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Jan Elizabeth Broussard
Louisiana State University and Agricultural and Mechanical College

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STUDENT PROBLEM SOLVING COMMUNICATION PROCESSES WHILE COMPLETING MULTIMEDIA CASE STUDIES: A LOOK INTO THE RELATIONSHIP AMONG LEVELS OF COLLABORATION, PROBLEM SOLVING PROCESSES, AND PROBLEM SOLVING PERFORMANCE ON INDIVIDUAL AND GROUP LEVELS

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Educational Theory, Policy, and Practice

by

Jan Elizabeth Broussard
B.A., University of Louisiana Lafayette (Formerly USL), 1996
MBA, University of Louisiana at Lafayette, 2002
December 2011
DEDICATION

I dedicate this dissertation to the two people in my life who have always supported me and given me the strength and courage to better myself. They have inspired me to live each day, encouraged me to understand who I am, and believed in me when it felt as though no one else did. They have supported me unconditionally and without their knowledge, love, and guidance I would not have accomplished this feat. They have been exemplary role models in my life and have instilled in me the importance of education and family. They have shown me how to laugh, love, and appreciate all that life has to offer.

I thank you, Mom and Dad, for your unending generosity, support, and love. My words cannot express how appreciative I am for all that you have done and continue to do for me. I want the two of you to know that I recognize very clearly that without the sacrifices and support that you have shown me throughout my life, none of this would have been possible. I feel blessed to have the two of you as my parents and I love you both.
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My Dissertation Committee

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ABSTRACT

In an effort to better prepare students to become productive members of the work force, educators must grant students the opportunities to become critical thinkers. Students need to be able to learn to inquire, create, and think critically in order to obtain meaningful information from the abundance of knowledge that is accessible to them through the Internet and the World Wide Web.

This quasi-experimental study examined the effects of online collaborative problem solving processes during a multimedia case study. Sixty-one students in two undergraduate management information systems classes agreed to participate. The experimental class, section 01, was required to use the online collaboration forum to discuss the multimedia Powertel Case Study with their group members, while the control class, section 02, was not. Analyses were run to determine any differences in the two sections on actual learning, perceived learning, and attitudes toward MIS. This study also investigated the problem solving process in the online discussion forum and the relationships of that process with actual and perceived learning, as well as attitudes toward MIS.

Results of the study indicate that there were no significant differences in the media used to communicate with each other in collaborative groups, but instead the difference resulted from the depth and breadth of the contributions. For those students who participated in the online collaboration forum, it was clear that the better the students were at participating in the discussion forum, the more positive their attitude toward MIS became and the more confident they became in their own abilities concerning MIS.

This research indicates that the students increased their actual learning and reported positive evaluations of the Powertel Case Study. Students reported that the case study was useful
in improving higher order thinking skills. Multimedia case studies used in the MIS classes, therefore, can provide a venue for students to improve the teamwork and higher order thinking skills needed upon entering the workforce.
CHAPTER 1. INTRODUCTION

"It is possible to store the mind with a million facts and still be entirely uneducated.”

- Alec Bourne

The ultimate goal of education is to assist students in learning how to become productive thinkers (Rusbult, 2001). In order to graduate persons who can actively solve problems in the real world, students must be able to combine critical and creative thinking. The traditional textbook and lecture approach typically does not encourage the critical and creative thinking and problem solving skills that employers are seeking in potential employees. Often, instructors tend to “cover as much content as possible, regard all content as equal, and divide content into artificial categories that bear little relationship on how individuals use content in the world beyond school” (Fennimore & Tinzmann, 1990, p. 1). Current pushes in education to standardize curricula and focus on standardized test scores can impede opportunities for the instructor to address critical thinking skills in the classroom (Snyder & Snyder, 2008; Landsman & Gorski, 2007; Sandholtz, Ogawa, & Scribner, 2004; Wong, 2007) and diverts the learning process from student-centered to content-centered. Students need opportunities to explore content, analyze resources, and apply information (Snyder & Snyder, 2008). In addition, the American Association of Colleges and Universities (AACU) determined “inquiry, critical, and creative thinking” as important skills needing attention in higher education (“Liberal Education Outcomes,” 2005).

Employers and top executives desire employees trained to become proficient problem solvers, decision makers, and team players (Rieley & Crossley, 2000). NASA, for example, recognized that decision errors are second only to procedural errors as being the direct cause of flight crew involved accidents (Donheim, 2000). In an effort to deter these mistakes from
continuing to occur, NASA imposed a training program to strengthen the decision-making skills of their employees. Similarly, Mbarika et al. (2003) noted that both academics and potential employers are expressing the difficulties they are having with students who are unable to comprehend technical issues to work successfully. Information technology (IT) employers expect recent graduates that go to work for them to possess higher-order cognitive skills in order to solve problems efficiently and effectively (Mbarika, Sankar, Datta, & Shipps, 2006).

Unfortunately, students typically do not learn how to think and learn independently (Snyder & Snyder, 2008; Landsman & Gorski, 2007; Rippin, Booth, Bowie, & Jordan, 2002). Therefore, it can be difficult to develop higher order thinking skills in students, particularly when working at the post-secondary level. However, it is never too late to learn, and by developing these critical thinking skills, students can become confident in their reasoning and can make adjustments to apply their problem solving abilities to various content areas and disciplines successfully (Lundquist, 1999).

Many business education researchers have focused on issues of critical thinking. Davis et al. (2003) found that although critical thinking skills were perceived by students as being very important, they generally did not know how to think critically. In other business education research, Tempelaar (2006) found a positive relationship between critical thinking skills and course performance. Ngai (2007) focused on using a project based team approach in an undergraduate e-commerce activity. Results from student surveys and assessments indicated student improvement in critical thinking skills which the author attributed to the practical application and collaboration requirement.

Critical thinking based on ill-structured problems—such as questions, case studies, or scenarios—presents students with debatable issues that require reflexive judgment and typically
do not have a specifically correct or incorrect answer (Snyder & Snyder, 2008). One tool that has been advocated in helping students to understand complex concepts in order to better prepare them for authentic decision making situations is multimedia case studies (Raju & Sankar, 1999; Lim & Benbasat, 2000). Multimedia instructional materials contain one or more media elements such as graphics, video, animations, or images, as well as, textual information (Beckman, 1996; Fetterman, 1997; Mbarika, Sankar, & Raju, 2003). The multimedia concept is used to provide a more engaging and interactive opportunity for students to acquire, assess, and formulate knowledge.

Research has not yielded a definitive answer on the impact of multimedia on students’ higher order thinking skills. Mbarika et al. (2001) found that students’ perceived higher-order cognitive skills improved when studying engineering issues using multimedia. Whereas, Orr et al. (2001) found that using multimedia–based information technology did not positively impact learning. This debate is not a new one. In his influential article entitled “Reconsidering Research on Learning from Media”, Clark (1983) argued that media are the vehicles that deliver the instruction and only the content of the vehicle can directly influence learning. In other words, he believed that it is not the media that makes the difference in learning, but the quality of content and opportunity for learning that it provides that may make it an effective method for administering information. Robert Kozma (1991) challenged Clark by defending the idea that media can provide interactivity, therefore making the choice of the medium an important part of learning. The Clark-Kozma debate continues on to this day.

With the Great Media Debate in mind, it is important to note that a collaborative environment is often used with multimedia case studies. Students are offered an authentic learning situation within the context of the work and the design of the task while progressing
through the learning process. The learning situation provided with the use of collaborative multimedia case studies follows Jonassen’s (1999) model for a constructivist learning environment. The key elements of the model are in Figure 1.1.

![Figure 1.1: Model for a Constructivist Learning Environment (Jonassen, 1999)](image)

Jonassen’s model is centered around an authentic activity surrounded by a number of supports including resources and tools for assistance in completing the activity. Features include information sources to help learners understand the concepts related to the task, cognitive tools to assist learners in understanding the problem, conversation and collaborative tools to encourage and allow learners to share ideas and come to a consensus, and social and contextual supports to assist the learner in the physical, social, cultural, and organizational characteristics of the learning process (Bennett, 2004).

Collaborative learning environments offer active learning situations. Students tend to appreciate the online collaborative environments due to the chance for equal voice provided as opposed to the traditional classroom. Research has also shown that there is credible evidence
indicating that students who work in cooperative groups are able to achieve higher levels of thinking and retain information longer than those who work individually (Johnson & Johnson, 1986).

As concluded in Fini’s (2010) study, implementing case studies significantly improves students’ higher order thinking skills, as well as their team skills, while working collaboratively. Fini’s research supports the successfulness of using case analysis to better prepare students for the practical application of knowledge.

1.1 Statement of the Problem

As potential employers indicate more prominently the desire to have employees who can problem solve and think critically, educators have to assume the responsibility of affording students the opportunity to acquire and practice these skills. Encouraging instructors to evolve from their “sage on the stage” methods of instruction into more student-centered techniques should result in an increase in students graduating from college with marketable problem solving skills. This could potentially create a win-win situation for both recent graduates looking for employment and employers looking for qualified applicants.

Multimedia case studies can assist instructors in providing students with authentic problem solving situations. By exposing students to real-world issues, they are typically better able to understand the value of the concepts and techniques presented. Case studies can also improve interest in the subject matter addressed. Often times students are encouraged to perform additional exploration of concepts and ideas, that otherwise may have gone unnoticed, in an effort to solve the posed problem.

1.2 Purpose of the Study

The purpose of this study was to examine the interactions of students in an online group
discuss the impact of online discussions on students’ perceptions of learning problem solving skills and case performance. The levels of participation in the collaborative groups and the online opportunities for collaboration were analyzed in relation to successful completion of the group task and individual knowledge gain. Various levels of participation in the group work, as indicated through peer/self-evaluations completed by the students, and online discussion rubrics completed by the researcher were also used in the analysis.

This study also looked to provide insight into the effects of the student problem-solving process as an aspect of participation in online discussions on achievement and perceptions. Kearsley (2000) suggests that students must essentially be actively involved in meaningful tasks for learning to occur. Therefore, it is not enough to simply look at whether or not students participated, but also the extent to which they were active participants in the group information gathering and decision making process.

1.3 Research Questions

The following questions were used in guiding the research in this study:

- Does students’ online collaboration during multimedia case studies have a positive effect on case study performance, individual knowledge gain, perceived learning, attitudes toward MIS subject matter, and/or peer/self-evaluations?

- What is the relationship between levels of students’ online interaction and case study performance, individual knowledge gain, perceived learning, attitudes toward MIS, and peer/self-evaluation?

In order to evaluate the potential usefulness of a method of instruction, it must be determined that the students are participating as expected. Assigning students to a group and
requiring them to participate does not mean that everyone will contribute to the same degree. Therefore, in addition to simply examining whether or not students participated in the online discussion board, the messages of those who were required to participate in the online discussion were also analyzed for depth and breadth of posts.

1.4 Significance of the Study

This study adds to the current research available on the effects of learning in collaborative environments. As Kirschner et al. (2009) point out, one drawback in the current research on individual and collaborative learning is that the effects of learning often measure performance of the group during the learning process and do not typically measure the actual learning achievement of individuals. Lou et al. (2001) meta-analyses on individual and small group learning with computer technology indicate that there was a significant difference between group performance and individual learning, especially when students engaged in exploratory environments. Therefore, it is important that evaluation methods used assess the quality of the group process in addition to the quality or change in individual learning (Kirschner, Paas, & Kirschner, 2009). This must be looked at more closely, as the group project does not always reflect the individual contributions of all of the members of the group, but may reflect the contributions of the most knowledgeable or responsible members (Zhang, Ayres, & KaKin, 2011; Lou et al., 2001). This study contributes to the research available by measuring the individual performance of students on knowledge tests and group contributions in addition to individual grades for performance on the case presentation.

Recent research has also determined that working in a group positively affects confidence in successful task completion (Kirschner, Paas, & Kirschner, 2011). Collaboration has been shown to increase the confidence of learners in solving complex tasks that are difficult to solve
individually. Kirschner et al. (2011) determined that high complex tasks and high efficiency of collaborative learning could be explained by both cognitive and affective factors. They further suggest that task characteristics and learner characteristics of the group can assist in explaining the relative contribution of the cognitive and affective factors. This study contributes to this body of knowledge by exploring the relationship of the individual student case process scores and case performance, individual knowledge gain, perceived learning, attitudes toward MIS, and peer/self-evaluation.

1.5 Limitations of the Study

This study is similar to most educational research in that it does have some limitations. The generalizability of the study is limited by the number of participants in the study. The sample consisted of two sections of undergraduate students in management information systems (MIS) courses, therefore it may be challenging to apply the findings to other educational levels or subject areas. Additional research must be completed before generalizing these results. In addition, replication of this study with a larger sample size would improve its validity.

A second limitation is that this study takes a snapshot of the learning process of the student. It is unclear from this study as to whether or not using multimedia case studies will affect their ability to perform in the real world. A longitudinal study that follows and assesses students’ critical thinking and problem-solving abilities over time could offer more insight. Also, collecting data on the performance of the students in their respective jobs after graduation would offer additional understanding into the transference of knowledge.
CHAPTER 2. LITERATURE REVIEW

Real world situations, unlike the typical classroom assignments, require a person to not only recall information, but also to apply that knowledge to authentic situations. According to Katajavuori et al (2006), it is important for a person to continuously update their knowledge and to apply that knowledge to work situations. It is, therefore, the responsibility of educators to afford students the opportunities to develop those skills necessary to successfully enter and prosper in the workforce.

The relationship between acquisition and application determines the potential usefulness of knowledge (Baddeley, 1982; Tulving & Thomson, 1973). In other words, the goal of instruction should not only be for students to learn materials, but also to engage in the appropriate cognitive processes while obtaining that knowledge (Clark & Mayer, 2008). In fact, studies have shown that students who are actively engaged in the material and concepts they are learning have a tendency to understand, learn, remember, enjoy, and are able to more fully appreciate the relevance of what is being learned in comparison to those students who simply absorb what is being taught to them (Park, 2003). In an effort to produce more real world ready students who can apply their knowledge to authentic situations, educators need to migrate from the “sage on the stage” traditional lecture based methods of instruction into a more student-centered methodology. For graduates to be prepared to enter the workforce, instructors must teach students to apply knowledge they have acquired within their own discipline and in conjunction with other disciplines to the solution of authentic, practical problems.

2.1 Problem Based Learning

In an effort to improve learner thinking and problem solving skills, many universities are utilizing a form of learning called problem-based learning (PBL). PBL is the use of carefully
selected and designed problems that require the learner to demonstrate critical thinking skills, problem solving proficiency, self-directed learning strategies, and team participation skills. By improving thinking skills, persons are able to solve non-routine problems for which there is no standard response (Clark & Mayer, 2008). Clark and Mayer go on to point out that “problem solving skills should be learned within the context of realistic problem-solving” (2008, p. 329).

2.1.1 Situated Learning Theory

There are several theoretical perspectives that lend themselves to PBL. First is the Situated Learning Theory. Learning occurs through the learner’s participation in the practices of the community. A person learns subject matter by doing what experts in the subject matter do (Reiser & Dempsey, 2002). The authentic social context offers the benefit of increased knowledge and application of that knowledge. The focus is on creating active learning opportunities that can be applied to real-world situations (Oregon Technology in Education Council, 2006).

The concept of social interaction is an important component of situated learning (Lave & Wenger, 1990). Learners are expected to develop a sense of community with team members and become more engaged in the learning process assuming more deliberate and important roles in an effort toward team success. In the 1990s, there was a push for further investigation into situated learning (McLellan, 1996) along with the increased interest in and partaking of educators in implementing multimedia and Web-based learning environments (Herrington, 2006).

Herrington (2006) identified several components that should exist in a situational learning environment. First, the authentic context for the problem needs to reflect the way that the knowledge can be transferred into the real world, particularly into job situations. According
to research, the context should offer a purpose for and desire to learn. It should also provide a multifaceted and continuous learning environment that can be explored in a deeper and to a longer extent than traditional methods of instruction (Brown, Collins, & Duguid, 1989; Honebein, Duffy, & Fishman, 1993; Reeves & Reeves, 1997). The learning environment should also present tasks that are relevant to the workplace and are interrelated to demonstrate the connection among the tasks (Bransford, Vye, Kinzer, & Risko, 1990; Brown, Collins, & Duguid, 1989; Reeves & Reeves, 1997; Lebow & Wager, 1994). A single complex task that can be broken down into manageable parts is much more likely to foster transferable knowledge than performing a series of disconnected tasks. Also, by organizing the resources in such a way that they can be revisited throughout the various stages of the problem-solving process, students are able to reflect on their own learning in comparison with other students and with ideas presented by experts in the designated field (Boud, Keogh, & Walker, 1985; Kemmis, 1985; Collins & Brown, 1988).

In the situated learning environment, it is also essential that the learner be exposed to modeling of processes and expert thinking. Students can be significantly influenced by the observation of real-life examples as they occur or the social involvement in hearing recounts of experiences in relation to the problem at hand (Collins, Brown, & Newman, 1989; Brown, Collins, & Duguid, 1989; Lave & Wenger, 1990). World Wide Web resources, online discussion communities, e-mail, video calling, instant messaging, and CD-ROMs, to name a few, afford learners unlimited access to experts and other experienced persons who are willing to share information, resources, and contacts.

Herrington (2006) includes collaboration and roles of learners in the components of situated learning. Collaboration on a task as a group is established through the appropriate design
of the tasks and the communication technology incorporated (Brown, Collins, & Duguid, 1989; Collins, Brown, & Newman, 1989; Hooper, 1992; Reeves & Reeves, 1997). Tasks should be addressed to the group instead of to individuals, and students should be expected to investigate the proposed learning tasks from multiple perspectives. Learning environments should provide opportunities to explore various angles and views on a topic and to inter-relate information discovered (Collins, Brown, & Newman, 1989; Honebein, Duffy, & Fishman, 1993; Spiro, Feltovich, Jacobson, & Coulson, 1991). Appropriately designed collaborative learning environments should also lead to varying degrees of coaching and scaffolding by the more capable students (Collins, Brown, & Newman, 1989; Greenfield, 1984).

To perform an authentic assessment, the learning environment also needs to provide inherent opportunities for articulation. These opportunities can be in the form of public presentation of argument in defense of a chosen position or in an effective performance portraying the acquired knowledge. The assessment should be effortlessly integrated with the activity in order to determine appropriate standards for assessment of final products (Wiggins, 1993; Reeves & Okey, 1996; Linn, Baker, & Dunbar, 1991; Duchastel, 1997; Bain, 2003).

2.1.2 Constructivism

Constructivism is another basis for PBL. Typically, the more students are engaged in the learning process and are able to conceptualize the relationship between their current structures of knowledge and understanding, then the deeper and more meaningful their learning will be (Hsu, 2004). Constructivism involves calling upon prior knowledge to make sense of new material and to construct new ideas. Constructivists base their ideas of knowledge acquisition on the works of Piaget and Vygotsky. While Piaget felt that knowledge constructions are made in the learner’s
mind, Vygotsky believed that learning occurs when there are knowledgeable social agents to mediate the learning (Wadsworth, 1996).

Students have a need to participate in the learning process (Koschmann, Myers, Feltovich, & Barrows, 1994). With a constructivist approach to learning, the learners can create their own knowledge rather than absorbing it through the teacher’s filter of experience (Rowlands, 2005). Campbell (as cited in Hsu, 2004) found that when pedagogy involves constructivism, learners solve problems while simultaneously forming knowledge structures and critical thinking abilities that will benefit them as practicing professionals. Instructors need to assume the role of a supporter in the construction of knowledge rather than that of a talking head spouting out information.

2.1.3 Critical Thinking Skills

American educators have been concerned with the critical thinking abilities of students for some time. As far back as 1933, John Dewey claimed that learning meant, “learning to think” (1933/1986, p. 196). Critical thinking abilities have stayed at the forefront of educators’ minds because American students continue to be perceived as being deficient in these skills. A report by the National Commission for Excellence in Education identified the United States as a “nation at risk” because of a lack in providing education that increases critical thinking (1983). Despite the “push” for teaching critical thinking skills, in 2005 research studies found that very few students were proficient in critical thinking (“Liberal Education Outcomes”, 2005).

Critical thinking skills are especially important in today’s society in which the Internet and the World Wide Web provide tremendous amounts of information. Students have to learn to decipher through the information available to determine what is important, necessary, and crucial to the task. Students must continue to develop even better critical thinking skills due to this
bigger and more complex knowledge base which is so readily available to them (Halpern, 2003). Critical thinking skills are worth teaching because the benefits are shared amongst the students, employers, and society in general.

Creativity and critical thinking in students is often stifled during a formal education. From a very young age, students are often taught the “right answers”, analytical rules and thinking boundaries- all of which can suppress creativity as students begin to lose the ability to think outside of the box, experiment, and improvise. Students eventually lose the ability to question, analyze, challenge, and reflect on ideas, concepts, and problems that arise. Figure 2.1 shows some of the characteristics of critical thinkers that should be fostered in the classroom.

![Critical Thinking](https://example.com/critical-thinking.png)

**Figure 2.1:** Critical Thinking (University of Victoria, 2011)

### 2.2 Computer Supported Collaborative Learning

“It is the supreme art of the teacher to awaken joy in creative expression and knowledge.”

- Albert Einstein

The art of teaching has become extremely challenging for many instructors in the world of computer-supported classrooms. In an effort to choose tools that nurture this creative expression and knowledge acquisition, instructors should look for opportunities that allow students to construct their own knowledge and validate their perspectives through social
negotiations (Conner, 1996). The opportunity for students to discuss the material being covered and to work through problem solving steps together allows them to regulate what they understand and what information may have been misunderstood or misinterpreted completely.

Collaborative problem solving involves the interaction of individuals in a problem solving activity (O'Neil, Chuang, & Chung, 2003). In PBL groups, students are allowed to express and acquire knowledge according to various learning styles simultaneously. Students rely on one another to ask and answer questions to assist in their understanding of the material. Persons with various backgrounds and experiences offer insight and together the group can solve a problem or create a workable solution that is typically more valuable than that which would have been created individually.

For many years, collaborative learning situations were restricted to those students who were full-time and in an on-campus setting. Otherwise, it was unfeasible for students to find the time and the location to work together (Kimball, 2001). In recent years, with the improvement of technology, the creation of virtual collaborative environments has evolved into what is known today as computer supported collaborative learning (CSCL). These e-learning environments can be used to provide learners with alternative settings in an attempt to stimulate and enhance learning, communication, and creativity (Saade & Bahli, 2005). CSCL is the use of an electronic learning environment to exchange ideas and arguments that lead to the collaborative construction of knowledge (Prinsen & Volman, 2007). One interesting paradox noted by Kennedy (2003) concerning online student interaction was that online students indicate that they like to work alone, but earn higher grades when they interact with others.

In CSCL, the student can discuss and interact virtually with other students, instructors, and even field experts, who in turn can advise, motivate, criticize, compete, and direct the
student toward a deeper and more comprehensive understanding (Kumar, 1996). Asynchronous CSCL, in particular, has removed many of the time and space boundaries that once prohibited collaborative interaction. Asynchronous CSCL occurs when there are time and place separations among the participants. Communication may take place at different times or over a designated period.

2.3 Communication Processes

The basic theories and conceptual frameworks have determined that task facilitation and communication are essential in creating a positive and thriving learning environment. Choosing the best methods of practice is not as cut and dry. Essentially, there are a growing number of tools for communication in CSCL situations. These tools can be divided into two areas: asynchronous and synchronous. Asynchronous communication involves communication that takes place at different times or over a certain period. It is, in essence, time delayed communication for situations when real-time communication may not provide sufficient opportunities for thought and reflection to produce quality results. Synchronous communication involves communication that takes place in real time. It is a continual flow of data where all parties involved in the discussion are available simultaneously.

Interaction is often confused with interactivity. Where interactivity involves the experiences and exchanges using technology, interaction addresses the learning outcome gained from using the technology (Sutton, 1999). There are three types of interactions: student-student, student-content and student-instructor. The types of asynchronous interaction include threaded discussions, e-mail, newsgroups, blogs, and shared documents and resources with and without version history. The interaction most often consists of a teacher posting an initial prompt or question, students posting responses, and peers responding to peer posts. Many studies, including
the one by Fisher and Baird (2005), note that a strong sense of community is important to student perceived learning. Manipulating and structuring the asynchronous discussion requirements can cause a change in student perceptions of learning and satisfaction. A beneficial aspect of asynchronous interaction is that since it can be in near-real time, but still not real time, students have time to reflect on questions before answering. This can lead to more focused and complete answers.

Past research supports the use of communication technologies in an effort to enhance and complement face-to-face learning or to use in distance education courses. However, there are a number of variations in the success of communication technologies dependent on facilitation and task design. Therefore, the relationship between task design and students is one to be considered. Asynchronous environments typically have a slower collaboration time, which allows for reflection, research, creation, and explanations that are more extensive. Students may be more willing to participate due to a certain degree of anonymity and lack of face-to-face interaction. Asynchronous environments and tools can encourage learning situations that allow participants to exchange information at a comfortable pace without limited restrictions of time and space (Wolz et al., 1997). These tools can be incorporated into lessons as stand-alone learning environments or as part of a course management system such as Blackboard or Moodle. Ashley (2003) lists several asynchronous tools and offers suggestions for their use:

- Discussion Boards- dialog taking place over a period of time
- Blogs- sharing of ideas and comments
- Messaging (E-mail)- one-to-one or one-to-many communications
- Streaming Audio/Video- communicating or teaching
- Narrative Slideshows- communicating or teaching
• Learning Objects (Web-based training)- teaching and training
• Document Libraries- managing resources
• Databases- managing information and knowledge
• Web books- teaching and training
• Surveys and Polls- obtaining information and trends
• Shared Calendars- coordinating activities
• Web Site Links- providing resources and references

In addition, Shepherd (2000) pointed out that asynchronous communication may be the appropriate choice for communication under the following conditions: 1) When it is important that your audience gets your message 2) When a quick but not instant response is needed 3) When time is needed to compose a message and 4) When students find it difficult to be available at the same time.

DeBourgh (2002) found that asynchronous discussions of readings and issues promoted reflective thinking and higher quality of work. Kirschner et al. (2004) discovered that assigning functional roles for team members for virtual assignments that promoted scaffolding also increased peer interaction and reduced the amount of teacher facilitation necessary in an asynchronous environment. Studies have also shown that requiring students to participate and post contributed greatly to the success of discussions (Arnold & Ducate, 2006).

Methods and levels of communication can affect student satisfaction. Grubbs (2002) found that increased peer interaction led to increased student satisfaction. Arnold and Ducate (2006) reported that social presence had a high correlation to student success and feelings of community. In fact, they reported that 82% of students felt that asynchronous discussion stimulated their learning.
Grubbs (2002) found that the number of individual message contributions in the course discussion boards contributed to the effectiveness of discussions. In addition, making the participation expectations clear to the students before the discussion is assigned can make a difference in participation. Effectiveness was not defined in the Grubbs article, although the author does note that student satisfaction with online courses positively correlated to the amount of peer-to-peer communication.

In a study conducted by Jiang and Ting (2000), data was collected from nineteen Web based courses. The findings indicated that students perceived learning when discussions were graded and the discussion requirements were stated. They also discovered that there was a strong correlation between the number of teacher responses and student responses, but not a strong relationship between the number of student responses and student learning.

2.4 Multimedia Case Studies

Courses and lessons should be planned according to how the minds of learners work and the features that have been best shown to encourage learning (Clark & Mayer, 2008). It is the responsibility of the instructor to not only present the information to the students, but also to encourage cognitive processing during learning activities.

Media comparison research has shown that it is not the delivery medium as much as the instructional methods that promote learning. Clark and Mayer (2008) go on to argue that when the instructional methods remain essentially the same, acquired learning results remain the same as well, no matter how that instruction is delivered. If effective instructional methods are used, then learning will be better no matter what delivery medium is used.

Although words are an efficient and effective way of creating products used for e-learning, Clark and Mayer (2008) offer that adding relevant graphics to those words can assist
learners in engaging in active learning. In fact, they show that students participating in a multimedia lesson that consisted of words and graphics performed better on a follow-up transfer test than students given the same information simply through text. The term used to identify this finding is the *multimedia effect* and it states, “people learn more deeply from words and graphics than from words alone” (Clark & Mayer, 2008, p. 68). Instructors can incorporate the use of multimedia into their lesson plans to address multiple student learning preferences while enhancing learning.

Additional research also shows that multimedia presentation of material is especially important to those who have minimal basic knowledge in the subject area (Clark & Mayer, 2008). This can be explained by the fact that experienced persons should be able to depend on their prior knowledge to create mental images of new concepts being learned. Those without prior knowledge have no files to pull from and therefore may find it more difficult to visualize the concepts for a complete and more thorough understanding of the materials. The Internet and other technologies that incorporate pictures, video, audio, diagrams, charts, and other visual and verbal references and information are key to supporting the handling of information and ideas and in supplying the learner with the necessary tools that inspire creativity and initiative (Clark & Mayer, 2008).

As stated earlier, one of the primary goals of higher education is to prepare students for the workforce. For successful transfer to take place from the educational setting into the work world, students must be exposed to situations and examples within the work context in order to organize and give contextual meaning to the concepts. The context in memory assists the transference of knowledge from theory to practice (Clark & Mayer, 2008).
Multimedia instructional materials, particularly multimedia case studies, to convey real-world technical concepts and applications such as those taught in engineering and information technology courses, have been advocated increasingly in the educational technology literature (Evans, 1992; Carlstrom, 1993; Hsi & Agogino, 1994; Raju & Sankar, 1999; Mbarika, Sankar, & Raju, 2003). Multimedia case studies use interactive formats to engage students in higher order cognitive skills while exploring situational problems. Specifically, video, sound, animation, graphics, and text are integrated to provide an ideal learning medium.

There is a strong backing for the use of multimedia case studies in the literature. Nielsen (1995) reported that multimedia enables non-linear access to vast amounts of information. This is an asset to any student in order to improve problem solving and thinking skills. Other researchers show that with multimedia, users can explore information in-depth on demand and interact with instructional materials at a self-paced mode (Collier, 1987; Barrett, 1988). Still others state that multimedia is attention capturing or engaging to use and represents a natural form of representation with respect to the working of the human mind (Jonassen, 1989; Delany & Gilbert, 1992). Mbarika, Sankar, and Raju (2003) found that multimedia instructional materials had a positive influence and resulted in a positive improvement in the learning-driven factor category for both business and engineering students within multi-criteria decision-making situations. Mbarika, Sankar, and Raju (2002) also examined the impact of multimedia case studies on gender differences. Results of the study revealed that multimedia case studies have more impact for female students because of the challenging learning environment and the opportunity to learn from others.

Most of the literature dealing with multimedia case studies in business learning has been based primarily on perceived learning and not many studies that have looked at actual
achievement of learning (Broussard, Lou, & Mbarika, 2008; Dillon & Gabbard, 1999). In addition, many of the studies in the literature use a single assessment tool and do not triangulate on measures from different sources (Dillon & Gabbard, 1999; Landauer, 1995). One notable National Science Foundation (NSF) sponsored project, the Laboratory for Information Technology in Engineering Education (LITEE) multimedia technologies, has led to a series of published academic and industry award-winning multimedia case studies piloted in a number of engineering and information technology programs across the country. Despite all the investments and continuing efforts of LITEE researchers, a paucity of research exists on the effectiveness and impact of this technology on teaching and learning. While the impact of multimedia instructional materials on “perceived” user learning has been previously studied (Landauer, 1995; Dillon & Gabbard, 1999; Bradley, Mbarika, Sankar, & Raju, 2005), their impact on “actual” learning has, to date, received little research attention.

The LITEE multimedia case studies are designed to provide students with an opportunity to integrate theory and practice. Video clips, audio clips, photographs, and animations enhance the learner’s ability to understand complex materials, which in turn improves the ability to participate in decision-making processes. The case studies also boost student-centered learning since students are actively involved in solving the problem presented.

The LITEE cases provide students with the theoretical basis of concepts and then expect students to apply the theories to the simulated environments of the real world, which are provided to them either on CD-ROM or on the World Wide Web. The simulated environment reinforces and expands the understanding of the concepts involved through hands-on experience (LITEE, Why Should You Use One of LITEE Case Studies?, 2008).
2.5 Summary and Implications

Students in college must be prepared to enter the workforce. To be successful in today’s job force, a person needs to be able to think critically and to solve problems that may not have a definitive right or wrong answer. In an effort to better prepare students for the work environment, problem based learning must be implemented as one teaching method. This methodology can assist in changing the classroom from the traditional content-centered or teacher-centered environment to a student-centered one.

The implementation of multimedia case studies in the management classrooms offer problem based learning in a computer supported collaborative environment. Students are able to communicate asynchronously through discussion boards in order to solve an authentic problem. The case studies give students the opportunity to apply the theoretical and conceptual knowledge that they have learned to a real-life situation similar to one that they may have to face in the workforce.

This study looked to add to the current research in the field by not only assessing group learning, but also the learning of the individuals once they have completed the group tasks. The level of participation in the group by individuals in relation with perceptions of learning, actual learning, and attitudes toward the subject matter was also studied.
CHAPTER 3. METHODOLOGY

3.1 Research Design

This study employed a mixed method experimental design in investigating the following two research questions: 1) Does students’ online collaboration during multimedia case studies have a positive effect on case study performance, individual knowledge gain, perceived learning, and/or attitudes toward MIS subject matter? 2) What is the relationship between levels of students’ online interaction and case study performance, individual knowledge gain, perceived learning, and attitudes toward MIS?

The first research question was examined via a quasi-experimental comparison between an experimental class where students used group discussion forums in Blackboard to discuss and collaborate on solving problems in a multimedia case study and a control class where groups did not use discussion forums for their group collaboration and problem solving using the same case study. Outcome measures included group and individual case study performance as measured via case solution written report and oral presentation, individual knowledge gains by pre- and post-knowledge tests, perceived learning, and attitudes toward subject matter through online surveys.

The second research question was examined through correlation analyses between levels of students’ online interaction during the case study process and other outcome measures including group and individual case study performance, individual knowledge gain, perceived learning, and attitudes toward MIS for the experimental class only.

While quantitative data allowed for descriptive and inferential statistical analyses between the experimental and control conditions, and among variables within the experimental condition, qualitative data was also collected to enrich the understanding of the quantitative data. Qualitative data was collected from the open-ended questions in the Student Perceptions
Questionnaire, the Powertel Case Study Perceived Learning Survey, the Peer/Self-Evaluation, and the Case Performance Analysis. The students’ comments were used to provide a richer picture of the trends and relationships identified in the quantitative data. Figure 3.1 shows how the data was viewed comprehensively to form a more complete picture of the results.

Triangulation, a part of mixed methods, allowed for the testing of consistency in the data results discovered using various instruments (Sydenstricker-Neto, 1997, Tashakkori & Teddlie, 2003). Triangulation was used in an effort to explain student behavior by approaching it from various angles (Cohen & Manion, 2000).

![Figure 3.1: Data Collection and Analysis](image)

### 3.2 Context and Participants

Sixty-one students in two sections of a management information systems undergraduate course at a university in the southern United States participated in the study. The university is a four-year Historically Black College accredited by the Commission on Colleges of the Southern Association of Colleges and Schools. The particular course chosen was already using the case study in the curriculum in previous years and the instructor was willing to use the case study in the course for the spring 2011 semester. The course emphasizes the understanding of management information systems in an effort to improve managerial decision-making skills. The Powertel Case Study was designed to assist in achieving this objective by assisting business
students in understanding the dynamics of making managerial decisions concerning information systems. The Powertel Case Study directly aligns with the objectives of the course.

The two classes selected were primarily face-to-face classes. One section of the course met twice a week and the other section met once a week in the evening. Both sections were taught by the same instructor. Blackboard and LiveText were used by the university and, therefore, both were incorporated into the course. The course syllabi and Powertel Case Study instructions and due dates were posted on LiveText. The surveys were created using SurveyMonkey and links to the surveys were posted in the LiveText courses. The group discussion areas were posted on Blackboard, as students were more familiar with the discussion forum process using that medium.

Generally, both sections were structured in the same manner, covered the same course content, and were taught by the same instructor. At the beginning of the spring semester, the instructor of the course and the researcher created a list of assignments and due dates concerning the case study. The instructor was charged with ensuring that students were made aware of and understood the assignments concerning the case study throughout the semester. The researcher reinforced the instructions and deadlines for the case study materials via messages in LiveText, Blackboard, and e-mail. The researcher also made a face-to-face visit with both classes at the beginning of the semester to introduce, explain, and answer questions concerning the upcoming case study assignments. The researcher was also available via e-mail for the students who experienced technical problems with the assignments. The researcher and the instructor also maintained a continuous dialog through phone, e-mail, and face-to-face conversations throughout the semester.
Students in both classes were randomly divided into groups of five to seven students. Groups were created for both sections on Blackboard for students to access their group members’ names and for section 01 to communicate with their group during the decision making process for the case study. The students were also given instructions on accessing LiveText, as well as how and when to complete the surveys and student questionnaires. The surveys were created in SurveyMonkey and the links to the surveys were posted in LiveText for the students to access them. The surveys were open at designated times throughout the semester and students were required to adhere to the deadlines.

Each group of students was given a scenario to defend to solve the case presented in the Powertel Case Study. Students worked in groups and then presented their findings and conclusions to the class at the end of the assigned task period. In addition, students completed peer and self-evaluations, perceptions of learning surveys, and two student questionnaires during this time.

Section 01 was required to communicate about the Powertel Case Study in the group discussion forum on Blackboard. These students received participation grades for their postings and participation in the Blackboard discussions. This section was also given guiding prompts that were posted by the researcher to assist them in the problem solving process.

Section 02 was not required to participate in the Blackboard discussion forum and was not given the guided prompts to assist them in completing the case study. The group discussion area was available on Blackboard for their voluntary use. A couple of the groups used the discussion forum to set up meeting times, but the area was not used for communication about the case study itself.
3.3 Multimedia Case Studies

NSF sponsored the LITEE\textsuperscript{1} technology project in an effort to assist instructors in the challenge of communicating information technology concepts to non-technical students to improve achievement. The LITEE technology project led to a series of academic and industry award winning multimedia case studies published by the Institute for Science, Technology, Engineering, and Mathematics (STEM). The cases were intended to assist students in understanding real-world issues and to demonstrate technological issues that need to be dealt with in the business world. In addition, the cases often prompt students to recognize the need to have the ability to understand terminology and concepts from other subject areas in order to communicate and make appropriate decisions. The multimedia case studies generate the connection between theoretical information and practical application.

The LITEE case studies provided students the opportunity to gain experience with real world problem solving situations while gaining teamwork experience and decision making skills. The students are typically assigned to groups of five to seven students and are asked to study the case and interact with their group members to solve issues presented in the case. The case used represented authentic problems and complex situations encountered in the real world. Experts and managers involved in the actual situations were able to communicate their opinions and points of view with audio and video clips made available to the students through the multimedia case format. The LITEE case studies have been shown to provide the “synthesis of ideas and skills in a format students respond to and enjoy” (Raju & Sankar, 2009). The cases gave students

\footnotesize{\textsuperscript{1} This research was based upon work partially supported by the National Science Foundation (NSF) under Grant Nos. 1036324 and 0811453. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.}
a purpose to develop, use, and improve their interpersonal and team working skills in a purposeful setting.

The case chosen for this study was the Powertel Case Study (©2009 Dr. P.K. Raju and Dr. C. Sankar). Powertel launched a hugely successful marketing plan that increased their network traffic 40 percent within the first month. The increased network traffic posed a particular problem at a busy intersection in Birmingham, Alabama. Because of the intense traffic at the intersection, drivers would often look to use their cellular phones while stuck in traffic. This increase in phone traffic led to more dropped calls and busy signals, which was not acceptable to Powertel’s customers. The company was faced with the decision to build a new site at the Summit or add antennas at the top of the Sheraton Hotel in an effort to satisfy the rapid increased growth in customers due to an aggressive marketing campaign.

The case contains textual instruction, videos, and diagrams to assist students in developing an understanding of the cellular industry. Students can watch videos of traffic, see diagrams of the area, and hear from experts and those who participated in the decision making process for Powertel.

3.4 Procedures

The study took place during the spring 2011 semester, which began in January and continued through May. At the beginning of the semester, the instructor was advised on the general procedures and guidelines for implementing the case study into the courses and the methods to be used for collecting data. Table 3.1 is a timeline of activities and special instructions for the Powertel Case Study provided to the instructor of the course prior to the start of the case study.
### Table 3.1: Timeline for Powertel Case Study Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Open Date</th>
<th>Deadline</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log in to LiveText and Blackboard</td>
<td>January 20</td>
<td>Feb. 28</td>
<td>This must be done by the deadline so that students can be placed into groups</td>
</tr>
<tr>
<td>Attitudes toward MIS- Pre-test</td>
<td>January 20</td>
<td>Feb. 28</td>
<td>Students need to complete the survey ASAP. It must be done before introducing the Powertel case study</td>
</tr>
<tr>
<td>Knowledge Pre-Test</td>
<td>January 20</td>
<td>Feb. 28</td>
<td>Please make sure that students complete the Knowledge Pre-test before introducing the Powertel Case study</td>
</tr>
<tr>
<td>Student Perceptions Questionnaire Pre-test</td>
<td>January 20</td>
<td>Feb. 28</td>
<td>Students will be prompted to answer several questions pertaining to the course and cases</td>
</tr>
<tr>
<td>Powertel Case Study</td>
<td>March 10</td>
<td>April 4</td>
<td>It is recommended that the instructor introduce the case to the students during the week of March 10 (if possible). The students have about two weeks to complete the case and create their oral presentation.</td>
</tr>
<tr>
<td>Group Discussion Forum</td>
<td>March 10</td>
<td>April 4</td>
<td>The discussion forum will remain open for students until they have completed the Powertel Case Study. Students will be randomly assigned into groups to work on the case in the forum area. Students will be informed of their group members and assignments on March 10.</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>April 5</td>
<td>April 7</td>
<td>Groups will present their findings pertaining to the Powertel Case Study</td>
</tr>
<tr>
<td>Student Perceptions Questionnaire Post-test</td>
<td>April 7</td>
<td>April 14</td>
<td>Students will be prompted to answer several questions pertaining to the course and cases</td>
</tr>
<tr>
<td>Powertel Case Study Perceived Learning Survey</td>
<td>April 7</td>
<td>April 14</td>
<td>Students are to complete the Powertel evaluation once the case work has been completed. This is also referred to as the Powertel Perceptions of Learning Survey.</td>
</tr>
<tr>
<td>Peer/Self-Evaluation</td>
<td>April 7</td>
<td>April 14</td>
<td>Students will be asked to complete the peer/self-evaluation. A link to the evaluation will be sent to each student through e-mail. Also, the link will be posted in the group areas on Blackboard.</td>
</tr>
<tr>
<td>Knowledge Post-test</td>
<td>April 27</td>
<td>May 3</td>
<td>Please make sure that students complete the Knowledge Post-test after the Powertel case is completed.</td>
</tr>
<tr>
<td>Attitudes toward MIS Post-test</td>
<td>April 27</td>
<td>May 3</td>
<td>Students should complete the survey after the completion of the Powertel case study</td>
</tr>
</tbody>
</table>

Students were given the first couple of weeks of class to log in to their Blackboard and LiveText accounts to ensure that they were working properly. The instructor and the researcher addressed any technical issues with Blackboard and LiveText at that time. The researcher and the instructor then met to finalize the deadlines and general format for the progression of the case study.
Once the timeline was finalized, the instructor asked the students to complete three preliminary assessments. The first was the knowledge pre-test (see Appendix A). The pre-test consisted of eleven multiple-choice questions related to technical aspects of the cellular industry. The second was the attitudes toward MIS survey (see Appendix B). This survey consisted of questions addressing students’ opinions about MIS subject matter, their ability to understand MIS and the relevance of the subject matter to their own lives. The third instrument was the pre-Student Perceptions Questionnaire (see Appendix G). This was a series of nine questions related to technical issues, managerial issues, critical expression, decision making skills, and problem solving skills. All three of these instruments were administered through links to SurveyMonkey on the LiveText site. The instructor and the researcher emphasized to the students the importance of adhering to the deadlines throughout the semester.

Students had the opportunity to use a hard copy of the Powertel Case Study along with a compact disc packaged with the text. They were also able to access the case and supplemental materials online from the LITEE Cases Web site (Welcome to LITEE Cases, 2010). Both contained all of the pertinent information, videos, recordings, diagrams, external links, and explanations to assist them in completing the case. Both sections of students were introduced to topics pertaining to the case over several class periods. The instructor provided lessons on terminology and the general topic of cellular technology. On March 10, 2011, the students were given a brief overview of the case, instructions on how to proceed through the case, and their assigned group scenario to research and discuss. Students were also informed of their group assignments during this class period. Groups had been assigned randomly through Blackboard by the researcher. Students were able to access their group members on the Blackboard course
management system and communicate with one another through the group discussion forum, chat, and file exchange areas.

Students in section 01 were required to communicate with their group members in the discussion forum created for their group on Blackboard, while section 02 students had the freedom to decide how they would communicate with one another. Students in section 01 were given the requirements and expectations for participation in the discussion forum. They were also given prompts to guide them through the decision making process while working through the case study. Students in section 02 were not given the requirements for discussion or expectations for communication.

For the Powertel case study, each group was assigned one of the following positions in an effort to assist the Powertel managers in solving the issue at hand:

- Defend the decision to build the cell site at the Summit and develop a plan including drawings to support your decision.
- Defend the decision to build the cell site on the top of the Sheraton and develop a plan including drawings to support your decision.
- As consultants, find out design options through which future demands for service could be fulfilled quickly so that customers will remain with Powertel. Develop a plan including drawings to illustrate your design option.
- As a management team, decide which option is best: the green field or top of the Sheraton given the business, technical, engineering, and legal issues. Develop a plan to implement your recommendation.

In order to determine and support a solution for the case study, students had to immerse themselves into the situation. The Powertel Case Study familiarized students with cell phones,
cell site erection, and wireless technologies through various diagrams, videos, audio clips, and text. By watching the interviews with managers and engineers who worked on the real-life Powertel problem, students could obtain inside information and had the issues of Powertel authenticated. The case assisted students in completing the steps required to make critical decisions and demonstrated the effects that decisions made can have on a company. The purpose of the Powertel Case Study was to have students understand the importance of establishing and sustaining communication between project managers and technical personnel by working through the case (Williams, 2008).

The discussion board for section 01 provided prompts to aid discussion of information and assisted students in progressing through the case. The four discussion prompts provided were:

1. Understand the Problem: What is the situation proposed in the case? What are your group’s responsibilities in resolving the situation? Students in each group should come to a consensus on what the case study is asking for and what is being asked of them. The group should agree on a mission and/or work together to resolve disagreements, and create a clear vision to progress steadily toward solving the case.

2. Research Areas and Report Results to the Group: Students will choose areas of interest pertaining to the case that they will focus on. Students will be expected to become “experts” in one particular area, all the while understanding the interaction of the various areas and the consequences of interactions among different areas. Research library, Internet, materials provided, as well as information from relevant journals and books. Summarize information and present pros and cons on the topic to your group. Make sure to cite sources. List possible actions that you think the
company should take. You do not have to agree that the possibilities are the best
choice, just list them.

3. Discuss and Decide on a Solution: Groups should decide on three possible solutions
and concentrate on them for further discussion. Keep in mind that discussions may
actually lead to solutions other than those chosen at this point. Note pros and cons of
each situation and provide references and citations to support opinions. Various
perspectives should be represented.

4. Support the Final Solution: Decide on the solution and offer support for your decision

5. Oral Presentation: Groups will be expected to give an oral presentation in support of
their decisions. Please use this area to communicate about your presentation.

Students were required to work on the case study outside of class and were not given time
during class periods to work in groups concerning the case study. Students were given from
March 10 through April 4 to complete their case study analysis and prepare a presentation to
present to the class. Section 01 gave presentations on Tuesday, April 5, and Thursday, April 7,
and section 02 gave their presentations on Thursday, April 7. Students normally would have had
two weeks to work on the case study, but the school’s spring vacation fell during the week of
March 27 through April 3. Therefore, students were required to present their findings to the class
upon their return from spring vacation.

Once the case study was completed, the instructor and researcher scored the students on
their processes and quality of work. The researcher used the case process rubric to assess the
discussions completed by section 01 on Blackboard in relation to the Powertel Case Study. The
rubric addressed the participation of the students in the various steps of the decision-making
process. The instructor scored the case performance for both sections. Students presented the
results of their decision-making process in both written and oral forms. The instructor assigned scoring for the case performance based on three areas: written report, presentation content, and individual contribution to the presentation.

In the two weeks following the completion of the Powertel Case Study, the students completed their post-case surveys and assessments. This included the post-knowledge test, the post-Attitudes toward MIS survey, and the second Student Perceptions Questionnaire. All three of these assessments were used in combination with the pre-assessments to measure any changes from prior to post assessment.

In addition to the above three post-assessments, students were also asked to complete two additional evaluations. The first was the peer/self-evaluation in which students rated each of their group members, as well as themselves, on their contributions to the process of completing the case study. The second was the Powertel Case Study Perceived Learning Survey. This survey offered insight into students’ perceptions of learning during the Powertel Case Study process and provided a better understanding of the students perceptions of the value of the case study in the learning process.

3.5 Data Collection Instruments

Data collection instruments in this study included a knowledge test, an Attitudes toward MIS Survey, a Peer/Self-Evaluation Rubric, a Case Performance Rubric, a Case Process Rubric, and a Powertel Case Study Perceived Learning Survey. Qualitative data of the collaborative problem solving process was also collected through comments and Student Perceptions Questionnaires completed by students at various stages during the case problem solving process. Through these instruments, the problem solving process, actual learning, and perceived learning outcomes were able to be evaluated and measured.
3.5.1 Knowledge Test

The knowledge pre- and post-test (see Appendix A) was administered through LiveText via a link to SurveyMonkey. The purpose of the knowledge pre-test was to determine the baseline knowledge of the students concerning the technological topics presented in the cases. The eleven multiple-choice question test addressed the topics covered in the Powertel Case Study. The pre-test was piloted in the fall 2010 semester and was found to have good internal consistency (Cronbach’s alpha = .816).

The knowledge post-test contained the same 11 multiple-choice questions related to the technical concepts and ideas covered in the Powertel Case Study as were in the pre-test. The comparison of the two scores was used to determine the increase in knowledge of the students relating to the technical concepts discussed and discovered in the case.

3.5.2 Attitudes toward MIS

The Attitudes toward MIS Survey (see Appendix B) was designed by the LITEE group to assess students’ opinions about the subject of management information systems. The LITEE team provided educators with the assessment tool and an explanation of the assessment implications for student learning, as well as to how business and engineering colleges can incorporate their findings into their own curriculums. This pre-survey was used to determine the initial responses of students toward the class and the MIS subject matter in general. The post-survey was then used to assess any changes in attitude toward the subject matter after the case study was completed. This same survey had been administered in many classrooms and results from the assessment tools have been reported in over twenty journals and over forty conference articles (LITEE, Quantitative Assessment, 2008).
The Attitudes toward MIS Survey was obtained from the LITEE Web site and contained thirty-five statements addressing the following general constructs.

General Attitude toward the Subject Matter: There were six statements used to determine the attitude of the students toward MIS. The statements concerned the general ability of students to learn, understand, and apply MIS concepts. Statement eleven (MIS is highly technical.) was reverse coded for the analysis in order to align the direction of the statement results.

Relevance to Life and Society: These four statements addressed the relevance of MIS skills and knowledge to the workplace. In this category, statement four (MIS is irrelevant to my life.) was worded negatively and therefore was reverse coded for proper data analysis.

Cognitive Domain of Learning: This category dealt with the use of the instructional materials in the MIS course that assisted with learning to identify, interrelate and apply important skills, topics, and ideas related to MIS and the confidence that students felt in being able to apply those concepts in real-world situations. Of the six statements in this category, several also asked students to evaluate statements directly related to how MIS tools can assist in business decision-making and problem solving.

Impact on Positive Aspects of Affective Domains: The affective domain involves feelings, emotions, or degrees of acceptance or rejection. In this instance, the survey wanted to capture the students’ feelings toward MIS. Students were asked to rate their agreement with six statements that addressed their emotions toward MIS. This included the degree to which they like MIS, their emotional involvement in learning the course content, the sense of accomplishment, self-confidence, and responsibility associated with the subject area.

Impact on Negative Aspects of Affective Domain: Like the previous category, this category also addresses the affective domain. The statements dealt with feelings of stress,
frustration, insecurity, and trouble understanding concepts in MIS. The six questions in this category were reverse coded so that data results would be more uniform across the categories.

Impact on Teamwork: Five statements addressed the concept of teamwork and the impact that the MIS course had on each individual’s teamwork skills. Statements addressed listening, team building, and interpersonal skills.

Communication Skills: There were two statements that addressed the students opinions on how the MIS course improved their writing and presentation skills.

A Likert scale was used to record the responses of the students according to the following scale: 1= Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly Agree. The survey also contained five questions pertaining to demographics including grade point average (GPA), years of work experience, gender, race, and status in school.

The Attitudes toward MIS Survey was first administered prior to beginning the Powertel Case Study. The survey was given again at the conclusion of the Powertel Case Study. Both surveys contained the same thirty-five questions and were used to determine any significant changes in students’ attitudes toward the MIS subject matter.

3.5.3 Peer/Self-Evaluation

Students had the opportunity to assess their own participation and the participation of their group members in the process of analyzing and proposing a solution to the case study on the Peer/Self-Evaluation rubric (see Appendix C). The evaluation was created on SurveyMonkey and students were e-mailed the link to their team’s evaluation. A survey was created for each team specifying the names of each of the participants. In an effort to eliminate confusion as to which evaluation students should be taking, the researcher chose to e-mail the correct survey to each student.
In the evaluation, students were asked to rate each team member’s efforts and contributions, including their own, during the Powertel Case Study. Students rated team members on the quality of contributions, support, responsibility to the project and the group, and overall quality of work. Students were reassured by the instructor and by the instructions provided by the researcher that their answers would be kept confidential in an effort to solicit honest responses. Students evaluated each of their group members and themselves on each question according to the following scale: always demonstrated the quality, frequently demonstrated the quality, sometimes demonstrated the quality, seldom demonstrated the quality, and never demonstrated the quality.

Students assessed themselves and their group members on their participation and contributions to the project. Students ranked the overall contribution to the success of the group made by each team member by rating them as excellent, above average, average, below average, or poor. In addition, after each topic area, a blank area was provided for students to enter any explanatory comments that they deemed necessary.

3.5.4 Case Process Rubric

The case process rubric (see Appendix D) was developed for the purpose of evaluating student contributions in the case study collaboration activity. The researcher evaluated each individual student’s participation in the online discussion according to the rubric. Each criterion was a ranking from one to four in the rubric, with one being the least desired behavior and four being the most desired behavior. Each level of the criterion provided a brief explanation of what was expected for each rating to assist the researcher in assessing all students against the same criteria. The categories assessed were the students’ participation in analyzing the key issues in the case study, determining proposed solutions for the given problem, defending the proposed
solutions, communicating with group members, and their overall contributions to the case study project.

3.5.5 Case Performance Rubric

A presentation evaluation form designed by an instructor who had used the case study in his courses for the last several years was used to assess the case performance of the students. The Case Performance Rubric (see Appendix E) contained categories for both content and delivery. Likert scale ratings were used to assign scores for the teams’ analyses, contributions, and proposed solutions to the problem assigned. Added to the evaluation was an assessment of the individual contributions to the presentations.

The Case Presentation Rubric contained three distinct areas for scoring: the written report, the presentation content, and the contributions of the individual students to the oral presentation. The written report section assessed the content of the report submitted by the group on such items as thoroughness, accuracy, and depth of the analysis, the relevance and justification for recommendations presented, and the connection of the material to theory. The presentation portion covered the organization, professionalism and the visuals utilized during the oral presentation of the case findings. The individual contribution score was based on each individual’s demonstration of the content knowledge during the presentation and question/answer session at the conclusion of the oral presentation including their demonstration of content knowledge, dependency on notes and slides, correct pronunciation of terminology, and professionalism during the presentation.

3.5.6 Powertel Case Study Perceived Learning Survey

The Powertel Case Study Perceived Learning Survey (see Appendix F) that was used to assess the perception of student learning in conjunction with the case study was also used in
similar research with LITEE case studies (Goodhue & Thompson, 1995; Hingorani, Sankar, & Kramer, 1998; Mbarika, Sankar, Raju, & Raymond, 2001; Mbarika, Sankar, & Raju, 2003). The survey consisted of forty-five questions that addressed students’ perceptions of learning in relation to the Powertel Case Study. Eight specific constructs were addressed in the Powertel Case Study Perceived Learning Survey:

Challenging: There were four statements addressing the students’ perceptions as to whether or not the Powertel Case Study was helpful in learning difficult concepts and successful in transferring theory to practice.

Higher Order Thinking: The nine higher order thinking statements addressed students perceptions on whether or not their abilities to identify, integrate and evaluate issues and alternatives related to cellular technology concepts had improved from the use of the case study. There were also two direct statements about the improvement of decision-making and problem-solving skills.

Learned from Others: On the evaluation, two statements were assigned to this category: 1) I learned to value my colleagues’ points of view. 2) I learned from other colleagues during the session. The answers from these questions signified the students’ opinions of the value of the group in which they participated.

Self-Reported Learning: Seven statements on the evaluation referred to whether or not students felt they learned new concepts and how to identify topics and central issues related to the cellular industry.

Learning Interest: There were five statements concerning the interests of the students in the subject matter being learned. Students were asked to indicate the extent to which they performed additional reading, discussion, and thinking about the subject matter.
Ease of Use: Eighteen statements on the evaluation addressed the difficulty in using the case study. The statements covered topics like the ease of navigating the case study, the quality of the video and audio, the legibility of the content and graphics, and the organization and presentation of the multimedia materials.

The reliability of these constructs had been tested in prior research by Mbarika et al. (2002) by computing Chronbach’s alpha for each of the eight constructs. The alpha coefficients ranged from 0.66 to 0.96 indicating internal consistency in the items included to measure the constructs. In addition to the forty-five statements, six questions were posed at the end of the survey to obtain demographic information from the students.

3.5.7 Student Perceptions Questionnaire

The Student Perceptions Questionnaire (see Appendix G) was administered twice during the semester: once prior to administering the case study and again when the case study was completed. The “yes” or “no” portions of the questions were used in quantitative computations, while the explanations to the answers were used to support any changes in attitudes and perceptions identified in the quantitative data results.

The Student Perceptions Questionnaire contained nine prompts addressing the following four categories: technical matters, managerial matters, critical expression, and critical thinking. The following areas were addressed in each category.

Technical Matters: The first two questions on the survey addressed the students’ perceptions of the impact of the course as of the current time on their ability to identify technology issues related to information technology management and the change in their abilities to integrate those issues into real-world situations.
Managerial Matters: Questions three and four on the student questionnaire dealt with student abilities to identify managerial issues related to information technology environments and to evaluate existing technology and managerial alternatives.

Critical Expression: There were two questions dealing with critical expression. Questions five and nine asked students to indicate their confidence in expressing ideas on the issues covered in the course thus far and whether or not they had discussed the subject matter with their classmates outside of the classroom.

Critical Thinking: Questions six, seven, and eight asked students to indicate whether or not their critical thinking skills had improved, more specifically, if their ability to interrelate important topics, their decision-making skills, and their problem-solving skills had improved thus far in the semester.

3.6 Data Analysis

Seven different instruments were used in the research process to obtain both quantitative and qualitative data. Outlined in Table 3.2 are the data sources and analysis plans for each research question.

3.6.1 Quantitative Analysis

To address the first research question, quantitative data collected, including case study performance, individual knowledge gains by pre- and post-knowledge tests, perceived learning, and attitudes toward subject matter via online surveys, was analyzed using descriptive, inferential, and correlational statistics. Descriptive statistics were used to produce comparative bar charts for each of the quantitative outcome measures to provide a visual comparison between the means of the experimental and control classes.
<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Source</th>
<th>Data Analysis</th>
</tr>
</thead>
</table>
| Does students’ online collaboration during multimedia case studies have a positive effect on group case study performance, individual knowledge gain, perceived learning, and attitudes toward subject matter? | • Case Performance Rubric  
• Knowledge Pre-Post Tests  
• Powertel Case Study  
• Perceived Learning Survey  
• Attitudes toward MIS Pre-Post Tests | • Descriptives  
• T-Tests |
| What is the relationship between levels of students’ online interaction and group performance, individual knowledge gain, perceived learning, and attitudes toward subject matter? | • Case Process Rubric  
• Peer/Self-Evaluation  
• Case Performance Rubric  
• Knowledge Pre-Post Tests  
• Powertel Case Study  
• Perceived Learning Survey  
• Attitudes toward MIS Pre-Post | • Descriptives  
• Correlations |
Independent sample t-tests were run to statistically test if the experimental and control classes differed significantly on: changes in content knowledge, changes in attitudes toward MIS, group and individual case performance, and the perceptions of learning. Changes in content knowledge were determined through the gains from the pre- and post-knowledge tests. Similarly, changes in student attitudes toward MIS were computed using the gains from the pre- and post-administration of the attitude survey.

The instructor for the two classes assigned student scores for the group and individual case performance. The written report assessed the thoroughness, depth, and accuracy of the decision reached by the group. The presentation component was scored based on the organization of the presentation, the professionalism of the students in giving the presentation, and the quality of visuals used to present their findings. The third component evaluated each individual’s contribution to the oral presentation. The instructor assessed the content knowledge of each individual during both the prepared presentation and the question/answer session that followed. The three scores were totaled to determine each student’s final score for case performance.

To address the second research question, levels of student contributions in group online interactions in section 01 were evaluated by the researcher using the Case Process Rubric. The rubric assigned ratings for the depth and breadth of postings made by the students. Pearson Correlations were then run between the overall levels of contributions made by the students as measured by the Case Process Rubric and the Peer/Self-Evaluation, group and individual case performance, knowledge tests, attitudes toward MIS, and perceived learning. Correlations describe the degree of relationship between two variables. In this study, correlation analyses were conducted in an effort to identify relationships between the level of student interaction in
the case process and case performance, individual knowledge gain, perceived learning, and student questionnaire answers for the students in section 01.

3.6.2 Qualitative Analysis

As previously described, student online interactions while working on case studies were evaluated via the Case Process Rubric. Using the rubric, the researcher assigned ratings for the depth and breadth of postings made by each student. Representative samples of student high and low quality interactions for each aspect of the problem solving process were selected and are presented in a table to provide a richer illustration of the student case problem solving process.

Qualitative data collected from the open-ended responses in the two student perception instruments, the Student Perceptions Questionnaire and the Powertel Case Study Perceived Learning Survey, were also analyzed to provide support for the quantitative findings. While some of the student comments are used to demonstrate and corroborate the results of the changes in perceptions and attitudes, the qualitative data also assists in suggesting explanations for the results of the quantitative data.

3.7 Validity

Triangulation is a way to test the strength of findings obtained through various instruments. Therefore, in an effort to gain a deeper and more complete understanding of the students in the courses studied, the surveys and data gathering instruments were correlated and compared in order to further explain the findings.

It is also important to note that data was obtained from several sources. The instructor evaluated the case performance of the students, whereas the researcher assessed the online case process contributions. In addition to obtaining information from the evaluator and the researcher, the students also provided information on the contributions of their team members and of
themselves in solving the problems posed in the case study. Each person evaluated every team member, including themselves, on a set of established criteria. The completed evaluations provided a clearer picture of each student’s perception of their own contributions in comparison to their team members. The data was also used to triangulate the findings in the case process rubric for the course section required to use the online discussion area.

Triangulation through the combination of different data gathering techniques was used in this study to minimize common biases in research. The study incorporates quantitative and qualitative data, self-reported and facilitated data, and perceived and actual learning data. The purpose of the multi-dimension triangulation was to produce results that present a complete understanding of the results from the study.
CHAPTER 4. RESULTS

This mixed methods study was designed to examine: 1) the impact of students’ online interactions on performance, learning, and attitudes toward the management information systems (MIS) subject matter via a quasi-experimental comparison of two sections of one course with one section using online discussion forums and another section not using discussion forums while working on a multimedia case study; and 2) the impact of the levels of collaborative contributions made by individual students on their performance, learning, and attitudes through correlation analysis of data from the experimental class that used online discussion forums while working on the multimedia case study. The results of the two class comparative analyses will be presented first, followed with the more in-depth analyses results on the experimental class.

4.1 Experimental and Control Comparisons

Descriptive statistics and inferential t-tests were used in comparing the means of section 01, the experimental class using the online group collaboration forums during the case study process, and section 02, the control class that did not use the online group collaboration forums during the case study process, on student case performance, knowledge gained, perceived learning, and attitudes toward MIS.

4.1.1 Case Performance

Students in both sections were graded by the instructor on their case performance at the conclusion of the Powertel Case Study. The grading rubric used (see Appendix E) was divided into three sections, including the written report for a total possible ten points, the presentation content for a total possible five points, and the individual contributions to the presentation for a total possible of five points, making the final project worth twenty points.
Figure 4.1 displays the results from the descriptives and inferential statistics calculated on the case performance for the two sections. Statistically, the data indicates that there were no significant differences between the two sections concerning the categories assessed in the final report: written report \((t=-.904, p=.366)\), presentation \((t=.377, p=.708)\), individual contribution \((t=.026, p=.979)\), and total score \((t=-.366, p=.738)\).

![Case Study Performance Chart]

**Figure 4.1: Case Study Performance**

4.1.2 Actual Content Knowledge Gained

The knowledge test (see Appendix A) was administered prior to the onset of the case study. The test contained eleven questions addressing technical concepts concerning the cellular industry and cellular technology. The same eleven question test was given again to the students at the completion of the Powertel Case Study. As shown in Figure 4.2, both sections demonstrated similar abilities on the tests. Independent t-tests indicated that there was no significant difference in the pre-test, post-test, or the knowledge gained scores as indicated by the following values: pre-test \((t=.240, p=.812)\), post-test \((t=-.675, p=.505)\), and knowledge gained \((t=-.979, p=.335)\).
4.1.3 Powertel Case Study Perceived Learning

Students in each of the two sections reported their perceptions of learning while using the case study in the Powertel Case Study Perceived Learning Survey (see Appendix F). Students were asked to evaluate forty-five statements according to the following Likert Scale: 1=Strongly Disagree, 2=Disagree, 3=Neither Agree nor Disagree, 4=Agree, and 5=Strongly Agree. Students were also asked three open-ended questions concerning the strengths, weaknesses, and suggestions for improvement the Powertel Case Study. Analyses were conducted on six constructs including: challenging, higher order thinking, learning from others, self-reported learning, learning interest, and ease of use.

Descriptive statistics and independent t-tests were conducted in analyzing student perception of learning between the two course sections. The results are presented in Figure 4.3. There was no statistically significant difference between the two sections in any of the six constructs.

Figure 4.2: Knowledge Tests Results
Figure 4.3 Powertel Case Study Perceived Learning Survey Test Results

Figure 4.3 shows that the means from both sections in all six categories were very positive toward the Powertel Case Study experience. Students offered additional comments in the three open-ended questions to corroborate their positive experience. The following are examples of student testimony:

- The strength of the multimedia version of the Powertel Case Study was that our group was able to view the study interactively with videos and graphics.
- The Powertel Case Study was interesting, kept my attention, and was informative to my group as a whole.
- The Powertel Case Study allowed us to think on our own and come up with our own solutions to the problems.
- As a group, we were able to think critically and work together to accomplish a goal.
4.1.4 Attitudes toward MIS

The attitudes toward MIS survey (see Appendix B) assessed students’ opinions about the MIS subject matter. The survey was given in a pre-test/post-test format before and after the Powertel Case Study was implemented into the course. Students were asked to rate their agreement with the 35 posed statements on the following Likert Scale: 1) Strongly Disagree 2) Disagree 3) Neither Disagree nor Agree 4) Agree 5) Strongly Agree. The survey addressed the following constructs: general attitude toward subject matter, relevance to life and society, cognitive domain of learning, impact on positive aspects of affective domain, impact on negative aspects of affective domain, impact on teamwork and communication skills.

Figure 4.4 represents the change in attitudes toward MIS as reported by students from the pre-test to the post-test. Students in section 01 indicated a positive change in all of the categories except for the “Relevance to Life and Society” and the “Impact on the Negative Aspects of the Affective Domain” constructs. Section 02 indicated positive changes from the pre- to post-survey in all seven of the constructs. Statistically, there was no difference in the change in mean scores between the two classes within each of the areas identified.

Figure 4.4 Changes in Attitudes toward MIS Tests Results
One noticeable characteristic, however, was the large increase for both sections in the “Impact on Teamwork” and “Communication Skills” categories. Section 01 showed an increase of .610 in the class mean for the teamwork category and an increase of 1.00 in the class mean for the communication skills area. Section 02 demonstrated an increase of .850 in the class mean for the team category and an increase of 1.88 in the class mean for the communications category. These are all considerable increases.

4.1.5 Student Perceptions Questionnaire

Students completed a Student Perceptions Questionnaire (see Appendix G) before participating in the Powertel Case Study and again after the study was completed. The questionnaire contained a series of nine questions. Each question was answered with a “yes” or “no” along with an explanation or comment. The responses were coded as a one for “No” and a two for “Yes”. Results of the t-test computed on the average change in mean scores from the pre-questionnaire to the post-questionnaire were not statistically significant (t=.340, p=.736), although both indicated more positive responses on the post-questionnaire with an average mean increase of .211 for section 01 and .161 for section 02.

The nine questions on the survey were arranged into four constructs: technical matters, managerial matters, critical expression, and critical thinking. Independent t-tests for the changes in mean scores from pre- to post-questionnaire were calculated. The results, as displayed in Figure 4.5, showed that there was no statistically significant difference between the two sections by category. It is important to note, however, that both groups reported positive responses in each of the four categories addressed. In addition to the “yes” or “no” responses, students also offered explanations and support for the answers chosen which gave further explanations into the reasoning for the answers provided.
Below is a summary of the responses made by the students supporting the positive responses given.

**Technical Matters:** Students indicated that they now had a better understanding of MIS, the importance of location within the cellular industry, the ability to recognize technology issues, and a better understanding of how technologies support businesses.

**Managerial Matters:** Students indicated that because of understanding the technical issues involved in MIS, they also became more aware of the issues that managers face when dealing with technology and the managerial decision-making process, including the identification and evaluation of alternatives.

**Critical Expression:** Students indicated that the Powertel Case Study was a good learning experience and they became more confident in expressing themselves in front of the class. Several students referenced that because the case study was designed to get them ready for the real world, they were willing to spend extra time on the project in order to perform better on the assessment.
Critical Thinking: Several students indicated that their decision-making skills improved because of the need for them to step up and lead their group. Those students who wanted to be successful in completing the case project found themselves leading the group in making decisions, not only on the technology issues, but also on the contributions to be made by various group members. Students that indicated an improvement in problem-solving skills attributed it to being able to learn the steps in the problem-solving process and implementing those steps in the case study.

4.1.6 Peer/Self-Evaluation

At the conclusion of the Powertel Case Study, students participated in a peer/self-evaluation (see Appendix C). Students were asked to evaluate each of their team members, including themselves, on thirteen specific statements that addressed each student’s willingness to participate in the collaboration forum, to work as a team, to meet deadlines and to produce high quality work.

A t-test was run to compare the means for the two sections based on the data collected from the evaluations. Although section 01 (M=91%) did report a higher mean than section 02 (M=85%), results of the test indicated that there were no statistically significant differences (t=1.167; p=.248) between the two sections.

4.2 Group Problem Solving Process Analysis

Section 01 was required to participate in the online discussion forum when working on the case study. The researcher evaluated the students’ participation in the online discussion forum using the case process rubric (see Appendix D) to give a quantitative value to the depth and breadth of participation by the students in the discussion forum.
4.2.1 Online Case Processes

The online discussion component for section 01 was analyzed to determine whether students engaged in high levels of thinking and problem solving while completing the Powertel Case Study. Twenty-nine students participated in the discussion forums on Blackboard for section 01. There were six students assigned to the course that did not participate in the discussion and therefore received zeros for their participation grade. Student participation was evaluated according to a scale of one to four for each of the following categories: Analysis of Key Issues, Determining Proposed Solutions, Defending Proposed Solutions, Communications, and Overall Contributions.

Descriptive statistics for the evaluation of the online discussion are presented in Table 4.1. The means for all of the categories fell below a 3.00 for analysis of key issues (M=2.55), determining proposed solutions (M=2.89), defending proposed solutions (M=2.86) and overall contributions (M=2.72). The communications category (M=3.02), which addressed the respectfulness in and the appropriateness of the language used in the responses, was the only construct that had a mean above a 3.00. The majority of the students in section 01 did not meet the expectations of the researcher. Approximately 79% of the students scored a 3.00 or below on their overall contributions to the case process. However, there was considerable variability in the level of contributions among the students.

Table 4.1 Descriptives from Case Study Performance

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis of Key Issues</td>
<td>29</td>
<td>.00</td>
<td>4.00</td>
<td>2.55</td>
<td>1.104</td>
</tr>
<tr>
<td>Determining Proposed Solutions</td>
<td>29</td>
<td>1.00</td>
<td>4.00</td>
<td>2.89</td>
<td>.927</td>
</tr>
<tr>
<td>Defending Proposed Solutions</td>
<td>29</td>
<td>1.00</td>
<td>4.00</td>
<td>2.86</td>
<td>.953</td>
</tr>
<tr>
<td>Communications</td>
<td>29</td>
<td>2.00</td>
<td>4.00</td>
<td>3.02</td>
<td>.695</td>
</tr>
<tr>
<td>Overall Contributions</td>
<td>29</td>
<td>1.00</td>
<td>4.00</td>
<td>2.72</td>
<td>.996</td>
</tr>
</tbody>
</table>
The categories for grading the online case processes, along with both high and low scoring sample entries from students for each of the categories are presented in Table 4.2.

Table 4.2 Case Process Scoring Samples

<table>
<thead>
<tr>
<th>Analysis of Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Scoring</strong> (3-4)</td>
</tr>
</tbody>
</table>
| Cost is an essential component in the decision of where to build the cell tower. Here is some basic information about how much it would cost to build a cell site on top of the Sheraton and the Summit. Let me know what you all think. **For the site at The Sheraton Hotel:**  
- The overall cost required to build the site at The Sheraton: $100,000.  
- For an existing site, and increasing the capacity, the costs will be:  
  - For Telco: $400 a month.  
  - For Rent: $600 - $1200, let’s say approx $1200 a month.  
  - Additional costs: $40,000 - $50,000.  
  - Power already exists. **For the site at Summit:**  
- The overall cost required to build the site at the Summit: $230,000.  
- The break up costs will be:  
  - Tower installation: $150,000; For Equipment: $100, 000; For lease: $5000  
  - For TI line: $400; For Grant including A & E: $20,000  
  - If the site is leased to other users they will pay; For lease of the land: $400 a month.  
  - For using the tower: $1000 a month. |
| **Low Scoring** (1-2) |
| The situation proposed in the case is to defend the decision to build a cell site at the Summit and our responsibility is to develop a plan including drawings to support our decisions. |

<table>
<thead>
<tr>
<th>Determining Proposed Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Scoring</strong> (3-4)</td>
</tr>
<tr>
<td>Yes, the tower at the Sheraton’s primary benefit would be the smaller range that allows more frequency reuse. However, that reuse is a major thing being that the location of the proposed towers will be in a high traffic area at the intersection of the highways. By having the tower at the Sheraton, quality of the calls as well as the longevity and durability of the tower will be ensured. It seems to come down to a decision between costs versus quality.</td>
</tr>
<tr>
<td><strong>Low Scoring</strong> (1-2)</td>
</tr>
<tr>
<td>I suppose that one solution would be to implement both of the suggested ideas to handle continued growth in the company.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Defending Proposed Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Scoring</strong> (3-4)</td>
</tr>
<tr>
<td>Although the hilltop location of the tower on the Summit increases coverage, it also restricts frequency reuse. <strong>Figure 5 &amp; 6 in the Powertel Case Study provides an illustration of this outcome.</strong> Hills in the area restrict the coverage of an additional tower at the Sheraton, but the larger coverage area has less frequency reuse. Frequency reuse in high-traffic areas (intersection of Hwy 280/Hwy 459) is important because a greater number of simultaneous users can be in a given geographical area. Less reuse of frequencies can lead to more dropped calls, slower connection speeds, and more intercepted calls (crossed lines).</td>
</tr>
<tr>
<td><strong>Low Scoring</strong> (1-2)</td>
</tr>
<tr>
<td>I believe that an advantage of the green field is that there will be less interference with that tower, whereas the Sheraton will cause interference from other satellites.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Scoring</strong> (3-4)</td>
</tr>
<tr>
<td>“Student X”? You made a good point in describing your opinion but I disagree with your statement. I believe the Sheraton would be better because although you cover less people in the area, you can place more towers in a different area. The green field covers more area but drops calls when there are a large number of calls in an area. “The coverage area of the Sheraton is not as wide as the Summit. As previously mentioned, this is not necessarily detrimental, because it allows for greater frequency reuse.” <strong>Powertel Case Study: coverage of Large Area versus better Frequency Reuse in Wireless Communications</strong></td>
</tr>
<tr>
<td><strong>Low Scoring</strong> (1-2)</td>
</tr>
<tr>
<td>ok</td>
</tr>
</tbody>
</table>
4.2.2 Relationship between Case Process and Case Performance

Pearson correlation was run using SPSS for section 01 to determine if there was any significance in the relationship between the overall contributions of students in the case process discussion forum and the scores received on the case performance evaluation. The instructor of the course, using the case performance rubric (see Appendix E), determined the case performance scores. The scores were divided into three categories: 1) written report 2) presentation content and 3) individual contributions to the presentation. The written report was valued at ten points, the presentation at five and the individual contribution at five, totaling a possible score on the case performance of twenty.

The overall contributions in the discussion forum, referred to as the case process, showed a statistically significant correlation with the written report as indicated in Table 4.3. The significant correlation is positive (.407) indicating that as the value of one variable increases (or decreases) the other variable does so as well. Therefore, as the overall contribution score of students increases (or decreases) the score the student obtained on the written report in the case performance rubric increases (or decreases) also. The correlation indicates that the better students were at participating in the case study process in the online collaboration forum, the better they scored on the written report.

Table 4.3 Case Process and Overall Contributions to Case Performance Correlation Results

<table>
<thead>
<tr>
<th></th>
<th>Pearson Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Report</td>
<td>.407* (.032)</td>
</tr>
<tr>
<td>Presentation Content</td>
<td>.266 (.171)</td>
</tr>
<tr>
<td>Individual Contribution to the Presentation</td>
<td>.107 (.587)</td>
</tr>
</tbody>
</table>

*p<.05
4.2.3 Relationship between Case Process and Knowledge Gain

A correlation was run to determine the relationship between the case process and the knowledge gained score. The knowledge gained score was determined by subtracting the post-test knowledge score minus the pre-test knowledge score for each student. This difference was used in the correlation with the overall contributions category from the online case process. The results indicated that there was no statistically significant relationship (.276), or correlation, between the case process and the knowledge gained score. In other words, the data did not indicate that there was a relationship between the knowledge gain and the degree of participation in the online collaboration forum. Students in both classes gained similarly in their knowledge from engaging in the multimedia case study.

4.2.4 Relationship between Case Process and Powertel Case Study Perceived Learning Survey

A correlation was run in SPSS to determine the relationship between the perceived learning categories obtained for the Powertel Case Study Perceived Learning Survey and the overall contributions of section 01 students in the case study online process. There were no statistically significant relationships identified from the correlation results as noted in Table 4.4. Students’ perceptions of learning from the Powertel Case Study were not influenced significantly by the amount of student participation in the online group collaboration forum.

**Table 4.4 Case Process and Powertel Case Study Perceived Learning Survey Correlation Results**

<table>
<thead>
<tr>
<th>Perception Category</th>
<th>Pearson Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenging</td>
<td>-.063(.758)</td>
</tr>
<tr>
<td>Higher Order</td>
<td>-.079(.700)</td>
</tr>
<tr>
<td>Learn from Others</td>
<td>-.100(.628)</td>
</tr>
<tr>
<td>Self-Reported Learning</td>
<td>.068(.742)</td>
</tr>
<tr>
<td>Learning Interests</td>
<td>-.197(.334)</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>-.189(.356)</td>
</tr>
</tbody>
</table>
4.2.5 Relationship between Case Process and Attitudes toward MIS Subject Matter

Student ratings on the seven categories identified in the Attitudes toward MIS pre- and post-surveys were computed and analyzed in SPSS. Each student’s mean for each category on the pre-survey was subtracted from the mean from the same category on the post-survey. This change in attitude toward the subject matter was then analyzed in a correlation with the online case process scores. It was determined that there was a statistically significant positive correlation between the overall contributions of students in the online group process and the “Impact on Negative Aspects of the Affective Domain”, as well as with the “Communication Skills” category. The correlations were significant at the .022 and .027 levels respectively. The results from the analysis are in Table 4.5.

The correlation results indicate that the more students participated in the online collaborative discussion forum, the more comfortable they became with the subject of MIS. Essentially, their contributions to the online discussion led to decreased stress and apprehension related to the course materials. The data also showed the positive correlation between case process and communication skills. Students who participated more fully in the online discussion tended to also report that they felt that their communication skills, both writing and presentation, had improved during the use of the case study.

Table 4.5 Case Process and Attitudes toward MIS Survey Correlation Results

<table>
<thead>
<tr>
<th></th>
<th>Pearson Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Attitude toward MIS</td>
<td>.337(.086)</td>
</tr>
<tr>
<td>Relevance to Life and Society</td>
<td>.287(.124)</td>
</tr>
<tr>
<td>Cognitive Domain of Learning</td>
<td>.390(.055)</td>
</tr>
<tr>
<td>Impact on Positive Aspects of Affective Domain</td>
<td>.124(.312)</td>
</tr>
<tr>
<td>Impact on Negative Aspects of Affective Domain</td>
<td>.478*(.022)</td>
</tr>
<tr>
<td>Impact on Teamwork</td>
<td>.393(.053)</td>
</tr>
<tr>
<td>Communication Skills</td>
<td>.463*(.027)</td>
</tr>
</tbody>
</table>
4.2.6 Relationship between Case Process and the Student Perceptions Questionnaire

As noted earlier, the Student Perceptions Questionnaire was administered in a pre- and post-case study format. The questionnaire attempted to gain insight into the opinions of the students based on the following categories: technical matters, managerial matters, critical expression, and critical thinking. Correlation results (see Table 4.6) indicated that there was a positive relationship between the overall contributions of students in the online case performance and the change in overall attitude of the students in section 01 as measured by the overall mean difference from the nine questions on the pre- and post-questionnaires. This positive correlation means that statistically, students who scored higher in the online discussion portion, signifying their greater depth and breadth of participation, also indicated a positive change in the opinions assessed in the Student Perceptions Questionnaire. It seems that the more students put into the activity, the more they took out of it.

A second positive correlation was found in this data between the overall contributions of individuals in the online discussion process and the self-reported critical thinking skills category. Again, students showed that as participation increased, the perception of their own abilities to think critically increase as well.

### Table 4.6 Case Process and Student Perceptions Questionnaire Correlation Results

<table>
<thead>
<tr>
<th>Category</th>
<th>Pearson Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Questionnaire Average Difference</strong></td>
<td>.451*(.035)</td>
</tr>
<tr>
<td>Technical Matters</td>
<td>.334 (.095)</td>
</tr>
<tr>
<td>Managerial Matters</td>
<td>.193 (.229)</td>
</tr>
<tr>
<td>Critical Expression</td>
<td>.151 (.282)</td>
</tr>
<tr>
<td>Critical Thinking Category</td>
<td>.523*(.016)</td>
</tr>
</tbody>
</table>
4.2.7 Relationship between Case Process and Peer/Self Evaluation

On the Peer/Self-Evaluation, students rated their own performance and the performance of their group members. Students were given a Likert Scale to rank each item on the evaluation according to the following scale: Excellent, Above Average, Average, Below Average, and Poor. A percentage score was calculated to determine a score for each student’s participation as noted by their peers and themselves. The majority of students rated their team members and themselves very well. One group member added the following comment about their group, “The members in this group worked really well together and were able to communicate effectively, which made our project run smoothly.”

The Pearson Correlation Coefficient was calculated using the percentage scores obtained from the evaluations and the overall contributions to the online case process. There was a statistically significant relationship found between the case process and the Peer/Self-Evaluation data (r=.041, p=.835).

Table 4.7 Case Process and Peer/Self-Evaluation

<table>
<thead>
<tr>
<th>Peer/Self-Evaluation</th>
<th>Pearson Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.835* (.041)</td>
</tr>
</tbody>
</table>

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CHAPTER 5: DISCUSSION AND CONCLUSIONS

The invention of the Internet and the World Wide Web has inundated students with information that can be accessed at nearly any time and from any place. Often times students will become overwhelmed by the abundance of information that is available. It is crucial that students are taught how to decipher, evaluate, and understand how to use this information to their advantage. In essence, they must be taught to think critically to solve problems in the classroom in order that they may one day transfer those skills into the real world.

The purpose of this mixed methods quasi-experimental study was to examine the impact of online discussions on students’ perceptions of learning, problem solving skills, and case performance. The study also analyzed the relationships between levels of participation in the online collaboration discussion forums while completing the multimedia case study with both actual and perceptual increases in knowledge and skills.

Two face-to-face classes taught by the same instructor and covering the same topics and material participated in the study, one using online discussion forums during the group case study process, and the other class not using the online discussion forums. Data was collected via the following instruments: knowledge pre- and post-tests, Attitudes toward MIS pre- and post-surveys, Case Performance Rubric, Peer/Self-Evaluation, Case Process Rubric, and Powertel Case Study Perceived Learning Questionnaires.

The results of the study indicate that both sections of students performed equally well on the group and individual case performance, individual knowledge gains, and had similar perceptions of learning and attitudes toward MIS subject matter. Both sections reported overall positive perceptions of learning with the Powertel Case Study, as well as positive increases in teamwork and communication skills as a result of using the case study. This positively reinforces
the use of collaborative multimedia case studies in promoting higher order thinking, teamwork, and communication skills—all of which are important to potential employers.

Students in both sections reported that their classmates, as well as themselves, participated satisfactorily in the problem solving process. Students in section 01 reported a mean participation score of 93% and students in section 02 reported a mean participation score of 85% concerning the problem solving process. The evaluation included items addressing understanding the problem, devising a plan, carrying out a plan, and evaluating a decision.

Further analyses of case problem solving processes in the experimental class indicate that the overall contribution score in the collaboration forum had a significantly positive relationship with the score on the written report as part of the case performance and communication skills, both written and presentation. These results indicated an increase in communication skills for those who participated more completely in the online collaboration process. The overall contributions scores in the collaboration process also positively correlated to changes in attitudes that addressed negative aspects of the affective domain. In essence, the more students were involved in the discussion, the more comfortable they felt with the subject matter.

5.1 Perceptions of Problem Solving and Higher Order Thinking Skills

In evaluating the student perceptions of learning while using the Powertel Case Study, both sections of students reported overall positive means in each of the six categories: challenging, higher order, learn from others, self-reported learning, learning interest, and ease of use. This positively reinforces the use of case studies in promoting higher order thinking. Students found the case challenging, but reported an increase in higher order thinking, which was one of the goals in implementing the case study.
Changes in attitudes toward MIS subject matter were also similar for both groups. Students in both sections notably reported increases in teamwork and communication skills after completing the Powertel Case Study. These are both skills that employers are looking for in new hires. It is interesting to note the increase in the teamwork and communication categories in comparison to some of the comments on the weaknesses of the Powertel Case Study. Several comments addressed the inability of the students to choose their own group members. One comment stated, “We were not allowed to choose our group members and ended up with slackers.” Another comment, “The weakness of this case study was the group members. Although we started with five group members, we only had three that actually showed up and did anything.” Perhaps the increase in skills was provoked by the “ slackers” in the groups, causing those who did participate to do so more extensively.

Students in the experimental group reported a statistically significant positive correlation (r=.575) between performance and perception of higher order thinking skills acquired during the case study process. Students also indicated statistically significant correlations in performance and learning from others, self-reported learning, and learning interest. Essentially, those who felt that they learned from others, had an interest in the material, and felt that the Powertel Case Study had assisted them in improving their higher order thinking skills received higher scores on the case study performance.

The results from this study concur with the findings from prior research indicating that students in hybrid courses are performing equally to those students in face-to-face environments (Webb, Gill, & Poe, 2005). The results also support Clark’s (1983,1994) conclusions on the media debate: when effective methods of instruction are used, the learning results will remain the same no matter the method of delivery. In essence, the case studies provided a solid foundation
for group processes and problem solving to take place, whether students participated in the process in the online environment or face-to-face.

The results of this study are encouraging in that students have the same responses to the case study whether their communication is online or face-to-face. The results of this study support the conclusion that we should not be so concerned with whether or not one delivery method is better than the other, but instead what conditions determine the choice of the appropriate technology (Bates, 2010).

However, there may be other reasonable explanations for the lack of difference between the experimental and control groups. For one, it is evident from research that teacher participation and presence can influence the participation of students. In this study, neither the instructor, nor the researcher, participated in the discussion area. Future studies may include the instructor guidance and participation in the discussion forums, which could influence the experimental group findings.

5.2 Engagement in Higher Order Thinking and Problem Solving

Research conducted by Lehtinen et al. (2003) suggests that using collaborative techniques with technology could increase high-level thinking skills, social interactions, critical reflective capabilities, and creativity. Students did indicate by the results of their peer/self-evaluations that they felt that their group members participated as needed, for the most part. As noted earlier, the overall contributions of students in section 01 was 93%. In addition, student questionnaire analyses showed an increase in mean scores for section 01 indicating that students believed that the case study process did assist them in the development of their problem solving and higher order thinking skills. This conclusion is also supported by the following entries made by students:
• I have improved my ability to solve problems by following the steps of the problem solving process.

• I am better able to decide on the best option between two equally good options.

• I have learned a lot by working in groups, and the technology knowledge I have gained has helped my ability to make decisions involving technology.

• Through practice by completing the case study, I feel I have developed a systematic approach to problem solving.

A correlation was conducted to determine any relationships between online group processes and case performance. The overall contributions score from the Case Process Rubric was correlated with each individual section of the final presentation as well as the total score received. There was a statistically significant positive correlation between the overall contributions of students on the discussion forum and the scores given on the written reports.

A 2001 study by Warschauer offers an explanation for the positive correlation between the online group participation and the written report performance. Warschauer refers to previous studies conducted on linguistic characteristics. The studies support claims that computer-mediated communication actually falls near the center of the continuum for formal and informal communication. It is also suggested from these studies that the computer-mediated communication can provide a connection between speaking and writing to develop an interaction that is both informative and communicative. So, perhaps the students who participated more in the online discussion had the opportunity to express themselves in a way that allowed for an increase in the communication process and therefore the increase in knowledge that was evident in the written report.
Sullivan and Pratt (1996) performed a research study to determine the differences in writing skills acquired by English as Second Language (ESL) students. Some of the students used a networked computer-supported classroom environment to work on their writing skills while others worked in a traditional face-to-face classroom. One important finding of the study was that students tended to make more comments on each other’s writings in the traditional setting, but the comments in the computer-supported classroom were more focused. In this study, the overall contribution score in the online collaboration positively correlated to scores on the written report in the case performance. It can be suggested that those students who wrote pertinent comments, thought critically about what was being said, referred back to comments and suggestions made, and thought through their written statements before posting, had more comprehensive resources when beginning to write their paper. Debourgh (2002) also found that asynchronous discussions promoted reflective thinking and higher work quality. In this study, students who thought critically about their own answers and participated in understanding the material more completely created written reports that scored higher than those who did not fully participate in the discussions.

Several positive correlations were found between the overall contributions of students in the online collaboration process and the changes in attitudes of students prior to and after using the Powertel Case Study. The negative aspects of the affective domain category on the Attitudes toward MIS Survey involved statements dealing with stress, frustration, and insecurity when dealing with MIS subject matter. The results from the six statements in this category indicated a positive correlation with the overall contributions. In other words, students who contributed more extensively to the online collaboration also indicated that they felt less frustration, less stress, and felt more secure with MIS subject matter than those who participated less. Students with greater
collaboration scores also reported improvements in their critical thinking skills. These results support the research findings by Kirschner et al. (2011) that working in groups positively affects the confidence of students in solving subject matter problems. Those students who participated more fully in the collaboration also indicated an increase in communication skills, reiterated by the written report score.

Although positive correlations were identified, it is important to recognize that correlation does not mean causation. It is possible that the influence could be from either direction. Other potential alternative explanations could be learner ability, prior experience, learning styles, and other demographic variables. Future research is needed to further examine the role of these factors in explaining the significant correlations identified in this study.

5.3 Conclusion

Evidence from the study indicates that there is no real difference in the media used to communicate with one another, but instead the difference results from the depth and breadth of the communication produced. Comparison of the two sections showed that they performed similarly in all of the areas identified in the study. This supports the research that good pedagogy is central to learning and the conditions in which that pedagogy is implemented should dictate the technology used. This research supports the use of online collaboration environments in distance learning courses to allow students the same opportunities to communicate and participate in-group activities.

For those students who participated in the online collaboration forum, it was clear that the more they participated the more they were able to take aware from the discussion. Students who participated in the collaboration with postings related to the problem solving process indicated a more positive attitude toward the subject matter and felt more confident in their own ability to
understand the subject matter as indicated by the changes in the negative aspects of the affective domain. The degree and quality of participation in the collaborative environment correlated to what the students benefited from the process.

5.4 Limitations

The participation in the online collaboration was not as extensive as the researcher had expected. The instructor or researcher cannot assume that students have had proper acclimation to the online environment. When using online collaborative groups, it is recommended that students be given specific guidelines on the communication process and the expectations of the instructor on the types and number of postings expected. Brooke (2006) offers several guidelines to give students to guide them in creating substantial responses in discussions:

- Responses should address all of the issues raised.
- Responses should provide an analysis, addition, critique, explanation, or disagreement. Knowledge of content should be evident along with support from outside materials.
- Use references by summarizing, outlining, and citing the information in your response.
- Create substantial responses that expand on the point and present information on the topic. Responses should demonstrate critical thinking about the topic.

There are additional resources, including rubrics, which can guide the student in gaining more from the online collaboration process. Assigning grades to students for participating in the discussions can also encourage more in depth and frequent postings. Students should be given a rubric prior to the onset of the collaboration so that they are aware of what is expected of them and are aware of what is considered satisfactory performance.
In this case, neither the instructor nor the researcher participated in the online collaboration area. The researcher did provide prompts for the different steps in the decision making process at the beginning of the study, but did not offer any content related suggestions thereafter. It is recommended that the instructor should have a presence in the online discussions. It is important for students to know that the instructor is present and to receive feedback from the instructor. This feedback can be general comments about the direction the collaboration is heading, a summary of the collaborative content, or specific kudos to those who are reaching expectations. This shows the students that the instructor is interested in their work, following their ideas, and offers students an opportunity to adjust their own behavior as necessary.

5.5 Implications

The findings in this study indicated that the students increased their actual learning as exhibited on the knowledge tests and the case performance. Students also reported positive evaluations of the Powertel Case Study. They felt that it was useful in improving their higher order thinking skills, group communication, content knowledge, and interest in the subject matter. Case studies used in the MIS courses, therefore, can provide a venue for students to improve the skills needed when entering the workforce.

It is not enough to provide the avenue for students to improve their skills. Instructors must encourage participation and assert guidelines and rules for participation. The more a student fully participates in a problem solving process, the more likely they are to benefit from the process. By giving students rules, guidelines, examples, and by modeling the behavior expected, students will understand what is expected of them and in turn produce higher quality work.
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APPENDIX A: KNOWLEDGE TEST

When choosing a cell site, wireless companies have to take __________ into consideration.
A. Cell coverage area  
B. the economics of the site  
C. Both a and b  
D. None the above

Wireless companies have to get approval from __________ before building a cell site at a proposed location.
A. FCC  
B. Local zoning board  
C. SEC  
D. DoD  
E. Both A and B

Which of the following is not a digital wireless standard technology?
A. GSM  
B. AMPS  
C. TDMA  
D. CDMA

On average, the cost of constructing a typical cell site is well under $150,000.
A. True  
B. False

________ enables a cellular system to be able to handle a huge number of calls with a limited number of channels.
A. Cellular reuse  
B. Frequency reuse  
C. Cellular hopping  
D. Frequency hopping

Which of the following is not a good way to maximize cell site coverage?
A. Ensure that nothing impedes line of sight  
B. Use lowly elevated sites  
C. Place antennas on rooftops of hotels  
D. All of the above

An area consisting of two or more Basic Trading Areas is known as a _______.
A. Digital Service Area  
B. Analog Service Area  
C. MBTA  
D. MTA
PCS is a newer class of wireless communications that usually uses all-digital technology for transmission and reception and emphasizes personal service and extended mobility.

A. Analog Service
B. PCS
C. BCS
D. TAM

Which digital wireless standard technology is more common in Europe and Asia than in the US?
A. GSM
B. AMPS
C. TACS
D. All of the above
E. None of the above

The size and shape of each cell in a network depends on _____________.
A. the nature of the terrain in the region
B. the number of base stations
C. the transmit receive range of base stations
D. All of the above
E. None of the above

Which of the following is not a component assembled on the sled design?
A. RBS
B. Generator
C. Antenna
D. All of the above
### APPENDIX B: ATTITUDES TOWARD MIS SURVEY

The questions below are designed to identify your attitudes about information systems. Be as honest as possible; there are no correct or incorrect answers. Please rate the degree to which you agree or disagree with the following statements in this questionnaire.

- A = Strongly Disagree (SD)
- B = Disagree
- C = Neutral (neither agree nor disagree)
- D = Agree
- E = Strongly Agree (SA)

**Instructional material is defined as the class lectures, text book, and homework exercises that have been used so far in this course and earlier courses. If you did not have any class in this field of study and did not work on any teams so far in this class, please mark the response as “C” – neutral.**

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MIS is a subject learned quickly by most people.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I have trouble understanding MIS because of how I think.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>MIS concepts are easy to understand.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>MIS is irrelevant to my life.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I get frustrated going over MIS tests in class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I am under stress during MIS classes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I understand how to apply analytical reasoning to MIS.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8.</td>
<td>Learning MIS requires a great deal of discipline.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9.</td>
<td>I have no idea of what's going on in MIS.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>I like MIS.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11.</td>
<td>MIS is highly technical.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12.</td>
<td>I feel insecure when I have to do MIS homework.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>I can learn MIS.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>MIS skills will make me more employable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Using the instructional material, I have learned to identify how MIS tools can help in business decision making</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Using the instructional material, I have learned to inter-relate important topics and ideas.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Using the instructional material, I have learned to identify various alternatives/solutions to a problem.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>My problem solving skills have improved because of the use of the instructional material.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>The instructional material has helped me to sort relevant from irrelevant facts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
20. The way in which the instructional material, class activities, labs, and assignments fit together has made my learning easier.  

21. I became emotionally engaged in learning the course topics because of the use of the course material.  

22. Using the instructional material has helped increase my self-confidence.  

23. Using the instructional material has helped me achieve a sense of accomplishment in learning.  

24. Using the instructional material has helped me assume a greater responsibility for personal learning.  

25. If I ever were to become part of top management in a company I would hire a MIS person to help with business decision making.  

26. The instructional material has helped me improve my team-building and interpersonal skills.  

27. The instructional material has helped my teammates and I listen carefully to each other’s statements and ideas.  

28. The instructional material has helped my teammates and I to arrive at decisions based on consensus building.  

29. The instructional material has helped my teammates and I share ideas with each other.  

30. The instructional material has helped me enhance interactions with my teammates.  

31. My writing skills have improved as a result of the MIS courses.  

32. My presentation skills have improved as a result of the MIS courses.  

33. My confidence in applying MIS concepts to real situations has improved.  

34. I have acquired an interdisciplinary focus due to the MIS course.  

35. My attitude towards MIS has improved as a result of the instructional materials.  

Using the items provided below, indicate the item that best describes you  

36. Please select one of the following for your GPA.  
(a) GPA 2.0 to 2.5  
(b) GPA 2.51 to 3.0  
(c) GPA 3.01 to 3.5  
(d) GPA 3.51 to 4.0  

37. Please select one of the following for your years of work experience.  
(a) less than 1 year  
(b) 1 to 2 years  
(c) 2 to 3 years  
(d) more than 3 years  

38. Gender  
(a) Female  
(b) Male
39. Race
   (a) White  (b) African-American
   (c) Hispanic  (d) Asian-American
   (e) American Indian

40. Status
   (a) Freshman  (b) Sophomore  (c) Junior
   (d) Senior  (e) Graduate
APPENDIX C: PEER/SELF-EVALUATION

1. Please choose the circle next to your name. This information will be used to report the completion of the evaluation to your instructor.
   ○ Student A
   ○ Student B
   ○ Student C
   ○ Student D

Please choose the rating that you believe best reflects each person’s effort and contributions (including your own) during the Powertel Case Study. Your answers will be kept confidential, so please be honest.

If the person:
Always demonstrated the quality, choose Always
Frequently demonstrated the quality, choose Frequently
Sometimes demonstrated the quality, choose Sometimes
Seldom demonstrated the quality, choose Seldom
Never demonstrated the quality, choose Never

2. Took an active role in initiating ideas or actions.

3. Was willing to take on task responsibilities.

4. Was willing to frequently share ideas and resources.

Explanatory Comments:
5. Accepted responsibilities for tasks determined by the group.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Student B</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Student D</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Explanatory Comments:

6. Respected differences in opinions and backgrounds and was willing to negotiate and make compromises.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Student B</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student D</td>
<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
</tbody>
</table>

Explanatory Comments:

7. Provided leadership and support when necessary.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Student B</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Student D</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
</tbody>
</table>

Explanatory Comments:

8. Acknowledged other members’ good work and provided positive feedback.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
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<tbody>
<tr>
<td>Student A</td>
<td>○</td>
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<tr>
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<tr>
<td>Student C</td>
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<td>○</td>
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<tr>
<td>Student D</td>
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</tbody>
</table>

Explanatory Comments:

9. Was willing to work with others for the purpose of group success.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
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<td>○</td>
<td>○</td>
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<tr>
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<td>○</td>
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<td>○</td>
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<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student D</td>
<td>○</td>
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</tr>
</tbody>
</table>

Explanatory Comments:
10. Kept in touch with the team so that everyone know how things were going.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student B</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student D</td>
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</tbody>
</table>

Explanatory Comments:

11. Produced high quality work.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student B</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student D</td>
<td>○</td>
<td>○</td>
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</tbody>
</table>

Explanatory Comments:

12. Met team deadlines.

<table>
<thead>
<tr>
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<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Student B</td>
<td>○</td>
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<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student D</td>
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</tbody>
</table>

Explanatory Comments:

13. Understood problems and responded with helpful comments.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student B</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Student D</td>
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</tbody>
</table>

Explanatory Comments:

14. Overall contribution to the success of the group.

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Above Average</th>
<th>Average</th>
<th>Below Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Student B</td>
<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>Student C</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Student D</td>
<td>○</td>
<td>○</td>
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</tbody>
</table>

Explanatory Comments:
## APPENDIX D: CASE PROCESS RUBRIC

<table>
<thead>
<tr>
<th>Category</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analysis of Key Issues</strong></td>
<td>Student used current, credible research to analyze the key issues in the case and offers excellent insight</td>
<td>Student used the text to analyze the key issues in the case.</td>
<td>Student did not analyze very many of the key issues in the case.</td>
<td>Student did not analyze any of the key issues in the case.</td>
</tr>
<tr>
<td><strong>Initial post and follow ups</strong></td>
<td>Initial post and follow ups are thoughtful, address the prompt, ask probing questions, and lead to deeper learning for all</td>
<td>Initial post addresses the prompt, ask probing questions, but does not lead to deeper learning for all</td>
<td>Initial post and follow ups address the prompt, but does not really dig deeper for meaning and deeper learning</td>
<td>Prompts are off-topic; no mention of course materials</td>
</tr>
<tr>
<td><strong>Determining Proposed Solutions</strong></td>
<td>Student demonstrates informed knowledge, in-depth thinking, and quality questioning of other students’ contributions and of the topic(s) at hand</td>
<td>Student demonstrates appreciation and questioning of other students’ contributions and of the topic(s) at hand</td>
<td>Student demonstrates little informed knowledge, thinking, and/or questioning</td>
<td>Student does not demonstrate thinking or questioning related to online discussion. Or, the frequency of such is minimal.</td>
</tr>
<tr>
<td><strong>Routinely provides useful ideas when participating in the online discussion. A definite leader who contributes a lot of effort.</strong></td>
<td>Usually provides useful ideas when participating in the group and in the discussion. A strong group member who tries hard.</td>
<td>Sometimes provides useful ideas when participating in the online discussion. A satisfactory group member who does what is required.</td>
<td>Rarely provides useful ideas when participating in the online discussion. May refuse to participate, or posts minimal discussion responses.</td>
<td></td>
</tr>
<tr>
<td><strong>Recommendation follows logically from the student’s analysis and research.</strong></td>
<td>The student recommends a reasonable course of action.</td>
<td>The student recommended a course of action that was not supported by his/her research</td>
<td>The student does not make any specific recommendation.</td>
<td></td>
</tr>
<tr>
<td><strong>Defending Proposed Solution</strong></td>
<td>All solutions are supported with credible evidence</td>
<td>Some solutions are left unsupported</td>
<td>No research is evident; student’s solutions are unsupported.</td>
<td></td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td>Almost always, understands, shares with, and supports the efforts of others. Tries to keep others involved in online conversation.</td>
<td>Usually understands, shares with, and supports the efforts of others. Does not cause “waves” in the online conversation.</td>
<td>Often understands the discussions by checking in, shares and supports the efforts of others, but sometimes is not responsive to the online conversation.</td>
<td>Rarely understands, shares with, and supports the efforts of others. Often is not a good team player in the online conversation.</td>
</tr>
<tr>
<td><strong>Replies are well developed and insightful, likely to refine or challenge the thoughts of others.</strong></td>
<td>Replies are well developed and thought provoking.</td>
<td>The replies show acceptable development and somewhat add to the discussion</td>
<td>The replies are present, but poorly but poorly developed.</td>
<td></td>
</tr>
<tr>
<td><strong>All statements, and responses were respectful and were in appropriate language</strong></td>
<td>Statements and responses were respectful, but on occasion, inappropriate remarks were made</td>
<td>Most statements and responses were respectful, but there were several sarcastic remarks.</td>
<td>Statements, and/or responses were consistently not respectful.</td>
<td></td>
</tr>
<tr>
<td><strong>Overall Contributions</strong></td>
<td>Provides work of the highest quality</td>
<td>Provides high quality work</td>
<td>Provides work that occasionally needs to be checked/redone by other group members to ensure quality</td>
<td>Provides work that usually needs to be checked/redone by others to ensure quality</td>
</tr>
</tbody>
</table>
## APPENDIX E: CASE PERFORMANCE RUBRIC

<table>
<thead>
<tr>
<th>Content</th>
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<th>Below Average</th>
<th>Average</th>
<th>Above Average</th>
<th>Superior</th>
</tr>
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<tbody>
<tr>
<td>Problem statement and identification of criteria</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Thoroughness, accuracy, and depth of analysis of technical factors</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Thoroughness, accuracy and depth of analysis of non-technical factors</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Identification and evaluation of alternatives</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Quality, quantity, feasibility, and relevance of recommendations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Justification and support for recommendations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Innovation/Interest generated</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Connection to theory</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### Delivery

<table>
<thead>
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<th></th>
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<th>Average</th>
<th>Above Average</th>
<th>Superior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization of presentation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Professionalism of presentation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Use of visuals and color</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### Individual Contributions to Presentation

#### Team Member #1: _______________________________

- Demonstrates full knowledge by answering all class questions with explanation and elaboration: 1 2 3 4 5
- Maintains eye contact with audience, seldom referring to notes: 1 2 3 4 5
- Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation: 1 2 3 4 5
- Professionalism in presentation: 1 2 3 4 5

#### Team Member #2: _______________________________

- Demonstrates full knowledge by answering all class questions with explanation and elaboration: 1 2 3 4 5
- Maintains eye contact with audience, seldom referring to notes: 1 2 3 4 5
- Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation: 1 2 3 4 5
- Professionalism in presentation: 1 2 3 4 5

#### Team Member #3: _______________________________

- Demonstrates full knowledge by answering all class questions with explanation and elaboration: 1 2 3 4 5
- Maintains eye contact with audience, seldom referring to notes: 1 2 3 4 5
- Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation: 1 2 3 4 5
- Professionalism in presentation: 1 2 3 4 5
| Team Member #4: _______________________________ |   |   |   |   |   |
| Demonstrates full knowledge by answering all class questions with explanation and elaboration | 1 | 2 | 3 | 4 | 5 |
| Maintains eye contact with audience, seldom referring to notes. | 1 | 2 | 3 | 4 | 5 |
| Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation | 1 | 2 | 3 | 4 | 5 |
| Professionalism in presentation |   |   |   |   |   |

| Team Member #5: |   |   |   |   |   |
| Demonstrates full knowledge by answering all class questions with explanation and elaboration | 1 | 2 | 3 | 4 | 5 |
| Maintains eye contact with audience, seldom referring to notes. | 1 | 2 | 3 | 4 | 5 |
| Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation | 1 | 2 | 3 | 4 | 5 |
| Professionalism in presentation |   |   |   |   |   |

| Team Member #6: _______________________________ |   |   |   |   |   |
| Demonstrates full knowledge by answering all class questions with explanation and elaboration | 1 | 2 | 3 | 4 | 5 |
| Maintains eye contact with audience, seldom referring to notes. | 1 | 2 | 3 | 4 | 5 |
| Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation | 1 | 2 | 3 | 4 | 5 |
| Professionalism in presentation |   |   |   |   |   |

| Team Member #7: _______________________________ |   |   |   |   |   |
| Demonstrates full knowledge by answering all class questions with explanation and elaboration | 1 | 2 | 3 | 4 | 5 |
| Maintains eye contact with audience, seldom referring to notes. | 1 | 2 | 3 | 4 | 5 |
| Uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation | 1 | 2 | 3 | 4 | 5 |
| Professionalism in presentation |   |   |   |   |   |
APPENDIX F: POWERTEL CASE STUDY PERCEIVED LEARNING SURVEY

Using the scale below, indicate the extent of your agreement/disagreement with each of the following items by circling a to e.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-----------------</td>
<td>b---------</td>
<td>c-------------</td>
<td>d------</td>
<td>e---------------</td>
</tr>
</tbody>
</table>

1. The case study was successful at bringing real-life problems to the session.
2. The case study was challenging.
3. The case study was helpful in learning difficult concepts.
4. The case study was helpful in transferring theory to practice.
5. I improved my ability to identify issues related to the wireless industry.
6. I improved my ability to identify issues related to cost/benefit concepts.
7. I improved my ability to integrate issues related to the wireless industry.
8. I improved my ability to critically evaluate wireless alternatives.
9. I improved my ability to critically evaluate cost/benefit alternatives.
10. I became more confident in expressing my ideas.
11. I learned to value my colleagues’ points of view.
12. I learned to inter-relate important topics and ideas.
13. I improved my understanding of basic wireless and cost/benefit concepts.
15. I learned to identify central issues related to the wireless industry.
16. I learned to identify central issues related to cost/benefit concepts.
17. I discussed topics related to the wireless industry outside of class.
18. I did additional reading on wireless topics.
19. I did additional reading on cost/benefit topics.
20. I did some thinking for myself about wireless issues.
21. I did some thinking for myself about cost/benefit issues.
22. I learned from other colleagues during the session.
23. I found connection between wireless concepts discussed and the case study.
24. I found connection between cost/benefit concepts discussed and the case study.
25. I identified various alternatives to the problem.
26. My decision-making skills improved.
27. My problem-solving skills improved.
28. Getting the information I want from the Website is easy.
29. Learning to use the Website was easy.
30. Becoming skillful at using the Website was easy.
31. The Website made it easy to find the meaning of terms related to the case study.
32. The Website site uses consistent terms.
33. The Website made it easy to recognize key information.
34. The Website displays visually pleasing design.
35. The display pages provides links to more detailed information
36. I can determine my position in the Website.
37. The Website allows easy return to previous display pages.
38. The Website loads quickly.
39. The videos load quickly.
40. The videos run smoothly (without delay or interruptions).
41. The audio/sound is clear.
42. The audio/sound runs smoothly (without delay or interruptions).
43. The Website is easy to navigate.
44. The Website uses understandable graphics.
45. The display pages within the Website are easy to read.

**Individual Questions:**
46. Please select one of the following for your cumulative/overall GPA
   (a) GPA 2.0 to 2.5  (b) GPA 2.51 to 3.0  (c) GPA 3.01 to 3.5  (d) GPA 3.51 to 4.0

47. Please specify your program/college of study
   (a) Engineering   (b) Business   (c) Liberal Arts   (d) Other

48. Please select one of the following for your years of experience in your program/field of study
   (a) less than 1 year  (b) 1 to 2 years  (c) 2 to 3 years  (d) more than 3 years

49. Please specify your gender
   (a) Female   (b) Male

50. Please specify your race
   (a) Caucasian   (b) African American   (c) Hispanic   (d) Asian   (e) Other

51. Please specify your status in your program of study
   (a) Freshman   (b) Sophomore   (c) Junior   (d) Senior   (e) Graduate
APPENDIX G: STUDENT PERCEPTIONS QUESTIONNAIRE

1. As of this week, has this course helped improve your ability to identify technology issues related to information technology management? If so, in what way? If not, please explain.

2. Looking at technology issues covered in this course as of this week, has your ability to integrate these issues to the real world improved? If so, in what way? If not, explain why.

3. As of this week, has this course helped improve your ability to identify managerial issues related to information technology management? If so, in what way? If no, please explain.

4. Have the materials covered as of this week helped to increase your ability to evaluate critically any existing technology or managerial alternatives? If so, in what way? If no, please explain.

5. Have you become more confident in expressing your ideas on issues covered in this course as of this week? If so, in what way? If no, explain why.

6. As of this week, have you learned to inter-relate important topics and ideas covered in this course? If so, in what way? If no, explain why.

7. Can you say that, as of this week, your decision-making skills have improved? If so, in what way? If no, explain why.

8. Can you say that, as of this week, your problem-solving skills have improved? If so, in what way? If no, explain why.

9. Have you discussed the subject matter with your classmates outside of class thus far in the semester? If so, what types of information did you discuss?
APPENDIX H: INSTITUTIONAL REVIEW BOARD APPROVED APPLICATION FOR EXEMPTION

Application for Exemption from Institutional Oversight

Unless qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/projects using living humans as subjects, or samples, or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This Form helps the PI determine if a project may be exempted, and is used to request an exemption.

- Applicant: Please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the IRB. Once the application is completed, please submit two copies of the completed application to the IRB Office or to a member of the Human Subjects Screening Committee. Members of this committee can be found at https://www.lsu.edu/screeningmembers.shtml

- A Complete Application includes All of the Following:
  (A) Two copies of this completed form and two copies of part B thru E.
  (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
  (C) Copies of all instruments to be used.
  *If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
  (D) The consent form that you will use in the study (see part 3 for more information.)
  (E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (http://phrp.nlhtraining.com/users/login.php)

1) Principal Investigator: Jan E Broussard
   Dept: ETPP
   Ph: 337.550.1355
   E-mail: jbrouss@lsu.edu

2) Co-Investigators: please include department, rank, phone and e-mail for each
   Dr. Yiping Lou, ETPP Program Coordinator, 225.578.2487, yilou@lsu.edu
   Dr. Victor Mbarika, ICITD Executive Director, 225.715.4621, victor@mbarika.com

3) Project Title:
   Student Problem Solving Communication Processes while Completing Multimedia Case Studies

4) Proposal? (yes or no) No
   If Yes, LSU Proposal Number
   Also, if YES, either
   - This application completely matches the scope of work in the grant
   - More IRB Applications will be filled later

5) Subject pool (e.g. Psychology students) Undergraduate Business Students
   *Circle any "vulnerable populations" to be used: (children <18; the mentally impaired, pregnant women, the ages, other). Projects with incarcerated persons cannot be exempted.

6) PI Signature: Jan E Broussard
   Date 4/24/11 (no per signatures)

**I certify my responses are accurate and complete. If the project scope or design is later changed, I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for three years after completion of the study. If I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Screening Committee Action: Exempted / Not Exempted Category/Paragraph

Reviewer: Mathews Signature: 5/11/11 Date 5/11/11
APPENDIX I: RESEARCH STUDY CONSENT FORM

Consent Form for a Non-Clinical Study

Study Title: Student Problem Solving Communication Processes while Completing Multimedia Case Studies: A Look into the Relationship between levels of collaboration and changes in student attitude, perceptions, and knowledge acquisition.

Performance Site: Southern University, Baton Rouge, Louisiana

Investigators:
Jan Broussard, PhD Candidate, Educational Theory, Policy and Practice, Louisiana State University, 337.550.1355, jbroussar@lsu.edu
Dr. Yiping Lou, Educational Theory, Policy, and Practice, Louisiana State University, 225.578.2487, ylp@lsu.edu
Dr. Victor Mbarika, Executive Director, International Center for IT and Development, Southern University, 225.715.4621, victor@mbarika.com

Purpose of the Study: This study examines the interactions of students in an online group discussion forum while working with multimedia case studies. Particularly, the study focuses on the impact of participation in those discussions on students’ perceptions of learning, attitudes toward management information systems (MIS), and actual learning. Furthermore, the study explores the comparison between students required to participate in the online discussion boards and those who were not. The study will also investigate the various levels of participation in the group work, as indicated through self-evaluation, peer evaluation, and online discussion rubrics completed by the instructor and the researcher in relation to perceptions of learning, attitudes toward MIS, and actual learning.

Subject Inclusion: Individuals enrolled in the two sections of Management Information Systems 305 at Southern University Baton Rouge

Number of Subjects: 75

Study Procedures: The study will be conducted throughout the semester. Subjects will complete a knowledge pre-test, attitudes and perceptions toward MIS pre-survey, and e-journal #1. Subjects will then be asked to participate in two collaborative multimedia case studies and e-journal #2. After the cases are completed, subjects will be asked to complete the knowledge post-test, attitudes and perceptions toward MIS post-survey and e-journal #3. Subjects will also complete post-evaluations of the case studies concerning their perceptions of learning. Subjects will also complete peer and self-evaluations concerning collaborative involvement.

Benefits: The study may contribute to the body of existing knowledge concerning the relationship of collaborative interactions with actual and perceptual learning. The instructor of the course will assign grades to students for participation and successful completion of the multimedia case studies.

Risks: There are no risks that have been identified.

Right to Refuse: Subjects may choose not to participate or to withdraw from the study at any time without penalty or loss of any benefit to which they might otherwise be entitled.

Privacy: Results of the study may be published, but no names or identifying information will be included in the publication. Subject identity will remain confidential unless disclosure is required by law.

Signatures: The study has been explained to me and my questions have been answered. I may direct additional questions regarding the study specifics to the investigators. If I have questions about subjects’ rights or other concerns, I can contact Dr. Robert Mathews, IRB Chair at 225.578.8692 or irb@lsu.edu.

Subject Signature: ___________________________ Date: ______________

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692  www.lsu.edu/irb
Exemption Expires: 3-11-2014
VITA

Jan Elizabeth Broussard is the daughter of two educators, Daryl and Shirley Broussard of Crowley, Louisiana. She graduated from Notre Dame High School of Acadia Parish in 1992. After earning a bachelor’s degree from the University of Southwestern Louisiana in 1996, she began teaching for the Acadia Parish School Board. In 2000, she returned to the University of Louisiana at Lafayette (formerly USL) and obtained her Master of Business Administration degree in May 2002. The following fall semester she began teaching in the Business Systems and Analysis Department in the BI Moody College of Business at ULL. Due to the encouragement of her colleagues at ULL, Jan decided to enroll in the doctoral program at Louisiana State University to obtain her degree in educational technology. As she progressed through the program, several professional opportunities came her way. She transferred to Louisiana State University Eunice to teach marketing, management, general business, and computer courses. Then in the fall of 2011, she transferred to McNeese State University to teach educational technology classes. Jan loves her job at McNeese and is so thankful for the opportunity to be a part of this wonderful faculty and institution.

Jan is engaged to William “Billy” Robichaux and they reside in Crowley, Louisiana. Together they enjoy cooking, traveling, fishing, and visiting family. Jan also enjoys spending her free time visiting with her niece and nephews and she is looking forward to the arrival of another nephew in March 2012.