perceptions of the communications climate (Varma & Lafever, 2007). In a study of sixty-six students in a computer science course, it was found that students feel less comfortable working in a team when they do not belong to the predominate gender group (Varma & Lafever, 2007). According to researchers, "The perception that gender differences exist in the classroom predicts that meaningful communication will not occur and that a positive interpersonal relationship will not exist between male and female students in the classroom" (Varma & Lafever, 2007, p. 1).

In studying the demographic data, it is clear that the capstone courses do not include equal distribution of students by gender. In the case of the innovations course it is clear that inequities existed in the numbers of students from the three academic disciplines. In addition, nine of the students in the course were not seniors.

Recommendations for Practice

1. It is recommended that educators consider engaging in processes to make innovations teams more equitable. Currently, the agricultural communications and agricultural business students are underrepresented on the innovations teams. Increasing the course size to double the number of non-engineering students may improve the overall balance of the teams.
2. Educators should consider the implications of junior and graduate students in a course meant for seniors. It is possible that juniors will not have the skills needed to successfully engage in the capstone experience. Additionally, graduate students may find the material covered in an undergraduate capstone course to be too simplistic.

Recommendations for Research

1. Future research is needed to understand the experiences of both junior and graduate students engaging in capstone experiences designed for seniors.
2. Research should also be conducted to understand the impact of teams with a predominate major represented.
3. Researchers should also collect demographic data related to cultural differences and study possible outcomes related to homogenous and heterogeneous teams.

Research Question Two

The frequencies for students' level of agreement or disagreement with statements regarding the communications provided by their faculty leaders resulted in the following notable findings. When considering the frequency of items selected, the agricultural communications course consistently demonstrated the highest percentage of

Strongly Agree ratings in all items. The items with the greatest frequency of Strongly Agree ratings were "challenge(s) us to be resourceful" and "encourages communication."

In eleven of the fifteen items the multidisciplinary innovations course had the fewest Strongly Agree ratings. The fewest rating in the Strongly Agree area was in the innovations class in the area of "inform(s) about future plans" with only one student. The multidisciplinary innovations course also had the largest number of Strongly Disagree ratings with eight items.

The economics course only had one item which received a Strongly Disagree from one student in the area of "ask(s) suggestions for improvement." Otherwise no other students selected Strongly Disagree in any areas. In the engineering course, only one student selected Strongly Disagree in the area of "ask(s) suggestions for tasks." Otherwise all other items were rated between Disagree and Strongly Agree.

Mean Scores within Constructs

In comparison, the mean scores of individual items within the construct, which measured students' perceptions of communications provided by their faculty leaders, resulted in the following notable findings. The communications course was the only group to have items in the Strongly Agree range, which included the following items: "encourage(s) communication," and "challenge(s) us to be resourceful," and "show(s) enthusiasm." In reviewing all of the responses only two classes offered undecided scores. Both the communications and multidisciplinary innovations course had scores in the Undecided range of 3.22 and 2.96 respectively for, "provide(s) clear instructions to us."

In three of the four classes the highest score was in "encourages communications." The scores are as follows: communications 4.65; innovations 4.33; and

engineering 4.17. However in the economics class the highest score was 4.34 for "showed enthusiasm." Whereas in the economics course "encourage communications" scored 4.30 and was tied for the fourth highest score. In three of the four classes "provide(s) clear instructions to us" was the lowest scored item. The scores are as follows: innovations 2.96, communications 3.22, and economics 3.93. In comparison in the engineering course "provide(s) clear instructions to us" scored 3.57 and was the second lowest item.

In considering the standard deviations there was not an identifiable pattern. However, the greatest deviation was 1.31 in the communications class and related to the "provide(s) clear instructions to us" item. The smallest deviation was 0.55 in the multidisciplinary innovations course and related to the "show(s) enthusiasm" item.

Grand Mean Scores within Constructs

The grand mean scores by capstone course in this construct, which measured students' perceptions of communications provided by their faculty leaders, were found to be as follows: engineering μ = 3.84, economics μ = 4.06, communications μ =4.18, and innovations μ = 3.69. These scores indicate that the communications course students provided on average the highest ratings and the innovations students provided on average the lowest rating. However, all ratings were found to fall within the range of "agreement" which was set as 3.50 to 4.49.

Qualitative Data

In considering the qualitative data it was determined that only three comments related to communications provided by faculty leaders. In the engineering and economics classes, no comments were made. In the communications course there were two

comments one comment was mixed and indicated positive and negative perceptions the other comment indicated negative perceptions of faculty communications. In the multidisciplinary course, the comment related to mixed perceptions of communication.

Conclusions and Implications

The second research question sought to determine students' perceptions of the communications provided by their faculty leaders in capstone courses. According to the results of the questionnaire, the communications course was the only group to have items with mean scores in the Strongly Agree range, which included the following items: "encourage(s) communication," and "show(s) enthusiasm," and "challenge(s) us to be resourceful." These are very positive results which indicate an advantage in students' perceptions of communications provided by their faculty leaders.

However, it is important to note that the grand means in all courses scores fell within the range of "agreement" which was set as 3.50 to 4.49. These scores indicate very positive communications, which has been shown to have a powerful impact on an individual's innovative behavior (Aijun, et al., 2010). Researchers have found that encouraging communications is an important aspect of the innovations process (Monge, Cozzens, & Contractor, 1992). Rugutt & Chemosit (2009) reported that providing enthusiastic communications is important when educators seek to become influencing agents who impact students' actions. Research has shown that providing challenging work which is within a students' ability to succeed has a positive impact on students' behavior and learning outcomes (Csikszentmihalyi, 1988).

One area of concern relates to clarity of communications. In three of the four courses "provide(s) clear instructions to us" was the lowest scored item. The scores are as

follows: innovations 2.96, communications 3.22, and economics 3.93. In the engineering course “provide(s) clear instructions to us” scored 3.57 and was the second lowest item.

Three out of 115 students wrote additional comments in the last section of the survey related to communications provided by the faculty leaders. However, in the communications course one of the students wrote, “Sometimes it is hard to know what exactly is expected from us and how the assignment is supposed to be completed. Most of the time we were left in the dark on trying to figure out how to complete an assignment.”

Clear communications is an important goal of educators (Sass, 1989). One important communications task for educators is to provide clear performance related communications (Schunk, 2008). A basic need of students is to understand what is expected of them in the classroom setting (Schunk, 2008). In the cases of the innovations and communications courses the item “provide(s) clear instructions to us” is in the Undecided range. While this should not be considered a major concern, clarity of communications should be considered when developing learning experiences for students. According to researchers, positive learning environments are important in encouraging student learning (McCombs & Pope, 1994).

The grand means in each of the construct all courses scores fell within the range of “agreement” which was set as 3.50 to 4.49. This finding indicates that students’ perceptions of communications provided by their faculty leaders are generally positive. However, the ratings ranged from the single disciplinary communications course with a mean of 4.18 to the multidisciplinary innovations course with mean of 3.69.

One possible cause of the lower score in the multidisciplinary course could be the inherent difficulty of team teaching a course. The multidisciplinary course had four

primary faculty leaders. According to experienced team teacher Rowland (2003), "Successful team teaching requires focus, compromise, and cooperation…team teaching can be both uplifting and frustrating at the same time" (p. 1). It is possible that this more complex teaching situation led to less successful communications.

Another possible cause of the lower score could be complications related to teaching students to develop innovative projects. Teaching innovations may be related to a less directive teaching style that students have not experienced. It may be that students' inexperience with less directive teaching style resulted in a lower communications construct score. While this teaching style may offer a bridge to the workplace many students are not comfortable with it and prefer a prescriptive approach.

Recommendations for Practice

1. It is important that educators acknowledge and make plans to overcome possible communications limitations of collaborative teaching in multidisciplinary courses.
2. Faculty teaching multidisciplinary courses should engage in activities which promote team building between the educators.
3. In single and multidisciplinary courses, educators should endeavor to consistently provide clear, straightforward communications.
4. Feedback provided to students should be carefully considered and course developers should consider adding opportunities for improving and encouraging feedback throughout the process.
5. While it is understood that a capstone course involves more opportunities for student decision making and project creation, educators should remember the importance of

positive communications which reassure students and clearly explain course expectations.

Recommendations for Research

1. It is recommended that this study be replicated with future capstone courses.
2. Researchers may consider studying the possible similarities and/or differences in students' perceptions of capstone courses offered across the nation.

Research Question Three

The frequencies for students' level of agreement or disagreement with statements regarding the communications provided by their peer student leaders resulted in the following notable findings. There was not a course which consistently demonstrated the highest percentage of Strongly Agree ratings in multiple items.

In the economics course, the highest number of strongly agree ratings were in "value(s) stundents' opinions," and "shows enthusiasm." However, in the engineering course, there were the fewest Strongly Agree ratings. In fourteen of the fifteen items, the economics course had the least number of Strongly Agrees. The course also had one student strongly disagree in eight items. The items with the greatest frequency of Strongly Agree ratings in the combined courses were "joke(s) good-naturedly with us." and "strike(s) up casual conversations."

Mean Scores within Constructs

The mean scores of individual items within the construct, which measured students' perceptions of communications provided by their peer leaders, resulted in the following notable findings. The economics course was the only group to have an item in

the Strongly Agree range which was “joke(s) good naturedly with us.” In reviewing the responses one group offered scores in the Undecided range. In the engineering course two items scored 3.33 including “show(s) enthusiasm” and “provide(s) clear instruction to us.”

The highest scores by course were as follows: engineering with a score of 3.87 for “keep(s) informed of project deadlines”; economics with two items tied at 4.37 were “show(s) enthusiasm” and “value(s) students’ opinions”; communications with a score of 4.49 for “strike(s) up casual conversations”; and innovations with two items tied with a score of 4.46 were “seek(s) input on important decisions,” and “strike(s) up casual conversations.”

The lowest scores by course were as follows: engineering with two scores tied at 3.50 for “explain(s) changes in assignments” and “ask(s) suggestions for completing tasks.”; economics with a score of 3.93 was “provide(s) clear instructions to us.”; communications with a score of 3.65 for “tell(s) reasons for work schedules.”; and innovations with a score of 3.63 for “explain(s) changes in assignments.”

In considering the standard deviations there was not an identifiable pattern. However, the greatest deviation was 1.08 in the communications class and related to the “provide(s) clear instructions to us” item. The smallest deviation was 0.52 in the engineering course and related to the “tell(s) reasons for work schedules” item.

Grand Mean Scores within Constructs

The grand mean scores by capstone course in this construct, which measured students’ perceptions of peer leader communications, were found to be as follows: economics μ = 4.22, communications μ =4.14, innovations μ = 4.07, and engineering μ

= 3.64. These scores indicate that the economics course students provided, on average, the highest ratings and the engineering students provided on average the lowest rating. However, all ratings were found to fall within the range of Agreement which was set at 3.50 to 4.49.

Qualitative Data

In considering the qualitative data, it was determined only two students made comments related to this research question. The students were both in the engineering course and made comments related to negative perceptions of communications provided by student peer leaders.

Conclusions and Implications

The third research question sought to determine students' perceptions of the communications provided by their peer leaders in capstone courses. The grand means in all courses scores fell within the range of "agreement" which was set as 3.50 to 4.49. This finding indicates that students' perceptions of the communications provided by their peer leaders are generally positive. However, the differences between the mean scores in the courses can be compared. The data indicated that the highest mean score was in the economics course and was 4.22 and the lowest mean score was in the engineering course and was 3.64.

According to the results of the questionnaire, the economics course was the only group to have an item in the Strongly Agree range, which included the following item: "joke(s) good naturedly with us." In addition, the economics course also had exceptionally high scores of 4.37 in the "show(s) enthusiasm" and "value(s) students' opinions" items.

In comparison, the engineering course had the lowest scores of 3.33 which fell in the range of Undecided in the areas of "show(s) enthusiasm" and "provide(s) clear instructions." There are noticeable differences in the students' perceptions of the communications provided by their peer leaders.

However, it is important to realize that the grand mean scores for all the classes are within the Agree range. Therefore, the communications are generally positive. This finding is contrary to the research conducted by Hansen (2006) which found that student leaders are generally underprepared for leadership roles. According to this study the team members offered high scores for their student peer leaders.

Nonetheless, there are some areas that generally received lower score that may need to be considered. As seen in the data for faculty leaders the student leaders also received lower scores in "provide(s) clear instructions to us." This clarity of communications and instructions should be considered. This finding may be a result of peer leaders not understanding the instructions and therefore being less successful in explaining tasks to their fellow students. Another remarkable finding is the considerably lower score for peer leaders' enthusiasm for the final project in the engineering. Enthusiastic communications has been shown to impact student communications (Schunk, 2008).

These findings are reflected in the comments from engineering students. Two engineering students wrote about difficulties with student leaders. For example, "The (student leaders) really could have been more approachable and supportive. I do not mean giving too much help but a lot of times they were unapproachable and tended to mock our

ideas or lack of insight." Another engineering student wrote, "Sometimes the (student leaders) would provide conflicting information which led to confusion among our team." While these are only the comments of two students the sentiments reflect the results of the quantitative data. It is possible to conclude that students in the single disciplinary engineering class experienced more peer leadership problems. This situation may have also had greater implications as it related to the students' course motivation and their perceptions of the innovativeness of their final project.

Recommendations for Practice

1. Educators should endeavor to understand the role of motivation in the classroom as it relates to capstone learning experiences.
2. Students appreciate "real world" learning experiences. Educators can use this motivating factor to improve educational opportunities.

Recommendations for Research

1. Investigating the selection of team leaders and its impact on team innovativeness would prove beneficial to educators as they design learning experiences.
2. A quasi-experimental study would enable researchers to understand the impact of leadership training on student leaders' ability to lead and their team's innovation outcomes.

Research Question Four

The frequencies for students' level of agreement or disagreement with statements regarding the perceptions of their motivation in capstone courses resulted in

notable findings. The economics and communications courses consistently demonstrated the highest percentage of Strongly Agree ratings in all fifteen items. In the economics and communications courses the highest number of strongly agree ratings were in “provide(s) students challenging tasks.” and “require(s) imagination and creativity.” However, the innovations and engineering courses had fewer Strongly Agrees in these items.

The engineering course had the fewest Strongly Agrees in ten of the twelve items. The economics course did not have any Strongly Disagrees and the communications course had one Strongly Disagree. Only three Strongly Disagrees were recorded in three separate items.

Mean Scores within Constructs

The mean scores of individual items within this construct, which measured students’ perceptions of their motivation in capstone courses, resulted in the following notable findings. Three of the courses had items fall in the Strongly Agree range. In the economics course, the three scores in the Strongly Agree range were 4.67in the area of “provides students challenging tasks,” and 4.57 in “requires imagination and creativity,” and 4.53 in “offers non-routine challenging work.” In the communications course, four of the items were in the Strongly Agree range, with the highest score being 4.67 for “require imagination and creativity,” and 4.61 for “provides students challenging tasks,” and 4.55 for “offers non-routine challenging work,” and 4.52 for “provides opportunities for exploration of ideas.” In the multidisciplinary innovations course, one item was in the Strongly Agree range with a score of 4.50 was the item “provides students challenging tasks.”

In reviewing the responses, one group offered scores in the Undecided range. In the multidisciplinary innovations course one score was in the Undecided range with a score of 3.33 and was the item "provides students useful feedback."

The highest scores in three of the four courses were for the item "provides students challenging tasks" with scores as follows: engineering with 4.30; economics with a 4.67; and innovations with score of 4.50. In comparison, the communications courses' highest score was 4.67 for "requires imagination and creativity." In comparison, the "provides students challenging tasks" item was second with a score of 4.61.

The lowest scores in two of the four courses was the item "provide(s) students useful feedback," with engineering being 3.50 and communications being 3.80. However, the economics courses' lowest score was 4.10 in "recognize student's achievements" and the innovations courses' lowest score was 3.50 in "provides stimulating work."

In considering the standard deviations, there was not an identifiable pattern. However, the greatest deviation was 1.14 in the innovations class and related to the "provide stimulating work" item. The smallest deviation was 0.48 in the communications course and related to the "requires imagination and creativity" item.

Grand Mean Scores within Constructs

The grand mean scores by capstone course in this construct, which measured students' perceptions of their course motivation, were found to be as follows: engineering μ = 3.86, economics μ = 4.37, communications μ =4.36, and innovations μ = 4.02. These scores indicate that the economics course students provided on average the highest ratings and the engineering students provided on average the lowest rating. However, all ratings were found to fall within the range of "agreement" which was set as 3.50 to 4.49.

Qualitative Data

In considering the qualitative data, it was determined the largest majority of comments were made related to course motivation. Four engineering students made comments. All of their comments were related to negative course attributes. In the economics course six comments were made. Five of those comments were positive. One comment was a statement of fact and neither positive or negative. Twelve comments were made in the communications course of those comments four were positive, five were negative, and three were mixed.

Conclusions and Implications

The fourth research question sought to determine students' perceptions of their course motivation in capstone courses. The grand means in all courses scores fell within the range of "agreement" which was set as 3.50 to 4.49. These finding indicate that students' perceptions of their motivation in the capstone courses was generally positive. The data from the economics and communications courses were very similar with the economics course having a mean of 4.37 and the communications course having a mean of 4.36. The multidisciplinary innovations course had a mean of 4.02. The course with the lowest reported mean in this construct was engineering with a mean of 3.86.

Understanding the lower course motivation for the engineering students is important in identifying differences in the capstone experience. In the engineering course, none of the motivation items fell in the Strongly Agree range of 4.50 to 5.00. Instead the highest score was 4.30 for the item, "provides students challenging tasks." This is an important finding because, according to Csikszentmihalyi's Theory of Flow, the level of complexity of the challenge positively impacts students' creativity and innovation (1988).

One possible factor which may have lowered students' motivation relates to relevance. According to expectancy-value theories of motivation (Weiner, 1985), there are two key cognitive influences which impact motivation, both students expectations and the utility value of the experience. When students report being frustrated about their final project it is possible that their perceptions of the utility value of the project have impacted their motivation. This idea is supported by the students' scoring of the item "provides innovative goals." The engineering course scored this item the lowest of all the courses with a 3.77 and the lowest standard deviation of 0.50. Realizing that the innovativeness of the goals was below students' expectations, educators may consider improving this area of the course.

In comparison, the communications and economics students demonstrated the highest motivation scores. These course had three items scored in the strongly agree range in the following items "require imagination and creativity," and "provides students challenging tasks," and "offers non-routine challenging work," and "provides opportunities for exploration of ideas." These high scores demonstrate students' excitement and motivation for the class. In considering goal theory as described by Schunk et al. (2008), it is clear that creative, challenging tasks provide opportunities for increased student motivation. In studies conducted by Shalley (1991) and Smith et al. (2008) it was found that students' motivation increased when they perceived their tasks to be related to their personal mastery goals and required imagination and creativity. The value of working on a project that students find meaningful has an impact on the motivation of students (Schunk et al., 2008).

The number of comments made by students relating to course motivation illustrates the importance of this area. However, the result of this qualitative data does not reflect the overall findings of the quantitative data from the questionnaire. Thirty of the 115 students chose to write comments. It is important to note that 26% of the students provided written comments. However, to add to the richness of the study this qualitative data should be considered even if anecdotal.

In considering the written comments from students, it is clear that the greatest majority of the comments related to course motivation. In the study 25 of the 30 students who wrote comments mentioned aspects relating to course motivation. Of those comments 13 were positive, 8 were negative, and 4 were mixed, and 1 was neutral.

In the economics, communications, and multidisciplinary courses, students wrote in the comments section about being excited about the practical applications of their new skills and their enjoyment for working on a "real-world" project. Some examples of comments include one economics student who wrote, "Loved the 'real world' aspect of the course." Similarly a communications student wrote, "This course gives a taste of what it is like to work with a 'real world' client." Another example was from the multidisciplinary innovations course, "A very useful and educational course shows the importance of innovation and the steps that create it." In contrast, none of the students in the engineering course commented on this aspect of the course.

The negative comments were made in the engineering and communications courses. In the communications course, one student wrote, "At times, it seems a waste of time, but who knows, it is not over yet. I could always get worse." In the engineering

course one student wrote, “I felt parts of the course were too structured. In many cases it was like pulling teeth to get a simple block diagram changed.” However, there were no negative comments written in the economics and multidisciplinary courses.

Mixed comments which mentioned positive and negative attributes were also mentioned in the engineering and communications courses. An engineering student wrote, “It sucks but I have learned a lot.” A communications student wrote, “It is a good course. Frustrating at times, but not the professor’s fault. It’s difficult working with some people but you learn a lot. I enjoyed working with my group, we get along great.”

In the survey quantitative data the multidisciplinary innovations course garnered fewer Strongly Agree items. However, it did have one item score a 4.50 in “provides students challenging tasks.” This finding is important when considering expectancy value theory and goal theory. It is notable that the scores were lower in the innovations course. Yet, it is important to realize that the grand mean for the motivation construct was within the Agree range. In the multidisciplinary innovations course only one item “provides students useful feedback” fell into the Undecided range. This item also garnered a lower score in the engineering course. Feedback is an important aspect of motivation. The theory of motivational communications (Mayfield & Mayfield, 2006), explained that feedback as part of meaning-making language is important in motivating individual innovations. Similarly, Schunk et al. (2008), wrote that feedback is based on recognizing student effort in the learning process and that feedback promotes student motivation and self efficacy.

In addition, it is important to realize that feedback is an important and necessary element of student learning (Schunk, 2008). A student mentioned this aspect in the written comments. For example in the multidisciplinary innovations course one student wrote, “My team had some trouble with our idea and low feedback from our sponsor…”

Recommendations for Practice

1. Educators should endeavor to understand the role of motivation in the classroom as it relates to capstone learning experiences.
2. Students appreciate “real world” learning experiences. Educators can use this motivating factor to improve educational opportunities.
3. The freedom to innovate in capstone courses can also negatively impact motivation. Educators need to explore this phenomenon and developing tactics to overcome this problem.

Recommendations for Research

1. Using the theory of flow, researchers should study students’ motivation levels throughout the innovations process to find factors which may cause the students’ motivation to increase and or decrease.
2. Researchers should also administer pre and post tests to see how students’ motivation changes after receiving the treatment of the innovations experience.

Research Question Five

The frequencies for students’ level of agreement or disagreement with statements regarding the perceptions of final project innovativeness by capstone course resulted in the following notable findings. The economics course had the largest number

of Strongly Agrees in the areas of “result in a product that goes to market” and “result in a product consumers will buy.” Whereas the engineering course has the lowest number of Strongly Agrees in these areas. In all the courses combined the fewest Strongly Agrees occurred in the area of “result in a patent” with only 10 of 115 students. This item also received the largest numbers of Strongly Disagrees with 21 of 115 students. The engineering students had the fewest total number of items selected with Strongly Agrees in 14 of 15 cases. In the item of “result in a product that goes to market” only four engineering students Agreed or Strongly Agreed with 40% of students Undecided, and 26.7% Disagreed and 20% Strongly Disagreed.

Mean Scores within Constructs

The scores of individual items within this construct, which measured students’ perceptions of the innovativeness of their final project, resulted in the following notable findings. None of the courses had items fall in the Strongly Agree range. However, three of the courses had items in the Undecided range. For example, in the engineering course, seven items were in the Undecided range. The lowest item was 2.50 in “result in a product that goes to market.” The highest items in the Undecided range scored 3.40 and were in “be on or ahead of schedule” and “be at or below projected cost.” In the communications course, four items were in the Undecided range from 2.50 to 3.49. The highest score in the Undecided range was 3.61 for “considered innovative by experts.” The lowest score in the Undecided range was 2.70 for “result in a patent.” In the multidisciplinary innovations course two scores were in the Undecided range with a score of 3.42 for “provides students useful feedback,” and 2.70 for “result in a patent.”

Notably, all the items in the economics course were in the range of Agree which includes scores 3.50 to 4.49. The highest score in the Agree range was 4.30 in "will meet or exceed course requirements." The lowest score in the Agree range with a score of 3.53 was "will be at or below projected cost."

The highest scores in two of the four courses were for the item "will meet or exceed course requirements" with scores as follows: economics with 4.30, and communications with a 4.12. In comparison, the engineering courses' highest score of 3.93 was given for the area of "result in an innovative project." However in the innovations courses the highest score of 4.17was "meet client's expectations."

The lowest item scores were different for each of the courses. In the engineering course, lowest item was 2.50 in "result in a product that goes to market." In the economics course, the lowest score 3.53 was "will be at or below projected cost." In the communications course, the lowest score was "will be considered innovative by experts." In the multidisciplinary innovations course, the lowest score in the Agree range was 3.59 in "be on or ahead of schedule."

In considering the standard deviations, there was not an identifiable pattern. However, the greatest deviation was 1.43 in the communications class and related to the "result in a product consumers will buy" item. The smallest deviation was 0.51 in the economics course and related to the "will be at or below projected costs" item.

Grand Mean Scores within Constructs

The grand mean score by capstone course in this construct, which measured students' perceptions of the innovativeness of their final project, were found to be as follows: engineering μ = 3.33, economics μ = 3.90, communications μ =3.75, and

innovations μ = 3.70. These scores indicate the economics course students provided on average the highest ratings and the engineering students provided on average the lowest rating. The engineering students on average rated the innovativeness of their final project within the range of "undecided" which was set as 2.50 to 3.49. However, the scores from the other capstone courses indicated average ratings were found to fall within the range of "agreement" which was set as 3.50 to 4.49.

Conclusions and Implications

The fifth research question sought to determine students' perceptions of the innovativeness of their final project in capstone courses. The data shows a disagreement in the perception of students regarding the innovativeness of their final project. The engineering course on average rated the innovativeness of their final project within the range of "undecided" which was set as 2.50 to 3.49. This finding indicates, that on average, the engineering students in the single disciplinary course are undecided regarding the innovativeness of their final project. This finding was supported by a comment from one student wrote, "More than likely 99% of all Senior Design projects will end up in the project graveyard. Not much incentive other than personal interest and desire to pass the class." This comment combined with the data from the surveys indicates that engineering students perceive their projects to be less innovative.

However, the scores from the other capstone courses indicated average ratings were found to fall within the range of "agreement" which was set as 3.50 to 4.49. The course with the greatest mean was economics with 3.90. This finding shows that the economics students have the highest perception of the innovativeness of their final

project. However, it is interesting to note that students did not describe the innovativeness of their final projects in any of the written comments from any of the students.

In considering the perceptions of students in the economics course, it is clear that on average the students believe that their project will "meet the client's expectations." This item was scored a 4.67 in comparison to the mean engineering score which was 3.67. The economics course score for the item "will be worth continuing" was also higher at 4.57 in comparison to the engineering courses' score of 3.50. As described, earlier students' perceptions of the value of tasks and the benefits derived from goals impacts student motivation which has been shown to impact task outcomes (Schunk, 2008). Regardless of the cause of the lower scores, motivation theory would lead researchers to believe that the lower perceptions in the items of "results in an innovative product," and "results in a product that benefits society," and "will be considered innovative by experts" will negatively impact student motivation and therefore project outcomes.

In considering the innovations course, the grand mean score for the construct was 3.70, which fell into the Agree range. However, it is interesting to note that the students in the multidisciplinary innovations course did not perceive their projects as innovative as the economics or communications students. Realizing that the economics and communications courses share faculty members with the multidisciplinary innovations course the difference is not expected to be related to a substantial difference in the innovativeness of the final projects. Therefore it may be possible that with the advanced education in innovations comes a more biased and critical evaluation of

innovativeness. Also, the course title of innovations may have the unexpected outcome of raising students' expectations.

Recommendations for Practice

1. When possible, educators should assign projects to students which offer consistent opportunities for innovation.
2. Educators should endeavor to understand students' expectations for innovativeness of final projects.
3. Educators should consider the implication of innovations training on students' perceptions and expectations of their final project.
4. It is important for educators to realize that the innovativeness of students' final project is related to course motivation.
5. Educators should consider the impact the clients' will have on students' outcomes.

Recommendations for Research

1. A study to analyze the final projects could make it possible to determine if there is a substantial difference in the projects or if the difference is in the perceptions of the students.
2. It may be possible that with the advanced education in innovations comes a more biased and critical evaluation of innovativeness. More research is needed in this area to explain this phenomenon.
3. For future research, it is recommended that qualitative researchers interview students in the capstone course to better understand their evaluation of the innovativeness of projects.

Research Question Six

The correlation coefficients as reported by capstone courses are representative of the relationships between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation. These constructs in all courses were positively correlated and found to be either very high or substantial. Specifically, the greatest correlation was found in the communications course (ρ =.72 ; α < .00), which is classified as being very high. The other courses demonstrated the following substantial relationships engineering (ρ =.58 ; α < .00), economic (ρ =.69 ; α < .00), and innovations courses (ρ =.69 ; α < .00).

Conclusions and Implications

The sixth research question sought to describe the relationships between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their course motivation in capstone courses. The constructs were positively correlated in all the courses and the relationships were found to be either very high or substantial in all courses. The data show there are positive relationships between students' perceptions of faculty communications and students motivation in capstone courses. Specifically, the greatest correlation was found in the communications course (ρ =.72 ; α < .00), which is classified as being very high. The other courses demonstrated the following substantial relationships: economics course (ρ =.69 ; α < .00), and multidisciplinary innovations course (ρ =.69 ; α < .00) and engineering course (ρ =.58 ; α < .00).

It is clear that a positive relationship exists between students' perceptions of the communications provided by their faculty leaders and students' perceptions of their

course motivation in capstone courses. According to the theory of motivating language (Sullivan, 1988) the communications of leaders impact follower attitudes, performance and innovation (Mayfield & Mayfield, 2006). This finding is supported in a business study which reported that group communication can increase innovation when leaders plan regular and sustained efforts to encourage individuals' motivation to innovate (Monge, Cozzens, & Contractor, 1992). According to a study of college students participating in a business innovations team experience, the communications of leaders which focused on direction-giving and empathetic language resulted in improved student participation and accuracy in implementation (Ching-Wen, et al., 2009).

In comparing the data in this study with previous research, it is clear that a relationship exists between communications provided by leaders and individuals' motivation to succeed.

Recommendations for Practice

1. It is important that educators consider the relationships between the communications they provide students' and students' course motivation.
2. Educators should consider improving their communications in an effort to improve students' course motivation.

Recommendations for Research

1. Researchers should interview students to find out which faculty communications styles are the most motivating in an innovations course experience.
2. Researchers should survey students from multiple universities to better understand the relationship between communications provided by faculty and students' motivation.

Research Question Seven

The correlation coefficients are representative of the relationships between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation. The correlation coefficients were all positively correlated and found to range from very high to low in the courses. Specifically, the very high correlation was found in the economics course (ρ =.81; α < .00). A moderate correlation was found in the communications course (ρ =.40; α < .025). A low correlation was found in the multidisciplinary innovations course (ρ =.29; α < .16). A negligible correlation was found in the engineering course (ρ =.18; α < .16).

Conclusions and Implications

The seventh research question sought to describe the relationships between students' perceptions of the communications provided by their peer leaders and students' perceptions of their course motivation in capstone courses. The constructs were positively correlated in all the courses and the relationships were found to range from very high to negligible in the courses. Specifically, the very high correlation was found in the economics course (ρ =.81; α < .00). A moderate correlation was found in the communications course (ρ =.40; α < .025). A low correlation was found in the multidisciplinary innovations course (ρ =.29; α < .16). A negligible correlation was found in the engineering course (ρ =.18; α < .16).

This finding shows that peer leader communications as perceived by students seems to have varying correlations with students' perceptions of their course motivation. This difference could be related to an attribute of the course, faculty leaders, peer leaders, students' perceptions and/or other unknown variables. It would be beneficial to

understand this phenomenon because the difference between the relationships between the constructs found in the economics course and the engineering course is dramatic.

From the quantitative and qualitative data it is clear that the student peer leader in the engineering course was the least successful of the four courses. As well it is also clear that the engineering course students had the lowest course motivation of the four courses interviewed. From the existing data it is impossible to identify the direct cause. However, research has found that problems related to student peer leadership include: 1) lack of communications; 2) lack of team development; 3) free-riding; and 4) social loafing (Hansen, 2006). Understanding these problems and supporting peer leaders as they overcome difficulties is important (Hansen, 2006).

In direct contrast, the economics course demonstrated a very high correlation between communications provided by the peer leaders and students' course motivation. This finding supports the conclusion that positive peer leader communications is related to positive course motivation. In a similar study, researchers examined communications patterns for strong and weak teams (Heckman & Misiolek, 2005). The researchers found that strong team leaders initiated and received significantly more social and task related communications than teams with weak leaders (Heckman & Misiolek, 2005). The findings in the single disciplinary economics course seem to relate with the research conducted by Heckman & Misiolek (2005).

This data shows there appears to be a correlation in courses which successfully combine strong communications provided by peer leaders with strong students' course motivation. However, there appears to be a weaker correlation between courses with less

successful communications provided by student peer leaders and lower students' course motivation.

Recommendations for Practice

1. It is important that educators consider the relationships between the communications they provide by peer leaders' and students' course motivation.
2. Educators should consider their method for selecting team members and the impact that could have on students' motivation.

Recommendations for Research

3. Researchers should interview students to find out which peer leader communications styles are the most motivating in an innovations course experience.
4. Researchers should survey students from multiple universities to better understand the relationship between communications provided by peer leaders and students' motivation.

Research Question Eight

The researcher studied the relationship between students' perceived motivation and their perception of their final project innovativeness. The correlation coefficients were all positive and found to range from substantial to low in the courses. Specifically, the substantial correlation was found in the communications course (ρ =.59; α < .00). Moderate positive correlations were found in both the economics course (ρ =.47; α < .01) and the multidisciplinary innovations course (ρ =.31; α < .15). A negligible positive correlation was found in the engineering course (ρ =.26; α < .16).

The eighth research question sought to describe relationships between students' perceptions of their course motivation and students' perceptions of the innovativeness of their final project in capstone courses. The constructs as measured using correlation coefficients were all positively correlated and found to range from substantial to low in the courses. Specifically, the substantial correlation was found in the communications course (ρ =.59; α < .00). Moderate positive correlations were found in both the economics course (ρ =.47; α < .01) and the multidisciplinary innovations course (ρ =.31; α < .15). A negligible positive correlation was found in the engineering course (ρ =.26; α < .16).

The substantial and moderate positive correlations are expected under the research's conceptual model. According to Carlson and Willmont (2006) motivation and innovation are related. The *Motivation Mantra* which includes achievement, empowerment, and involvement focuses on the idea that individuals desire the opportunity to participate in innovative projects which increases motivation. Business expert Tucker (2008), reported that a business's innovation strategy should address efforts to reward and encourage innovation. In his book Tucker, points out that business should reward intrinsically and extrinsically (2008).

However, it is important to note that in the engineering course, the relationship between the constructs is weak. Understanding the causes of this difference could be beneficial. It is possible that motivation in the engineering course is a minor factor in students' perceptions of the innovativeness of their final project and/or the final projects' innovativeness is a minor factor in student's perceptions of their course motivation.

Recommendations for Practice

1. It is important that educators consider the relationships between students' perception of their course motivation and the final project innovativeness in developing learning experiences.
2. Educators should consider their method for selecting innovation projects and the impact that could have on students' motivation.

Recommendations for Research

1. Researchers should interview students to find out which aspects of the innovation projects are the most motivating and which aspects are barriers which negatively impact motivation in a capstone course.
2. Researchers should survey students from multiple universities to better understand the relationship between project innovativeness and students' motivation.

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APPENDIX A

Institutional Review Board Approval

Oklahoma State University Institutional Review Board

Date:	Thursday, November 04, 2010
IRB Application No	AG1042
Proposal Title:	Perceptions of Group Members Working Collaboratively on a Semester-Long Project With a Real-World Client
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 11/3/2011

Principal Investigator(s):

Amanda Evert
444 Ag Hall
Stillwater, OK 74078

Cindy Blackwell
440 Ag Hall
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia M. Kennison

Shelia Kennison, Chair
Institutional Review Board

APPENDIX B

Recruitment Script

Recruitment Script

Hello Students, my name is/ *our names are* Amanda Evert *and/or Dr. Cindy Blackwell. I/We* appreciate the opportunity to invite you to participate in this research study. As you can see on the participant information sheet, which has been passed out, we plan to study the 'Perceptions of Group Members Working Collaboratively with a Real-World Client as part of a Capstone Project.' Please read the participant information sheet carefully before agreeing to participate in this research study (Give students 10 minutes to read participant information sheet)."

APPENDIX C

Participant Information Sheet

Participant Information Sheet

Project Title: Perceptions of Group Members Working Collaboratively with a Real-World Client as Part of a Capstone Project.

Investigator(s): Amanda Evert, Doctoral Student in the Department of Agricultural Education, Communication, and Leadership at Oklahoma State University and Dr. Cindy Blackwell Associate Professor in the Department of Agricultural Education, Communication, and Leadership at Oklahoma State University.

Purpose: This study will analyze the characteristics of an innovation learning environment in a multidisciplinary educational experience. You are being asked to participate because of your courses' characteristics as a capstone learning experience. The survey you complete will investigate the role of leadership, communication, and motivation on students' perception of innovation.

Procedures: The survey will include sections regarding leader communications, motivation, and innovation. These quantitative surveys will require a minimum of 20 minutes to complete and will be conducted during the academic week of November 15, 2010

Risks of Participation: There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

Benefits: The study seeks to acquire information related to the perceptions of group members working collaboratively on a capstone project with a real-world client. Findings will enable instructors to better understand students' motivation and perception of leadership, communication, and innovation when working with real-world clients. Future students may benefit from improvements in curriculum as a result of the findings of this survey.

Confidentiality: You can be assured that the records of this study will be kept private and any information obtained relating to you or your students will be kept confidential. Any reports that are generated as a result of this study will remain confidential as well, and not include any identifiers to you or your students. Research records will be stored securely and only researchers and individuals responsible for research oversight will have access to the records. It is possible that the consent process and data collection will be observed by research oversight staff responsible for safeguarding the rights and wellbeing of people who participate in research. All primary data will be recorded on a password protected computer located in Ag Hall 444 and not on a network drive. Only the principal investigator and project advisor will have access to the research study data. The data will be kept on file for three years.

Contacts: If you have any questions about the research or your rights as a participant in this study, please feel free to contact Amanda Evert at Phone 405-744-3036 or amanda.evert@okstate.edu or Dr. Cindy Blackwell at Phone 405-744-5133 or cindy.blackwell@okstate.edu email. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.

Participant Rights: Your participation in this project is appreciated and completely voluntary. You may choose not to participate at any time without any penalty or problem. By completing the survey, you are consenting to participate. Returning your completed survey in the envelope provided indicates your willingness to participate in this study.

APPENDIX D

Institutional Review Board Modification Approval

Oklahoma State University Institutional Review Board

Date:	Friday, May 20, 2011	**Protocol Expires:**	**11/3/2011**
IRB Application No:	AG1042		
Proposal Title:	Perceptions of Group Members Working Collaboratively on a Semester-Long Project With a Real-World Client		
Reviewed and Processed as:	Exempt **Modification**		

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Amanda Evert
444 Ag Hall
Stillwater, OK 74078

Cindy Blackwell
440 Ag Hall
Stillwater, OK 74078

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The modification request to include the data collected from ECEN 4012 is approved.

Signature :

Shelia H. Kennison

Shelia Kennison, Chair, Institutional Review Board

Friday, May 20, 2011
Date

APPENDIX E

Panel of Experts

Panel of Experts

Dr. Cindy Blackwell
Associate Professor
Agricultural Education, Communications, and Leadership
Oklahoma State University

Dr. Rob Terry
Department Head and Roger Howell Professor of Agricultural Education
Agricultural Education, Communications, and Leadership
Oklahoma State University

Dr. Rodney Holcomb
Agricultural Economist and Browning Endowed Chair
Food and Agricultural Products Center
Oklahoma State University

Dr. Dan Tilley
Professor
Agricultural Economics
Oklahoma State University

Dr. Paul Weckler
Associate Professor
Biosystems and Agricultural Engineering
Oklahoma State University

APPENDIX F

Survey Questionnaire

Capstone Course Experience Questionnaire

Deadline: Nov. 22, 2010

Assessment of Capstone Experience

Instructions:

1. Read each statement carefully.
2. Circle the one number that best reflects your perceptions of your experience in this course.
3. Please note that high numbers represent strong agreement and low numbers represent strong disagreement.

Sample Response:

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

The Student Leader(s) . . .	SD	D	U	A	SA
… encourage(s) teamwork.	1	2	3	(4)	5

This individual **agrees** that his/her student leader(s) encourage(s) teamwork.

Please continue to the next page...

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

The Student Leader(s) . . .	SD	D	U	A	SA
. . . encourage(s) communication.	1	2	3	4	5
. . . challenge(s) us to be more resourceful.	1	2	3	4	5
. . . show(s) enthusiasm for innovation.	1	2	3	4	5
. . . value(s) students' opinions.	1	2	3	4	5
. . . give(s) recognition for good work.	1	2	3	4	5
. . . explain(s) changes made in assignments.	1	2	3	4	5
. . . keep(s) us informed about project deadlines.	1	2	3	4	5
. . . provide(s) clear instructions to us.	1	2	3	4	5
. . . inform(s) us about future plans for the group.	1	2	3	4	5
. . . tell(s) us the reasons for work schedules.	1	2	3	4	5
. . . joke(s) good-naturedly with us.	1	2	3	4	5
. . . ask(s) for suggestions about completing tasks.	1	2	3	4	5
. . . seek(s) input on important decisions.	1	2	3	4	5
. . . strike(s) up casual conversations with us.	1	2	3	4	5
. . . ask(s) for suggestions for improvement.	1	2	3	4	5

Please continue to the next page...

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

The Course . . .	SD	D	U	A	SA
. . . supports students to see ideas come to fruition.	1	2	3	4	5
. . . provides students with challenging tasks.	1	2	3	4	5
. . . provides students useful feedback.	1	2	3	4	5
. . . offers students freedom, flexibility, and resources.	1	2	3	4	5
. . . recognizes students' achievements.	1	2	3	4	5
. . . provides students with innovative goals.	1	2	3	4	5
. . . .encourages interpersonal communication.	1	2	3	4	5
. . . provides intellectually stimulating course work.	1	2	3	4	5
. . . provides opportunities to explore new ideas.	1	2	3	4	5
. . . offers non-routine and challenging course work.	1	2	3	4	5
. . . requires imagination and creativity.	1	2	3	4	5
. . . provides opportunities to increase knowledge.	1	2	3	4	5

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

The Faculty Leader(s) . . .	SD	D	U	A	SA
. . . encourage(s) communication.	1	2	3	4	5
. . . challenge(s) us to be more resourceful.	1	2	3	4	5
. . . show(s) enthusiasm for innovation.	1	2	3	4	5
. . . value(s) students' opinions.	1	2	3	4	5
. . . give(s) recognition for good work.	1	2	3	4	5
. . . explain(s) changes made in assignments.	1	2	3	4	5
. . . keep(s) us informed about project deadlines.	1	2	3	4	5
. . . provide(s) clear instructions to us.	1	2	3	4	5
. . . inform(s) us about future plans for the group.	1	2	3	4	5
. . . tell(s) us the reasons for work schedules.	1	2	3	4	5
. . . joke(s) good-naturedly with us.	1	2	3	4	5
. . . ask(s) for suggestions about completing tasks.	1	2	3	4	5
. . . seek(s) input on important decisions.	1	2	3	4	5
. . . strike(s) up casual conversations with us.	1	2	3	4	5
. . . ask(s) for suggestions for improvement.	1	2	3	4	5

Please continue to the next page...

1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Undecided (U)
4 = Agree (A)
5 = Strongly Agree (SA)

The Final Team Project. . .	SD	D	U	A	SA
. . . will result in an innovative product.	1	2	3	4	5
. . . will meet the client's expectations.	1	2	3	4	5
. . . will result in a product that benefits society.	1	2	3	4	5
. . . will result in a patent.	1	2	3	4	5
. . . will result in a product that goes to market.	1	2	3	4	5
. . . will result in a product consumers will buy.	1	2	3	4	5
. . . will be the best of many possible solutions.	1	2	3	4	5
. . . will meet or exceed course requirements.	1	2	3	4	5
. . . will be on or ahead of schedule.	1	2	3	4	5
. . . will be at or below projected cost.	1	2	3	4	5
. . . will be worth continuing.	1	2	3	4	5
. . . will be considered innovative by industry experts.	1	2	3	4	5

Please continue to the next page...

Part II: Personal Characteristics

1. Gender: (mark one) Male_____ Female_____

2. Age_____ 3. College Major_____

4. School Classification: Freshman Sophomore Junior Senior Graduate

Part III: Additional Comments

Below, please write any additional comments you have regarding your experiences with this course.

Thank you for your participation! Your input is valuable to the study!

APPENDIX G

Written Comments

Written Comments

Electrical and Computer Engineering Course

2 It sucks but I have learned a lot.

4 (Student leaders) really could have been more approachable and supportive. I do not mean giving too much help but a lot of times they were unapproachable and tended to mock our ideas or lack of insight.

7 The course would have been much better if there was documentation about past systems. That was the most frustrating part of the course.

9 I felt parts of the course were too structured. In many cases it was like pulling teeth to get a simple block diagram changed.

11 Sometimes the (student leaders) would provide conflicting information which led to confusion among our team.

22 More than likely 99% of all Senior Design projects will end up in the project graveyard. Not much incentive other than personal interest and desire to pass the class.

Agricultural Economics Course

3 Performance and product viability varies greatly from product to product and team to team.

10 This was an outstanding experience to have with a real world setting.

19 Worthwhile course.

24 Loved the “real world” aspect of the course!

25 It was a wonderful class and an outstanding project.

27 More diversity is needed in undergraduate courses. I felt more exchange/ international students should be included in programs to diversify the atmosphere at OSU.

28 Love the hands on experience and one on one with clients that you get from this course.

Agricultural Communications Course

3 After being in the campaigns class I wish I had more marketing under my belt.

4 This is a great course. It was very beneficial.

5 This course was great. I was very hesitant in the beginning, but it ended up being worthwhile.

6 It would be awesome if we had examples of what we were supposed to do for each assignment.

8 At times, it seems a waste of time, but who knows, it is not over with yet. It could always get worse.

9 It's a good course. Frustrating at times, but not the professors fault. It's difficult working with some people but you learn a lot. I enjoyed working with my group, we get along great.

11 This course gives a taste of what it is like to work with a real world client. I like the flexibility it gives to work as a team and make decisions.

13 Sometimes it is hard to know what exactly is expected from us and how the assignment is supposed to be completed. Most of the time we were left in the dark on trying to figure out how to complete an assignment.

14 I had difficulty working with a group. I felt like I was left out.

17 This was a very challenging course with real world experience. It allows students to work creatively with little guidance.

18 Too much busy work, had no idea what to do on half of the assignments, very frustrating. I thought it was a pain and not beneficial at all.

26 Working in groups is great, but grade wise, it would have been better if we had turn in our own grades as in every member of the team turns in homework.

27 It has been a fun course to see our teams ideas become a reality.

Innovations Course

7 A very useful and educational course shows the importance of innovation and the steps that create it. The instructors are some of the best in the department and for the most part help students when they can. The communication with client and team really shows a work experience that no other class can teach.

10 Really enjoyable and able to put what we learn in other class to use.

21 Overall, this course has been a good experience. My team had some trouble with our idea and low feedback from our sponsor, but I feel confident about the idea. The class has been very useful.

23 I have truly enjoyed working in this course.

VITA

Amanda Faith Evert

Candidate for the Degree of

Doctor of Philosophy

Dissertation: STUDENTS' PERCEPTIONS OF COMMUNICATIONS PROVIDED BY FACULTY AND PEER LEADERS, COURSE MOTIVATION AND FINAL PROJECT INNOVATIVENESS IN CAPSTONE COURSES

Major Field: Agricultural Education

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in July 2011.

Completed the requirements for the Master of Science in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in May 2005.

Completed the requirements for the Bachelor of Science in Agricultural Communications at Oklahoma State University, Stillwater, Oklahoma in December 2003.

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Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: STUDENTS' PERCEPTIONS OF COMMUNICATIONS PROVIDED BY FACULTY AND PEER LEADERS, COURSE MOTIVATION AND FINAL PROJECT INNOVATIVENESS IN CAPSTONE COURSES

Pages in Study: 144 Candidate for the Degree of Doctor of Philosophy

Major Field: Agricultural Education

Scope and Method of Study:

The purpose of this study was to assess students' perceptions of communications provided by faculty and peer leaders in relationship to both students' perceptions of their course motivation as well as their perceptions of the innovativeness of their final project in single and multidisciplinary capstone courses. The scope of this study was limited to115 students participating in four capstone courses at Oklahoma State University. The study included a mixed method approach including a questionnaire which collected quantitative descriptive, correlational data and qualitative written comments.

Findings and Conclusions:

Student demographic information indicated that 43 respondents (37.4%) were engineering majors, 34 respondents (29.6%) were economics majors, and 38 respondents (33%) were communications majors. Four construct areas were considered including students' perceptions of: communications provided by faculty leaders; students' course motivation; communications provided by peer leaders; and innovativeness of the final project. When considering the four constructs the grand mean scores for all courses were in either the Agree or Strongly Agree classification, expect the engineering course where the grand mean for the innovativeness of final project construct received a grand mean in the Undecided range. The correlations between the constructs demonstrated a variety of relationships. Specifically, in assessing the relationship between students' perceptions of communications provided by peer leaders and students' course motivation, the economics course had a strong correlation with (ρ =.81; α < .00) and the engineering course had a weak correlation with (ρ =.18; α < .16). These findings indicate that the relationships between the constructs vary in the four individual courses. It is not clear what factors are responsible for the differences.

ADVISER'S APPROVAL: Dr. Cindy Blackwell