

FINDING THE PERFECT BLEND: A COMPARATIVE STUDY OF  
ONLINE, FACE-TO-FACE, AND BLENDED INSTRUCTION

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Dissertation Prepared for the Degree of  
DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

August 2009

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Pearcy, Agnes Goz. *Finding the perfect blend: A comparative study of online, face-to-face, and blended instruction*. Doctor of Philosophy (Information Science), August 2009, 121 pp., 13 tables, 3 illustrations, references, 96 titles.

As distance learning evolved, course designers and teachers quickly recognized the value of integrating online features into the classroom. The result was blended learning, a combination of online and face-to-face components. This complex and dynamic new form of education has raised many questions about the role of computer-mediated communication in education and has provided new opportunities for extending research in learning and communication.

The purpose of the study was to determine whether a blended class will produce different (and possibly better) results in terms of student perceptions of the overall learning experience and student satisfaction than traditional lecture-based face-to-face instruction or learning that is delivered entirely online. The main goals of this study were to compare the effectiveness of face-to-face, online, and blended instruction, and to examine the role of interactions in the effectiveness of each educational method.

While each form of instruction received very positive feedback from both students and instructors and the newly introduced blended courses proved very successful in terms of overall satisfaction with the learning experience, the traditional lecture-based courses produced more positive attitudes toward the subject matter. The possible causes of these discrepancies between some of the quantitative and qualitative results point toward the role of previous experience with online learning, cognitive development, and learning styles.

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## ACKNOWLEDGEMENTS

I wish to thank my dissertation committee, Philip Turner, Brian O'Connor, and Deanna Bush, for their guidance and encouragement. This study would not have been possible without the participation of the blended faculty and the students at the University of North Texas. Thank you.

## TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS.....	iii
LIST OF TABLES.....	vi
LIST OF ILLUSTRATIONS.....	vii
Chapters	
1. INTRODUCTION AND STATEMENT OF THE PROBLEM.....	1
Initial Problem Statement	
Importance of the Problem	
Definition of Terms	
2. LITERATURE REVIEW.....	6
Introduction	
The Role of Interaction in the Educational Process	
Interaction in Learning and Communication Theories	
Conclusions	
3. METHODOLOGY.....	21
Introduction	
Research Questions	
Research Hypotheses	
Population and Sample	
Data Collection and Instrumentation	
Data Analysis	
Summary and Limitations of the Study	
4. DATA ANALYSIS AND RESULTS.....	34
Introduction	
Organization of Data Analysis	
Research Questions and Associated Hypotheses	
Qualitative Data Analysis and Results	
Student Experiences	
Faculty Experiences	
Summary	

5.	CONCLUSIONS.....	72
	Introduction	
	Summary of the Study	
	Findings	
	Conclusions	
	Implications	
	Future Research	
	Summary	
	APPENDICES .....	91
	REFERENCES .....	109

## LIST OF TABLES

	Page
1. Perceived Course Success Rates.....	38
2. Student Ratings of the Learning Experience .....	38
3. Multiple Comparisons of Course Ratings.....	39
4. Differences in Attitude Changes Toward Subject .....	41
5. Attitude Toward Subject Pre-Test Results.....	42
6. Attitude Toward Subject Post-test Results .....	43
7. Pearson's $r$ for the Relationship Between Final Scores and Online Activity .....	45
8. Pearson's $r$ for the Relationship Between Final Scores and Online Activity in Online Sections.....	47
9. Pearson's $r$ for the Relationship Between Final Scores and Online Activity in Blended Sections.....	48
10. Group Statistics for Final Scores in Online and Blended Sections.....	50
11. Independent $t$ -Test Results for Final Scores and Online Interactions in Online and Blended Sections.....	51
12. Chi Square Test of Independence Crosstabulations for Students' Perceived Interactions vs. Their Overall Satisfaction with the Learning Experience .....	53
13. Chi Square Test of Independence Crosstabulations for Students' Perceived Interactions vs. Class Format (Blended and Online) .....	56

## LIST OF FIGURES

	Page
1. Educational Interactions.....	9
2. Pre-Test Confidence Intervals for Attitude Scores .....	42
3. Post-Test Confidence Intervals for Attitude Scores.....	43



## CHAPTER 1

### INTRODUCTION AND STATEMENT OF THE PROBLEM

Learning traditionally gets measured as on the assumption that it is a possession of individuals that can be found inside their heads... [Here] learning is in the relationships between people. (McDermott)

#### Initial Problem Statement

Numerous comparative studies of traditional and online education have concluded that online learning can be as successful and effective as traditional learning. Certain learning and communication theories suggest that a third alternative – blended learning, a combination of distance and face-to-face learning – has the potential to produce even better results than either alone. The advantage of blending is that it may combine the strengths of face-to-face (more intimate interactions, potential for immediate feedback) and online learning (asynchronous setting, technology, and interactive features). Blended learning, however, is not a single recipe (Garrison & Cleveland-Innes, 2004). There are many ways of combining online and face-to-face learning, falling anywhere along a spectrum between entirely face-to-face and entirely online education. The optimum balance can vary depending on the subject matter and the learning situation.

Although many case studies and guidelines have been published about blended learning, there are only a limited number of studies that compare blended instruction with both traditional and online learning. Most of these comparative studies examine only one course and focus on the relationships between no more than a couple of variables. In order to gain a better understanding of what makes blended learning successful and what are the optimal blends of the synchronous and asynchronous learning events that support learning in various disciplines, large scale studies of courses of different subject matter are needed.

Why should a blended class produce different (and possibly better) results in terms of learning outcomes and student satisfaction than traditional face-to-face or entirely online classes? Previous research and certain learning and communication theories indicate that interaction is one of the key variables in the learning process and that it should be the focus of investigation when comparing the various forms of education. In blended learning, the combination of synchronous and asynchronous learning events and the opportunities for collaborative and problem-based learning are likely to increase the quantity and quality of interactions. The goal of this study was to examine how interactions vary across face-to-face, blended, and entirely online classes, and how the quantity of these interactions might impact the effectiveness of these courses in terms of students' perceptions of the course success and their satisfaction with the overall learning experience.

#### Importance of the Problem

Blended learning has been gaining popularity both in academia and the corporate environment. Each has its own motives (Dewar & Whittington, 2004). In the business world, the most important reasons for developing blended solutions include the ability to match learning styles; to create individually tailored solutions; to reduce class time; to improve the learning rate; and to exploit the investments already made in re-usable training resources (Sparrow, 2003). In academia, the initial cost-saving argument for e-learning (Gayeski, 1998; Wilson, 1999) has recently been replaced with a more refined understanding of how to integrate technology into an overall learning strategy. Blended learning is sometimes preferable because it provides pedagogical richness and access to knowledge, social interaction, and personal agency. It also can be cost effective and facilitate revision (Osguthorpe & Graham, 2003).

Another explanation for the increasing popularity of blended learning is that there has been a somewhat natural movement to add limited components of each extreme to the other – of adding some online elements to traditional face-to-face classes and including limited classroom time to online courses. In 2000, the ASTD Benchmarking Service of over 950 business organizations noted that there was a growing movement away from e-learning in favor of in-class training (Saunders & Werner, 2004). While Mantyla (2001) also reported that learners prefer a live instructor, many organizations did not go so far as to abandon virtual learning but instead found ways to merge technology and in-class learning.

The undeniable strengths of e-learning have also begun to affect traditional campus-based education. Although there is still some resistance towards entirely virtual learning environments, students as well as faculty have started to recognize the advantages of e-learning (Jaffee, 1998). While the traditional lecture method is often preferred as the more efficient approach, easily controlled by the teacher and conducive to predictable and manageable student learning (Kim & Kellough, 1987), it is often criticized for stifling creative thinking, occasioning little student involvement in decision making, and lacking intrinsic sources for student motivation. The traditional pedagogical model is primarily teacher-centered, and knowledge tends to be abstract and out of context. Especially in large-enrollment classes, students do not have a chance to benefit from collaborative learning. Traditional classroom discussions, where vocal students tend to dominate, can frustrate learners with a more introverted personality. Additionally, discussions may be superficial, spontaneous, and limited (Rovai & Jordan, 2004), and traditional lecture-based courses may fail to promote deep learning (Campbell, 1998).

E-learning, on the other hand, provides flexibility in time and space as well as increased communication and interaction capabilities (Anderson, 2004). As a result of its increased access to an ever-growing body of online content, e-learning also supports the

constructivist instructional design theory that stresses the importance of individual discovery and construction of knowledge (Jonassen, 1991). The reliance on collaborative written communication lends itself to concurrent critical reflection and discourse, and it ultimately leads to higher-order (or deep) learning outcomes (Kinsel, Cleveland-Innes, & Garrison, 2004). For faculty and students not entirely comfortable with technology-based education, blended learning might offer an ideal solution and ease them into the use of technology. Blended learning might also be “a viable means for introducing asynchronous online learning in campus based universities with little risk and minimal resistance” (Garrison & Cleveland-Innes, 2004).

Blended learning has the potential to improve learning experiences by adding the advantages of online instruction to traditional classroom settings; however, “the magic is in the mix,” and there is no custom recipe that would help create the ideal blend for every learning situation. The five blended courses developed at the University of North Texas provided an excellent opportunity to conduct a large scale study comparing the effectiveness of face-to-face, online, and blended instruction. This study examined large-enrollment undergraduate courses and focused on the quality and quantity of student-student, student-instructor, and student-content interactions and the impact of these interactions on the learning experience in the several learning environments. Interrelationships among other variables, such as students’ perceived interactions and changes in their attitude toward subject were also examined.

#### Definition of Terms

##### *Blended learning:*

Blended learning is a learning solution that provides a mix of online and face-to-face elements. It has been further refined to mean a learning solution that contains a mix of

formats, media, and experiences, including informational and instructional elements, synchronous and asynchronous learning, self-paced and instructor-led learning.

*Online learning:*

Online learning is the newest form of distance learning primarily based on asynchronous text-based communication over the Web. For the purposes of this project, the terms *online learning*, *e-learning*, and *distance learning* are used interchangeably.

*Traditional (or face-to-face) learning:*

The lecture and textbook method of instructional delivery where the instructor and a group of learners are physically present in the same classroom.

*Interaction:*

Interactions are reciprocal events that require at least two objects and two actions (Wagner, 1994). The main types of educational interaction are teacher-student, student-student, student-content, and student-interface interactions (Moore, 1989; Hillman, Willis, & Gunawardena, 1994).

## CHAPTER 2

### LITERATURE REVIEW

#### Introduction

As previous research findings and theories of distance education indicate, interaction is one of the key variables in studying the learning process. The first part of the literature review discusses why interactions should be the focus of investigation when examining the differences between face-to-face, online, and blended instruction and how this project can take a significant step beyond what is already known about the role of interaction in the learning process. The second part provides a theoretical base for the study with a summary of related learning and communication theories that emphasize the importance of interaction in the learning process.

#### The Role of Interaction in the Educational Process

Interaction has long been a “defining and critical component of the educational process and context” (Anderson, 2004). Wagner (1994) defines interactions as “reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another” (p. 8). Interactions serve a variety of functions in the educational transaction (Sims, 1999). These functions allow for learner control, facilitating program adaptation based on learner input, allowing various forms of participation and communication, and acting as an aid to meaningful learning. Constructivist learning theorists (Jonassen, 1991) especially emphasize the role of interaction in gaining other people’s perspective during the learning process.

Interaction has always been an important factor in distance education. Holmberg (1989) argued for the superiority of individualized student-teacher interaction and introduced the concept of “guided didactic interaction” (the idea of simulated interaction). In Laurillard’s (1997) conversational model of learning, interaction between students and teachers plays the critical role. Garrison and Shale (1990) define education essentially as interactions between contents, students, and teachers.

Interactivity, a concept related to interaction, is a characteristic of the technology itself (Woods & Baker, 2004). It is fundamental to the creation of online learning communities (Lipman, 1991; Wenger, 1991) and it should be the primary criterion for selecting media for educational delivery (Bates, 1991). The various forms of media used in distance education are very different in terms of their capacity to support interaction and their capacity to support independence of time and space. The higher and richer the form of communication in terms of supporting interaction, the more restrictions it places on independence of time and distance (Anderson, 2004).

### *Types of Interaction*

Moore (1989) has identified the three most common types of interaction in distance learning. He argues that interactions are not limited to teacher-student interaction, but also include interactions between students and students, and students and content. Learner-teacher interaction is what differentiates self-study from distance education. The instructor provides the learner with an organized plan, or curriculum, for mastering the content and communicates with the learner throughout the process (Kelsey & D'souza, 2004).

Learner-learner interactions can take various forms including group projects and discussion groups. Interestingly, the contribution of learner-learner interactions to the overall effectiveness of distance education in the literature has been mixed. Some students reported

that other learners were essential to their success in a course, while others suggested that fellow learners actually detracted from their success (Biner, Welsh, Barone, Summers, & Dean, 1997).

Learner-content interaction occurs when a student reads a book, views pre-recorded video, or in some way interacts with inanimate learning resources. In order to master the content, the learner must engage in an internal didactic conversation (Holmberg, 1983).

Hillman, Willis, and Gunawardena (1994) added learner-interface interaction to Moore's (1989) framework. Learner-interface interaction occurs between the learner and the technologies used to deliver instruction. Hillman, Willis, and Gunawardena (1994) argue that a student's skill with the communication medium necessary to participate in a distance education course is positively correlated with success in that course. In order to gain any meaning from the course content, the student must be literate in the communication medium's rules of interaction (Kelsey & D'souza, 2004). Anderson and Garrison (1998) further expanded Moore's model by adding teacher-teacher, teacher-content, and content-content interaction. Anderson's (2003) recent interaction model of e-learning incorporates all six types of interaction in an expansive framework, which will serve as a foundation for a comparative study of interactions in face-to-face, online and blended learning environments.



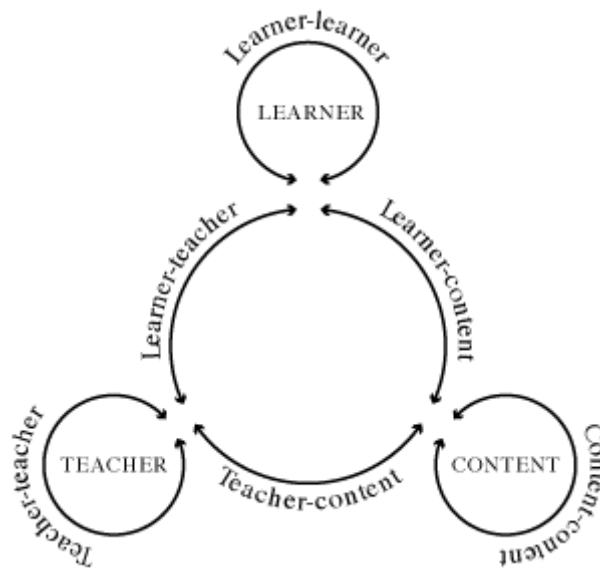


Figure 1. Educational interactions (Anderson, 2004).

#### *Previous Research on Interaction in the Learning Environment*

Comparative studies of face-to-face and online instruction as well as case studies of online or blended courses often conclude that most problems associated with online instruction result from a lack of quality interaction (Burnside, 2001; Haythornthwaite, et al., 2000; Phipps & Merisotis, 1999; Hara & Kling, 1999; DeLacey & Leonard, 2002).

Interaction serves not only as a means to make students feel connected (Rovai, 2004), but also as an integral part of learning (Garrison & Cleveland-Innes, 2004). As Harasim (1989) points out, “knowledge building occurs as students explore issues, examine one another’s arguments, agree, disagree, and question positions. Collaboration [learner-learner interaction] contributes to higher order learning through cognitive restructuring or conflict resolution” (p. 55).

The results of Keefe’s (2003) study on the impact of interactions on student performance supports the view that high quality student interactions are essential to positive student outcomes. “Student interaction is central to teaching and learning, and the online use

of interaction needs to develop further to be as effective as face-to-face interaction” (Keefe, 2003, p. 29). The most important role of instructors is to ensure a high degree of interactivity and participation (Kearsley, 2000) by promoting student interaction (De Verneil & Berge, 2000).

Results of Keefe’s (2003) study indicate that differences in the amount of interactions accounted for the bulk of differences in grades. These results imply that designers should increase the quantity and quality of interactions as a way of improving the quality of their courses. Keefe (2003) essentially describes blended learning when suggests that technology can be used to enhance a traditional class by moving lectures out of the classroom to free up classroom time for additional value-added interactions (Keefe, 2003). The implication for designers is that computers should be used to increase levels of student interaction based on frequent dialogue and prompt feedback.

Chen and Jones (2007) reported that students in a blended section on average contacted their instructor more often outside of class than students in the traditional section of the same course. Students from both sections indicated that the predominant form of contact was email. Chen and Jones (2007) also found that blended students had stronger perceptions of improvement in their analytical skills than those who took the same course in the traditional classroom setting. They attributed this to the fact that blended students used their computers to access additional resource to broaden their understanding of the course concepts and possibly became more engaged in the material and more involved in the learning process.

Woods and Baker (2004) also agree that online education environments offer an opportunity for increased interaction. High levels of interaction, particularly those that promote social engagement, can have positive effect on the learning experience. As previous research on the relationship between perceived interaction and student satisfaction (Fulford & Zhang, 1993; Arbaugh, 2000; LaRose & Whitten, 2000) suggests, interaction alone, however,

is insufficient to create a positive social dynamic in the online classroom. Woods and Baker (2004) argue that the integration of verbal and non-verbal immediacy communication behaviors lets instructors move from mere interaction to authentic intimacy and interpersonal closeness.

Rovai and Jordan (2004) examined the relationship of the sense of community between traditional classroom, blended, and fully online higher education learning environments. They found that the blended course possessed a significantly higher adjusted mean connectedness score than either the traditional or online courses with a large effect size. The blended course also possessed a significantly higher adjusted mean learning score than the online course, but with a medium effect size. Rovai and Jordan (2004) argue that interactions should result in increased socialization, a stronger sense of being connected and increased construction of knowledge through discourse, thus providing stronger feelings that educational goals were being satisfied by community membership. “Through focused interaction within the community comes the critical evaluation and synthesis of ideas. Thus, online communities of inquiry are crucial to successful higher-order learning outcomes” (Garrison & Cleveland-Innes, 2004). In order to achieve higher-order learning, learners need to learn how to adjust their roles to the new environment. “Role adjustment is a continual shifting of expectations and requirements among individuals interacting within a community” (Garrison & Cleveland-Innes, 2004, p. 32). Role adjustment appears to be most directly associated with issues of interaction. Also, successful role adjustment is the key to student satisfaction and success (Garrison & Cleveland-Innes, 2004).

### *Interaction and Student Satisfaction*

As previous research suggests, student satisfaction depends on students’ learning experience, their sense of community, and their perception of interactions. Student

satisfaction can only be sustained and it only has lasting value if it is combined with a successful learning experience (Sener & Humbert, 2003; Swan, 2001; Garrison & Cleveland-Innes, 2004). Both satisfaction and learning are also significantly correlated with interaction, feedback and clear expectations (Shea, Swan, Frederickson, & Pickett, 2002).

Student satisfaction may also well be associated with a feeling of community (Rivera & Rice, 2002). While lack of support reduces students' level of satisfaction (Rivera & Rice, 2002), the sense of community increases that. Garrison and Cleveland-Innes (2004) suggest that satisfaction positively correlates with interaction (especially with the teacher). Rovai and Jordan (2004) confirm that a combination of face-to-face and online learning environments produces a stronger sense of community, because it provides a greater range of opportunities for students to interact with each other and with their professor.

Attitude (or affective) surveys can provide valuable information on students' perceptions (emotions, feelings, attitudes, etc.) of their course experience (Lewis & Seymour, 1997). They can reveal perceptions on course content as well as on specific components of the course. They can also focus on students' needs in taking the course, their interest in or appreciation for the subject matter, their confidence in their ability to perform well in the course, and their beliefs about the nature of the discipline itself. Instead of measuring absolute attitudes toward a subject, these instruments are designed to detect and measure changes in attitude during a course. A comparison of attitudes at the beginning and at the end of the semester allows instructors to discover the impact of their course on student perceptions.

There usually exists a positive correlation between attitudes and achievement, thus attitudes can be considered indicators (or predictors) of the effectiveness of the learning process. Miller (2003) investigated the effect on undergraduate students' attitude toward the instructional delivery when web-based course management tools were added to the traditional

face-to-face delivery mode. He hypothesized that students receiving instruction in different modes would have significantly different attitudes toward the educational experience. He found that the form of instructional delivery had no significant effect on students' overall satisfaction with the learning experience and concluded that more research should be conducted to understand how to get the most out of student-centered instruction. The weakness of the study is that it assumes that students have the same learning needs which can be satisfied with one learning solution.

Havice (1999) also conducted a study to test for differences in attitude toward course presentation between students instructed in a traditional manner and those instructed through the use of integrated media. To measure this difference, he used the Attitude Rating Scale (ARS) developed by Kelly, Pascarella, Terenzini, and Chapman (1976). The instrument includes 5 dimensions, such as interest value, practical value, emotional appeal, dullness (apathy), and difficulty. The findings of the study suggest that the type of class presentation had little or no effect on the students' total ARS attitude scores. However, the students instructed in traditional lecture-based classes found the class presentations less dull. This result was supported by Vamosi, Pierce, and Slotkin (2004), in their study of student perceptions of an undergraduate accounting course, where the students indicated that online learning was less interesting and less efficient than traditional delivery. Comparing the relative effectiveness and overall perceptions of blended learning and traditional classroom delivery, Chen and Jones (2007) also reported conflicting results. Despite the comparable results regarding the effectiveness of the overall learning experience, traditional classroom students appeared significantly more satisfied with the clarity of instruction and seemed to have a more favorable overall perception of the instructor than the blended students. Chen and Jones (2007) also found that blended students found the course more difficult and reported a significantly higher degree of agreement that their analytical skills were improved.

## Interaction in Learning and Communication Theories

Recent views and theories on the learning process as well as certain communication theories support the integration of learning and communication technologies into traditional education, thus providing a theoretical background for blended learning.

### *Learning Theories*

#### Teacher-Centered vs. Student-Centered Model

The traditional pedagogical model is concerned with teacher-centered instruction, where the teacher controls the information that is transmitted to the students, usually in the form of lectures, presentations, or demonstrations. New views on learning, however, stress action, creativity, and social interaction in the learning process. The transformation of facts and information into knowledge is now considered a multi-step process, and educators argue that courses should be designed to promote this transformation process by balancing receiving knowledge and creatively using knowledge (Zull, 2002).

The online setting offers more opportunities for collaboration than the traditional large-enrollment lecture-based classes. Online course instructors seem to be more intentional about fostering active learning experiences, such as asking questions or participating in discussions. A well-designed course should take the student through the entire learning cycle and engage several parts of the brain (Zull, 2002). Online learning is more consistent with Knowles' (1975) andragogical model of learning that emphasizes the importance of student-centered, self-directed, problem-solving-based learning (Neville & Heavin, 2004). In online education, learners can interact directly with content (that they find in multiple formats) or can have their learning sequenced, directed and evaluated with the assistance of a teacher (Woods & Baker, 2004).

## Engagement Theory

Engagement theory (Kearsley & Shneiderman, 1999) presents a model for learning in technology-based environments. The major premise is that students must be engaged in their course work in order for effective learning to occur. The theory posits three primary means to accomplish engagement: (1) an emphasis on collaborative efforts (2) project-based assignments, and (3) non-academic focus. It is suggested that these three methods result in learning that is creative, meaningful, and authentic. The role of technology is to facilitate all aspects of engagement.

## Situated Learning

The theory of situated learning indicates that learning is a function of the activity, context, and culture in which it occurs. This contrasts with most classroom learning activities that involve abstract and out-of-context knowledge. Social interaction is a critical component of situated learning, because learners become involved in a “community of practice” which embodies certain beliefs and behaviors to be acquired (Lave & Wenger, 1991).

The theory of conditions of learning stipulates that there are several different types or levels of learning and each different type requires different types of instruction. Gagne (1985) identifies five major categories of learning: verbal information, intellectual skills, cognitive strategies, motor skills and attitudes. Different internal and external conditions are necessary for each type of learning. For example, for cognitive strategies to be learned, there must be a chance to practice developing new solutions to problems; to learn attitudes, the learner must be exposed to a credible role model or persuasive arguments.

## Constructivism

Constructivism is a philosophy of learning founded on the premise that, by reflecting on previous experiences, an individual constructs his or her own meaning and understanding

of the world. Each individual generates his or her own rules and mental models that they use to make sense of their experiences. Learning, therefore, is not simply memorizing answers or reproducing someone else's meaning, but the process of adjusting our mental models to accommodate our new experiences.

Instructional methods based on the constructivist pedagogy include (1) making links with what students already know to encourage a sense of structure; (2) being receptive and flexible in terms of allowing students' input into course goals and methods; (3) discussing/teaching learning skills explicitly; and (4) trying to link course topics to students' lives and career aspirations (Campbell, 1998). All of these instructional methods involve high levels of interaction (See Jonassen, 1991; Woods & Baker, 2004; Sims, 1999).

#### Deep vs. Surface Learning

While deep (or higher-order) learning requires higher-order cognitive thinking skills, such as analysis and synthesis, surface learning consists mainly of comprehension and reproducing knowledge. Atherton (2003) points out that deep or surface learning are not attributes of individuals. Although learners may have a preference for one or the other, they can use both approaches at different times. Deep or surface learning also correlate fairly closely with motivation ("deep" with intrinsic and "surface" with extrinsic motivation), but they are not necessarily the same thing. Either approach can be adopted by a person with either motivation.

Research indicates that there are six major factors that specifically promote deep learning. These include good teaching, openness to students, freedom in learning (where students have a choice in what they study), clear goals and standards, vocational relevance (when courses are considered relevant to future careers) and good social climate. Factors that detract from deep learning are heavy workloads and the exclusive use of formal teaching methods such as lecturing. Reducing lecture time and extending individual study time and



time designated for projects can also promote deep learning. Encouraging teacher-student and student-student interaction (e.g., group projects and peer tutoring) as well as using active and interactive teaching methods especially help promote deep learning (Campbell, 1998).

Instructional methods that help promote deep learning include encouraging faculty-student and student-student interactions, using active and interactive teaching methods, etc. Since testing can sometimes run counter to this kind of learning, professors should consider the following assessment methods: define assessment goals and tasks clearly, allow choice of assessment tasks, stress tasks that allow time for information gathering, depth, and reflection (projects vs. exams), encourage collaborative projects, choose tasks that require integration of information from a range of sources, and give full and proactive feedback on labs, assignments, and tests (Campbell, 1998).

### Transactional Theory

Moore's (1993) transactional distance theory is one of the fundamental theories in distance learning. The main premise of Moore's (1993) theory is that distance is a pedagogical phenomenon, rather than a function of geographic separation, and it exists in face-to-face as well as in distance education classes. Transactional distance is the psychological and communication space between learners and teachers and it is a function of dialogue, structure, and learner autonomy. As dialog increases, the structure decreases, which minimizes the transactional distance between the teacher and the learner. The aim for each course is to find the optimum balance of structure and dialog (Saba & Shearer, 1994).

### Learning Styles

The cognitive school of learning emphasizes the importance of recognizing individual differences and including a variety of learning strategies to accommodate those differences

(Ally, 2004). Learning style, one of the measures of individual differences, refers to how a learner perceives, interacts with and responds to the learning environment. “Cognitive style refers to a learner’s preferred way of processing information; that is, the person’s typical mode of thinking, remembering, or problem solving. [...] Cognitive style is considered to be a personality dimension that influences attitudes, values, and social interaction” (Ally, 2004). Witkin et al. (1977) differentiate between field-dependent and field-independent personalities. Field-independent individuals tend to approach the environment in an analytical manner and they are more likely to learn more effectively under conditions of intrinsic motivation. Field-dependent personalities experience events in a more global way and they have a greater social orientation compared with field-independent people.

### *Communication Behavior Theories*

Promoting interaction will lead to positive communication behaviors such as instructor immediacy, social presence, and community in the online classroom (Woods & Baker, 2004).

#### Immediacy

Immediacy is defined as “a measure of the degree to which a source is emotionally involved with the topic of conversation” (Heath & Bryant, 1992, p. 62). Immediacy refers to communication behaviors that reduce perceived distance between people (Thweatt & McCroskey, 1996). Immediacy behaviors primarily include nonverbal communication behaviors, which signal approval, indicate liking (e.g., head nods, smiles, vocal reinforcers), and create high sensory involvement between provider and client (Infante, Rancer, & Womack, 1997). Immediacy can also have verbal forms. While non-verbal immediacy is understood as a sense of closeness produced by physical communication behaviors, verbal

immediacy is considered a sense of closeness produced by word selection. Gorham (1988) describes verbal immediacy behaviors as linguistic differences in expression from which feelings of like and dislike are inferred.

### Social Presence Theory

Social presence theory is basically the groundwork for many theories on new medium effects. It is based on the idea that a medium's social effects are primarily caused by the degree of social presence it affords to its users. Social presence indicates a communicator's sense of awareness of the presence of an interaction partner. Increased presence leads to a better person perception, because the communicator learns about other persons, their characteristics, qualities and inner states (Short, Williams, & Christie, 1976). Garrison and Anderson (2003) argue that, in addition to social presence, learning communities have two other core elements: cognitive and teaching presence. Social and cognitive presence must be integrated through teaching presence to produce a high quality learning experience. "This integration of the external and internal, the collaborative and reflective is the key to higher-order learning and reflects the key properties of online learning" (Garrison, 2003). As previous studies indicate, there is a "positive significant relationship between sense of community and cognitive learning" (Rovai, 2002). The purpose of learning communities is to create links among members and to meet the requirements surrounding the reason for the community to exist (Kinsel, Cleveland-Innes, & Garrison, 2004). Successful adjustment to the role of online learner empowers students to engage in critical discourse and achieve higher learning outcomes (Garrison & Cleveland-Innes, 2004). Garrison, Kanuka, and Hawes (2002) claim that "a primary obligation of a research university should be to engage students in active, intentional, a collaborative knowledge-building communities—or communities of inquiry."

## Conclusions

Learning and communication theories suggest that the key to finding the perfect blend for each situation is in a better understanding of the role of interactions in the learning process. Previous studies indicate that the quality and quantity of interactions affect academic results, the level of higher-order learning, and students' perception of their learning experience. Blending online instructional strategies with traditional classroom discussions and lectures seems especially suitable to promote inquiry-based learning. The online learning environment extends opportunities for exploration (interactions with content) and critical discourse (interactions with peers and instructor). In a blended class, reflective asynchronous text-based discussions can complement spontaneous verbal classroom discourse and lectures providing "a unique quality enhanced educational experience" (Garrison, Kanuka, & Hawes, 2002).

In order to identify the variables that really make a difference in terms of effectiveness of the various forms of instruction and to find out what type of blend is optimal for the various disciplines, large-scale comparative studies of courses offered in all three formats covering various subjects are necessary. The current study was designed to investigate if there is a relationship between the form of instruction and its effectiveness. The primary goal was to examine how interactions and the perception of these interactions vary across face-to-face, blended, and entirely online classes, and how the quality and quantity of these interactions might impact students' academic performance, learning behavior, sense of community, and their satisfaction with the overall learning experience. The relationship between the form of instruction and students' attitude toward subject, a possible indicator of course effectiveness, was also investigated.

## CHAPTER 3

### METHODOLOGY

#### Introduction

The purpose of the current study was to determine whether or not a blended class will produce different (and possibly better) results in terms of student perceptions of the overall learning experience and student satisfaction than traditional face-to-face instruction or entirely online learning. The two main goals of this study were (1) to compare the effectiveness of face-to-face, online, and blended instruction, and (2) to examine the role of interactions in the effectiveness of each educational method. The general hypothesis was that, since blended instruction can combine the strengths of face-to-face and online learning, it has the potential to maximize the effectiveness of both and to produce better results than either alone. In addition, a better understanding of the role of interactions can help identify the areas of instruction that should be rethought and redesigned when converting online or face-to-face courses into blended formats.

#### Research Questions

The research questions focused on two problem areas. The first looked at the differences among the three teaching methods in terms of learning outcomes and attitude changes toward subject matter. The second research problem area focused on comparing the different teaching methods in terms of the quantity of actual and perceived student-student, student-instructor, and student-content interactions.

Research Problem 1:

Research Question (1): In terms of effectiveness, can a blended class produce different (and possibly better) results than a traditional lecture-based face-to-face or an entirely online class?

Research Question (2): Does the method of instruction affect students' attitude toward the subject matter?

#### Research Problem 2:

Research Question (3): Is there a relationship between students' actual online interactions and academic performance?

Research Question (4): Is there a significant difference between blended and online students in terms of their online interactions (number of emails, discussion postings, Learning Management System sessions, hours spent in the Learning Management System)?

Research Question (5): Is there a significant difference between online and blended students in terms of their academic performance?

Research Question (6): Is there a relationship between students' perceived interactions and their level of satisfaction with their overall learning experience?

Research Question (7): Is there a relationship between class format and perceived interactions?

#### Research Hypotheses

The general hypothesis of the study was that a typical, large-enrollment, undergraduate blended class, where the amount and quality of interactions is optimal, will produce more positive student perceptions of the overall learning experience, higher levels of student satisfaction with the learning experience, and more positive attitudes toward the subject matter than the other two methods of instruction.

### *Null Hypotheses*

Null Hypothesis (1): In terms of effectiveness, there is no difference between a blended class, a traditional lecture-based face-to-face class, and an entirely online class.

Null Hypothesis (2): In terms of attitude toward subject matter, there is no difference between a blended class, a traditional lecture-based face-to-face class, and an entirely online class.

Null Hypothesis (3): There is no relationship between students' actual online interactions and their academic performance.

Null Hypothesis (4): There is no difference between online and blended classes in terms of online interactions.

Null Hypothesis (5): There is no difference between online and blended students in terms of their academic performance.

Null Hypothesis (6): There is no relationship between perceived interactions and the level of satisfaction with the learning experience.

Null Hypothesis (7): There is no relationship between class format and perceived interactions.

### Population and Sample

The general population of the study was the undergraduate students enrolled at the University of North Texas. The target population was the students enrolled in the face-to-face, online, and blended sections of five large-enrollment undergraduate courses: Introduction to Communication, U.S. History Until 1865, Principles of Language Study, Music Appreciation, and Principles of Nutrition.

Participation in this study was voluntary. Students in the traditional classroom settings completed paper surveys, while those taking online or blended classes used online questionnaires. Students were asked to participate in the study by their instructors, two of whom rewarded participation with extra credit. A total of 633 students filled out the end-of

semester course evaluation survey. A total of 482 students responded to the pre-test, and 569 students participated in the post-test of the Attitude Toward Subject survey.

### *Class Descriptions*

The University of North Texas started the first phase of its Blended Learning Project, Phase I (BL I) in fall 2005. Five faculty members volunteered to develop blended courses for high enrollment undergraduate courses in communication, history, music, nutrition, and linguistics.

#### COMM1010 Introduction to Communication

The communication blended course was an introductory course for undergraduate students. The original face-to-face section was offered in a large lecture/recitation format with approximately 200 students enrolled in a section attending one 50-minute lecture with the course director and two 50-minute recitations with his/her teaching assistant.

The course content and structure of the online and blended sections were designed to mirror the face-to-face section. The course material was presented online for both the online and blended sections. Each learning module included interactive features, such as quizzes and self-tests, and students were required to participate in online discussions using the asynchronous discussion forums. Students completing the online version of the course were required to record two presentations in front of a small group of at least three people and submit those electronically. Students enrolled in the blended section were required to perform their speeches in front of the class during the face-to-face meetings.

The blended class had five required in-class meetings during the semester. The first meeting was focused on introductions and discussing the syllabus, the second, third and



fourth meetings were designated to student presentations (one for introductory speeches and two for persuasive speeches), and the final meeting was an in-class final exam.

Because of the large number of enrollment, each class format was further divided into three sections. The faculty member worked closely with three experienced teaching assistants in developing and teaching the course. Each teaching assistant was responsible for a face-to-face, an online, and a blended (approximately 70% online) version of the course. The online and blended courses included 30 students. Enrollment for face-to-face recitation was set at 27 students per recitation.

The course requirements included two exams (40% of the final grade), two presentations (25%), an analytical paper (15%) and class participation (20%). Class participation included several activities such as an experimental learning activity, four quizzes, as well as discussion forum and online activities. Participation in the activities was graded holistically twice during the semester after the exams.

#### HIST2610 U.S. History Until 1865

The history course (HIST2610 U.S. History Until 1865) had 125 students in each section. The online and blended sections had identical online content and course structure. Blended and online sections were designed to be built on case studies and required no textbook. All the necessary material was available within the learning management system (LMS) in the form of course materials, linked documents, Web pages, and electronic library pages. While the students in the online sections worked in small groups on the case studies using online communication tools, the blended section met every other week in groups of 25 students to discuss the case studies. In the online and blended sections, students were required to reflect on each unit at its conclusion and cumulatively at the end of the semester on a discussion board linking the content material with the counterfactual simulated case studies.

The face-to-face section had the format of a traditional lecture and met weekly. Students were graded based on four exams that included multiple-choice, identification, and essay questions.

In the online and blended sections, the final grade was primarily based on the four papers associated with the large counter-factual simulation case studies (60%). Students were also required to take weekly multiple-choice quizzes on basic facts and chronology (10%). Students were required to retake each quiz until they scored at least 70% prior to moving on to the next week's material. The midterm and final exams (15% of the final grade each) were created directly from the weekly mastery quizzes and consisted entirely of multiple-choice questions.

The case studies were graded based on specific grading rubrics that guided the students on how their grades were determined. Each case study consisted of a writing part as well as a discussion component and they were graded overall on three levels of solution: description, analysis, and synthesis level.

#### LING3060 Principles of Language Study

The blended and online sections of the linguistics course also had identical online versions. The seven core topics of the course were presented entirely online; there was no additional required textbook. The blended section met eight times during the semester. In addition to the required class meetings, there were five optional class meetings scheduled with the teaching assistant. There was a major assignment for each topic (25% of the final grade altogether). A few topics included quizzes (25%), and four of them ended with tests (25%). Students were also graded on their discussion postings with an overall grade (15%) for the quality of their postings at the end of the semester. In addition, the course assessments included a short written project and a comprehensive final exam (10%). Students enrolled in

the blended course had to take all the assessments online, and they were required to attend in-class meetings with prepared assignments for discussion.

#### MUMH2040 Music Appreciation

The music appreciation course was only offered in a blended format during the fall 2005 and spring 2006 semesters, but student tracking data for an entirely online version from spring 2005 was made available for the researcher. Traditional face-to-face music appreciation courses usually have 230 students per class. In an in-class format, only lectures are possible because of large enrollment and large auditorium. The lecture format generally does not allow interactions between students and instructor.

For the blended class, the first class meeting was scheduled for the entire class to orient the students with the format of the course and the basic course objectives. After this introductory meeting, students were assigned to small discussion groups of 25 students each and had five group meetings during the semester. The small discussion groups addressed concepts that had been introduced online, practiced identifying listening selections, and discussed personal responses to music. These small group meetings incorporated listening exercises to popular music and classical music as well as provided students with opportunities to ask questions that they might have been hesitant to ask in a large lecture setting. The focus on experiential learning (i.e., “experiencing” music in the classroom), both through guided listening and through guest performers, allowed the students become more comfortable with further listening outside of the classroom. Small discussion groups were designed to develop critical thinking and problem-solving skills by working through task assignments together.

The entire class met as a large group to review for exams and to cover a few topics that seemed appropriate for the large lecture setting. Large lecture meetings also involved live

music performances and guest speakers. Exams were administered in class, because of the large amount of listening identification that was involved with each exam.

A textbook and a compact disc (CD) set were required in addition to the online content. Online lessons were designed to supplement the required textbook. By the end of a lesson, students were required to have read the assigned pages from the textbook and listened to the corresponding music from the CD set.

### SMHM1450 Principles of Nutrition

The various sections of the nutrition class had similar designs and course requirements. Online and blended students were required to take exams online in a computer lab, whereas students in the face-to-face sections took paper-pencil exams. One major difference between the blended and face-to-face students was that students in the blended sections completed their investigative reports as a team in class during the scheduled class meetings, while students enrolled in the face-to-face lecture class were required to complete their investigative reports independently. The blended sections had three class meetings to complete projects and three additional meetings to take exams. Although the exams were online, students were required to take them in a computer lab during set times. Due to the manner in which the blended class was listed in the course schedule, some of the students were confused about the class format, and many believed that they would be attending weekly face-to-face lectures. This misalignment of expectations seemed to be an issue throughout the semester and may have affected research results. Students who accidentally signed up for blended sections were allowed to attend face-to-face lectures, but still needed to take exams online and work on their projects during the regular small-group meetings of the blended sections.

## Data Collection and Instrumentation

In fall 2005, the University of North Texas offered five blended undergraduate courses (COMM1010 Introduction to Communication, HIST2610 U.S. History Until 1865, LING3060 Principles of Language Study, MUMH2040 Music Appreciation, and SMHM1450 Principles of Nutrition) parallel with their face-to-face and online sections. An effort was made to ensure that the same instructors would teach all three sections of each course and all course requirements would be identical for the various sections of each course.

During the fall 2005, spring 2006, and summer 2006 semesters two sets of surveys were administered among the students enrolled in these courses, and two sets of interviews were conducted with the faculty members involved in the project. Qualitative data was collected by observing the online classes and the monthly blended faculty meetings. Student online activity data was collected by using the student tracking tool of the learning management system (LMS).

Students in the traditional classroom were asked to fill out paper surveys, while online and blended students were asked to complete the online versions of the surveys. Changes in students' attitude toward the subject matter were measured with the Attitude Toward Subject instrument (Appendix A). This two-part survey included a pre-test during the second week of the semester and a post-test during the week before the final exams.

The end-of-semester course evaluation survey (Appendix B) was administered during the last week of the semester, before finals week. This survey collected demographic data and information on students' overall satisfaction with the learning experience. Two open-ended questions were designed to elicit information on the positive and negative aspects of the course. The online version included the Perception of Interactions instrument to investigate how blended and online students perceived the quality and quantity of their interactions as compared to a traditional face-to-face class.

### *Attitude Toward Subject Instrument*

Changes in students' attitude toward subject were measured by comparing results of pre- and post-course surveys using the Attitude Toward Subject instrument, a modified version of the Survey of Attitudes Toward Statistics (Schau et al., 1995). Since the original instrument was created to measure attitude toward statistics specifically, the statements in the Attitude Toward Subject instrument were converted into more general, not subject-specific statements.

The instrument (Appendix A) includes four subscales: affect, cognitive competence, value, and difficulty. The Affect subscale measures positive and negative feelings concerning the subject matter of the course. The Cognitive Competence subscale collects information on attitudes about intellectual knowledge and skills when applied to a specific subject. Value refers to attitudes about the usefulness, relevance, and worth of the subject matter in personal and professional life. Difficulty measures attitudes about the perceived difficulty of the subject. All the Cronbach alpha values on the original instrument were around .80 with the exception of .64 for males in the difficulty subscale (Appendix F).

### *End-of-Semester Course Evaluation Survey: Perception of Interactions Instrument*

Student online interaction data was collected using the LMS student tracking tool, while students' perceived interactions were measured by a slightly modified version of Picciano's (2002) Perception of Interactions instrument. This instrument was part of the end-of-semester course evaluation survey (Appendix B), which was also designed to generate feedback from the students about their satisfaction with the learning experience.

### *Interviews with Faculty*

Semi-structured interviews (Appendix D) were conducted with the blended faculty and their teaching assistant mid-semester and at the end of the semesters. The interviews focused on issues such as student and instructor workload, technical challenges, satisfaction with support and instructional technology, perceptions of student learning as well as perceptions of student-student and student-instructor interactions in their blended, online, and face-to-face sections.

### Data Analysis

The study employed quantitative as well as qualitative data analysis techniques. Students' attitude toward subject was measured on four subscales. A 7-point response scale was used to calculate an overall attitude score for each respondent. Since higher scores are supposed to indicate more positive attitudes, responses to Questions 6-12, 14, 16, and 19-21 (see Appendix A) needed to be reversed before the total score could be calculated. Then the analysis of variance (ANOVA) was used to test for differences ( $p < .05$ ) in attitude toward subject between face-to-face, online, and blended students.

Students' perceived interactions were measured by the Perception of Interactions (Picciano, 2002) instrument as part of the end-of-semester course evaluation survey (Appendix B). Blended and online students were presented 9 statements on the quality and quantity of their interactions with their peers and instructor and they were asked to evaluate these statements in comparison to traditional classroom instruction on the following 5-point scale: 1 = *increased*; 2 = *somewhat increased*; 3 = *no change*; 4 = *somewhat decreased*; 5 = *decreased*. In this instrument, lower scores corresponded to more increased interactions. After the perception of interaction scores were calculated, the mean differences between online and blended students were tested using the Independent Samples *t*-test. The

relationship between perceived interactions and students' overall course ratings was tested with the Chi Square Test of Independence tool.

The qualitative data collected during faculty interviews and through open-ended questions of the end-of-semester course evaluation survey were analyzed inductively (Patton, 2002). After identifying major categories, student responses were coded and counted to identify components of the courses that contributed to their success as well as features that needed to be changed or improved.

### Summary and Limitations of the Study

Data collection included student surveys with Likert-type scales and open-ended questions, final score information, student online activity data recorded by the student tracking tool of the learning management system, faculty phone interviews, and observations of monthly faculty meetings. In order to gain a more complete picture of the blended learning experience, a methodological triangulation was used. The attitude and course evaluation surveys provided both qualitative and quantitative data about students' perceptions of the learning experience. Faculty members participating in the blended project were interviewed twice during each semester about their perceptions of student learning and the challenges they had to face while teaching the blended courses. The quantitative data collected in the student surveys was compared to final course scores and, in the case of online and blended classes, to students' actual activity within the online environment. The qualitative data on student perceptions of the classes was compared to faculty perceptions of student performance and activity.

Some study limitations were identified as early as the planning phase of the project. Originally, the five blended courses (COMM1010 Introduction to Communication, HIST2610 U.S. History Until 1865, LING3060 Principles of Language Study, MUMH2040



Music Appreciation, and SMHM1450 Principles of Nutrition) were going to be offered at the University of North Texas parallel with their face-to-face and online section. The same instructors were expected to teach all three sections of each course, and, for each course, all course requirements and text were expected to be the same. However, because of certain administrative and workload issues, not all sections of the courses were offered every semester at UNT and not all sections of the courses were taught by the same instructors.

Comparable sections and comparable data for the missing sections of each course were used. In addition, while the structure, content, and course requirements of the online and blended were close to identical for each course, face-to-face sections were significantly different especially in terms of how the course content was presented.

Another limitation of the study was related to the sample. In addition to using cluster sampling of existing class sections, only volunteering students participated in the study, so the sample of the study was not random. It is also possible that only those who felt strongly about their learning experience participated in the surveys. Two instructors agreed to reward students with extra credit for their participation in the study.

The University of North Texas also introduced a new version of the learning management system (WebCT Vista) at the beginning of the first phase of the Blended Project, which reportedly increased both the faculty and student workload in terms of learning to navigate the new system. Technical problems were quite frequent especially during the first semester of the study and they affected student perceptions of the overall learning experience.

## CHAPTER 4

### DATA ANALYSIS AND RESULTS

#### Introduction

This chapter presents the data analysis procedures and results for the seven research questions of the study. The purpose of the study was to compare the effectiveness of blended, online, and traditional face-to-face instruction and examine if interactions impact the effectiveness of these teaching methods. The effectiveness of the class format was measured by students' perceived learning experience, as well as changes in their attitude toward the subject. Changes in students' attitude toward subject were measured by comparing results of pre- and post-course surveys using the Attitude Toward Subject instrument (Appendix A), a modified version of the Survey of Attitudes Toward Statistics (Schau et al., 1995). Student online interaction data was collected using the student tracking tool of the learning management system, while students' perceived interactions were measured by a modified version of the Perception of Interactions instrument (Picciano, 2002), which was part of the end-of-semester course evaluation survey (Appendix B).

#### Organization of Data Analysis

Data collection of the study involved both quantitative and qualitative data. The first part of this section presents the descriptive characteristics of the sample and a description of the classes involved in the first phase of the Blended Project. The second part discusses the quantitative data analysis and the results of these procedures in terms of the research questions and hypothesis of the study as presented in Chapter 3. The last part of this section

presents the qualitative data analysis and results including summaries of student and faculty experiences of the blended learning experience.

### *Descriptive Characteristics of Respondents*

Demographic data was collected as part of the end-of-semester course evaluation survey (Appendix B). The purpose of the demographic data collection was to determine if there were any significant differences between the various class sections in terms of demographics, and to identify any possible extraneous variables that might threaten the validity of the study. Altogether 784 students (154 face-to-face, 337 online, and 293 blended) participated in the end-of-semester survey. The majority (57.9%) of online students was between 21 and 30 years old, while most students in the blended (64.5%) and face-to-face (75.9%) sections were under 20 years old. About two thirds (70.5% online and 66.6% blended) of the students were female in each section and around 70% (69.3% online and 74.13% blended) rated their computer expertise as “intermediate.” The ratings on the “ease of use” of the learning management system were almost identical in both sections with about 50% of the students finding it “easy” and about 30% finding it “fairly easy.” In terms of geographic distribution, the majority of students (62.9% online and 73.12% blended) lived within 10 miles from the UNT Denton campus.

In all sections, an overwhelming majority of the students (76.6% online, 86% blended, 79% face-to-face) decided to take the course primarily to fulfill a general education requirement, and about 40% of them needed the course as a requirement for their specific major. The course being offered in that particular format and in that particular semester seemed to be an issue only for online students: 60.7% of them decided to take the course because it was offered entirely online, and 26.9% of them took the course because it was offered during that semester. Only 0.3% of the blended students decided to take the course because of the format and only 2.8% took the course because it was offered in that semester.

The interest in the subject matter was moderately important for students in all sections (14.5% online and 22.1% blended). The instructor's reputation was a negligible factor in all sections (2.7% online, 3.73% blended, and 3.57% face-to-face).

On average, the majority of the students (59.5% online and 67.97% blended) spent between 1-5 hours online in the course on a weekly basis. The higher percentage of blended students suggests that the face-to-face meetings cut down on the time spent online. However, the number of weekly logins to the course and the number of weekly postings were almost identical. The largest percentage of both sections (21% online and 28.16% blended) reported that they logged in to the course approximately three times a week and on average over 70% of students in each section posted only once a week.

Overall, the student sample in the blended and face-to-face sections seemed rather homogeneous in terms of age, location, and computer expertise. The students in the online sections, however, were older and lived further away from the UNT Denton campus. These factors were considered as extraneous variables and were expected not to affect student satisfaction with the overall learning experience and the attitude change toward the subject matter by the end of the semester.

### Research Questions and Associated Hypotheses

The research questions focused on two problem areas. The first looked at the differences between the three teaching methods in terms of student perceptions of the overall learning experience and student attitude changes toward subject matter. The second research problem area focused on comparing the different teaching methods in terms of the quality and quantity of actual and perceived student-student, student-instructor, and student-content interactions.

The general hypothesis of the study was that a typical, large-enrollment, undergraduate blended class, where the amount and quality of interactions is optimal, will produce a more positive perception of the overall learning experience, higher levels of student satisfaction with the learning experience, and more positive attitudes toward the subject matter than the other two methods of instruction.

#### Research Problem 1:

Research Question (1): In terms of effectiveness, can a blended class produce different (and possibly better) results than a traditional lecture-based face-to-face or an entirely online class?

Null Hypothesis (1): In terms of effectiveness, there is no difference between a blended class, a traditional lecture-based face-to-face class, and an entirely online class.

Effectiveness was measured by student perceptions of the overall learning experience. As part of the end-of-semester course evaluation survey (Appendix B), students were asked to rate their learning experience on a scale from 1 (*poor*) to 5 (*excellent*) and to indicate if they considered their educational experience successful or unsuccessful and why. Around 70% of both online and blended students rated their learning experience *successful* (Table 1). The distribution of the ratings was also almost identical in the online (72.4%) and blended (70.27%) sections. Face-to-face sections were considered *successful* by more than 90% of the students.

Table 1

*Perceived Course Success Rates*

	<b>Online</b>	Number of Respondents	<b>Blended</b>	Number of Respondents	<b>Face-to-Face</b>	Number of Respondents
Successful	72.4%	226	70.27%	194	94.41%	186
Not successful	27.6%	86	29.73%	82	5.58%	11

The distribution of the ratings of the learning experience (Table 2) on a scale of 1-5 was also almost identical in the online and blended sections. The face-to-face sections, however, scored much higher.

Table 2

*Student Ratings of the Learning Experience*

	<b>Online</b>	Number of Respondents	<b>Blended</b>	Number of Respondents	<b>Face-to-Face</b>	Number of Respondents
Poor	14.1%	44	17.75%	49	1.52%	3
Satisfactory	22.5%	70	20.68%	57	10.65%	21
Good	29.9%	93	32.97%	91	16.24%	32
Very Good	24.8%	77	20.28%	56	34.01%	67
Excellent	8.7%	27	8.30%	23	37.56%	74

The analysis of variance (ANOVA) was used to test for differences ( $p < .05$ ) in overall ratings of the various class formats. The Bonferroni test of multiple comparisons revealed that there was a significant difference ( $p < .05$ ) between the face-to-face and the other two (online and blended) sections. While the mean scores for the overall course ratings

were similar in the online (mean=2.91) and blended (mean=2.81) sections, the mean for the face-to-face sections was significantly higher (mean=3.59) indicating an overall higher satisfaction with the learning experience in a traditional lecture-based learning environment (Table 3).

Table 3

*Multiple Comparisons of Course Ratings*

Course Evaluation	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	276	2.81	1.192	.072	2.67	2.95	1	5
2	311	2.91	1.176	.067	2.78	3.04	1	5
3	154	3.59	1.070	.086	3.42	3.76	1	5
Total	741	3.01	1.197	.044	2.93	3.10	1	5

(Course Codes: 1-Blended, 2-Online, 3-Face-to-Face)

ANOVA

Course Evaluation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	66.131	2	33.066	24.532	.000
Within Groups	994.706	738	1.348		
Total	1060.837	740			

Multiple Comparisons

Dependent Variable: Course Evaluation		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) Class Format	(J) Class Format				Lower Bound	Upper Bound
1	2	-.105	.096	.820	-.34	.13
	3	-.783*	.117	.000	-1.06	-.50
2	1	.105	.096	.820	-.13	.34
	3	-.678*	.114	.000	-.95	-.40
3	1	.783*	.117	.000	.50	1.06
	2	.678*	.114	.000	.40	.95

(Course Codes: 1-Blended, 2-Online, 3-Face-to-Face)

Qualitative data was also collected regarding student perceptions of the learning experience and faculty perceptions of the effectiveness of each class format. The learning experience of the blended faculty and students are discussed in the second part of the chapter as part of the qualitative results.

Research Question (2): Does the method of instruction affect students' attitude toward the subject matter?

Null Hypothesis (2): In terms of attitude toward subject matter, there is no difference between a blended class, a traditional lecture-based face-to-face class, and an entirely online class.

Attitude toward the subject matter was measured by the Attitude Toward Subject survey (Appendix A), a modified version of the Survey of Attitudes Toward Statistics (Schau et al., 1995). The goal was to compare average attitude scores of students enrolled in blended, online, and face-to-face sections of undergraduate courses. Students in all sections were given a pretest at the beginning of the semester and a posttest at the end of the semester. Altogether, 578 students responded to the pre-tests (Table 5) and 655 students participated in the post-test (Table 6). The analysis of variance (ANOVA) was used to test for differences ( $p < .05$ ) in attitude changes toward subject. Based on the variability of the data (Table 4), the null hypothesis (that the three independent populations' means are equal) was rejected.



Table 4

*Differences in Attitude Changes Toward Subject*

AttitudeScore ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	34526.210	2	17263.105	38.188	.000
Within Groups	294738.8	652	452.053		
Total	329265.0	654			

Attitude Score <b>Pre-Course</b>	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	87	105.03	16.380	1.756	101.54	108.53	57	136
2	243	101.81	18.650	1.196	99.45	104.16	39	147
3	248	99.35	20.779	1.319	96.75	101.95	36	139
Total	578	101.24	19.353	.805	99.66	102.82	36	147

(Course Codes: 1-Blended, 2-Online, 3-Face-to-Face)

Attitude Score <b>Post-Course</b>	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	121	98.12	19.002	1.727	94.70	101.54	33	143
2	303	97.36	21.282	1.223	94.95	99.77	31	147
3	231	112.76	22.325	1.469	109.87	115.66	44	152
Total	655	102.93	22.438	.877	101.21	104.65	31	152

(Course Codes: 1-Blended, 2-Online, 3-Face-to-Face)

While the pre-test (Table 5) results showed no significant difference between the teaching formats in terms of the average attitude scores (AS), the post-test multiple comparison results (Table 6) revealed that in the end of the semester those taking face-to-face classes had significantly higher attitude score (AS mean=112.76) than those enrolled in online (AS mean=97.36) or blended (AS mean=98.12) sections.

Table 5

*Attitude Toward Subject Pre-Test Results*

Dependent Variable: Attitude Score (Pre-Test)		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) Class Format	(J) Class Format				Lower Bound	Upper Bound
1	2	3.228	2.410	.543	-2.56	9.01
	3	5.684	2.403	.055	-.09	11.45
2	1	-3.228	2.410	.543	-9.01	2.56
	3	2.456	1.741	.477	-1.72	6.64
3	1	-5.684	2.403	.055	-11.45	.09
	2	-2.456	1.741	.477	-6.64	1.72

(Course Codes: 1-Blended, 2-Online, 3-Face-to-Face)

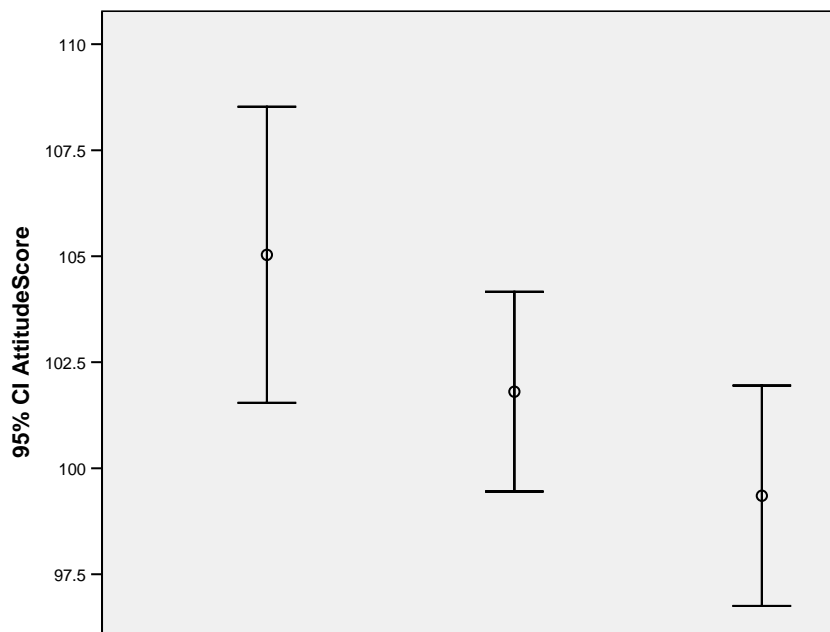


Figure 2. Pre-test confidence intervals for attitude scores.

(The x axis shows the confidence intervals for Blended, Online, and Face-to-Face classes.)

Table 6

*Attitude Toward Subject Post-Test Results*

Dependent Variable: Attitude Score (Post-Test)		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) Class Format	(J) Class Format				Lower Bound	Upper Bound
1	2	.764	2.286	1.000	-4.72	6.25
	3	-14.638*	2.386	.000	-20.36	-8.91
2	1	-.764	2.286	1.000	-6.25	4.72
	3	-15.402*	1.857	.000	-19.86	-10.94
3	1	14.638*	2.386	.000	8.91	20.36
	2	15.402*	1.857	.000	10.94	19.86

(Course Codes: 1-Blended, 2-Online, 3-Face-to-Face)

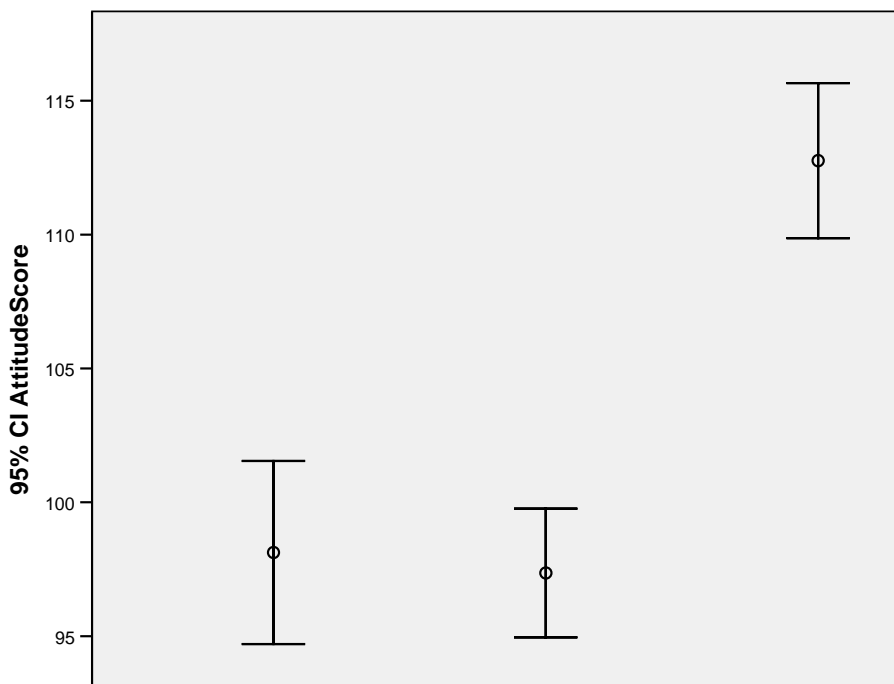


Figure 3. Post-test confidence intervals for attitude scores.

(The x axis shows the confidence intervals for Blended, Online, and Face-to-Face classes.)

## Research Problem 2:

Research Question (3): Is there a relationship between students' actual online interactions and academic performance?

Null Hypothesis (3): There is no relationship between students' actual online interactions and academic performance.

This research question focused on the possible differences between online behavior of blended and online students. The online activity data collected by the student tracking feature of the learning management system was used to measure students' actual interactions. Both tracking information and final course scores were only available for 149 blended and 154 online students. Academic performance was measured by final scores (on a scale of 1-100). The average final score for was almost 7 points (and almost a letter grade) higher for the blended students than for the online student (74.03 for blended and 67.58 for online students).

On average, as it was expected, blended students spent less time online. Although, the average number of online sessions during the semester was almost identical for both sections (71 for the blended and 80 for the online students), on average blended students spent 21 hours whereas online students spent 27.7 hours in the learning management system. As regards the online communication activities, on average, blended students sent 5.2 emails and posted 16 times to the discussion topics, while online students sent 6.8 emails and posted 23 times to the discussion topics during a semester.

The Pearson's  $r$  correlation coefficient was calculated for the relationship between the final scores (the measure of academic performance on a scale of 1-100) and the following variables measuring actual online interactions:

- Number of postings (measure of student-student, student-teacher interactions);

- Number of emails (measure of student-student, student-teacher interactions);
- Number of online sessions (measure of student-interface interactions);
- Time spent online (in hours) (measure of student-interface interactions).

Table 7

*Pearson's r for the Relationship Between Final Scores and Online Activity*

		Grade Score	No. of Sessions	Hours	Mail Read	Mail Posted	Discussion Read	Discussion Posted
Grade Score	Pearson Correlation	1	.495(**)	.458(**)	.376(**)	.218(**)	.177(**)	.472(**)
	Sig. (2-tailed)		.000	.000	.000	.001	.002	.000
	<i>N</i>	304	304	304	301	249	300	296

*(table continues)*

Table 7 (continued).

		Grade Score	No. of Sessions	Hours	Mail Read	Mail Posted	Discussion Read	Discussion Posted
No. of Sessions	Pearson Correlation	.495(**)	1	.616(**)	.491(**)	.458(**)	.515(**)	.705(**)
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	<i>N</i>	304	304	304	301	249	300	296
Hours	Pearson Correlation	.458(**)	.616(**)	1	.512(**)	.593(**)	.372(**)	.604(**)
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	<i>N</i>	304	304	304	301	249	300	296
Mail Read	Pearson Correlation	.376(**)	.491(**)	.512(**)	1	.593(**)	.280(**)	.302(**)
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	<i>N</i>	301	301	301	301	249	298	294
Mail Posted	Pearson Correlation	.218(**)	.458(**)	.593(**)	.593(**)	1	.345(**)	.435(**)
	Sig. (2-tailed)	.001	.000	.000	.000		.000	.000
	<i>N</i>	249	249	249	249	249	248	245
Discuss. Read	Pearson Correlation	.177(**)	.515(**)	.372(**)	.280(**)	.345(**)	1	.368(**)
	Sig. (2-tailed)	.002	.000	.000	.000	.000		.000
	<i>N</i>	300	300	300	298	248	300	295
Discuss. Posted	Pearson Correlation	.472(**)	.705(**)	.604(**)	.302(**)	.435(**)	.368(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	<i>N</i>	296	296	296	294	245	295	296

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

In the online classes, as shown in Table 8, the Pearson's *r* indicated a moderate positive correlation between final scores and number of online sessions (.538), number of hours spent online (.535), and the number of discussion postings (.658). Whereas, there was little if any correlation between final scores and number of discussion postings read (.239) and email sent (.283). There was a low positive relationship between final scores and emails read (.456).

Table 8

*Pearson's r for the Relationship Between Final Scores and Online Activity in Online Sections*

		GradeScore	NoSessions	Hours	MailRead	MailPosted	DiscRead	DiscPosted
GradeScore	Pearson Correlation	1	.538(**)	.535(**)	.456(**)	.283(**)	.239(**)	.658(**)
	Sig. (2-tailed)		.000	.000	.000	.002	.003	.000
	N	154	154	154	152	121	152	151
NoSessions	Pearson Correlation	.538(**)	1	.621(**)	.634(**)	.475(**)	.566(**)	.739(**)
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	154	154	154	152	121	152	151
Hours	Pearson Correlation	.535(**)	.621(**)	1	.571(**)	.616(**)	.365(**)	.571(**)
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	154	154	154	152	121	152	151
MailRead	Pearson Correlation	.456(**)	.634(**)	.571(**)	1	.623(**)	.337(**)	.478(**)
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	152	152	152	152	121	150	149
MailPosted	Pearson Correlation	.283(**)	.475(**)	.616(**)	.623(**)	1	.368(**)	.443(**)
	Sig. (2-tailed)	.002	.000	.000	.000		.000	.000
	N	121	121	121	121	121	120	119
DiscRead	Pearson Correlation	.239(**)	.566(**)	.365(**)	.337(**)	.368(**)	1	.348(**)
	Sig. (2-tailed)	.003	.000	.000	.000	.000		.000
	N	152	152	152	150	120	152	151
DiscPosted	Pearson Correlation	.658(**)	.739(**)	.571(**)	.478(**)	.443(**)	.348(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	151	151	151	149	119	151	151

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

In the blended classes, as shown in Table 9, there was a low positive correlation between final scores and the number of online sessions (.475) and number of hours spent online (.499).

Table 9

*Pearson's r the Relationship Between Final Scores and Online Activity in Blended Sections*

		GradeScore	NoSessions	Hours	MailRead	MailPosted	DiscRead	DiscPosted
GradeScore	Pearson Correlation	1	.475(**)	.499(**)	.336(**)	.196(*)	.186(*)	.387(**)
	Sig. (2-tailed)		.000	.000	.000	.027	.023	.000
	N	150	150	150	149	128	148	145
NoSessions	Pearson Correlation	.475(**)	1	.654(**)	.189(*)	.417(**)	.488(**)	.692(**)
	Sig. (2-tailed)	.000		.000	.021	.000	.000	.000
	N	150	150	150	149	128	148	145
Hours	Pearson Correlation	.499(**)	.654(**)	1	.285(**)	.449(**)	.338(**)	.651(**)
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	150	150	150	149	128	148	145
MailRead	Pearson Correlation	.336(**)	.189(*)	.285(**)	1	.479(**)	-.061	-.195(*)
	Sig. (2-tailed)	.000	.021	.000		.000	.462	.019
	N	149	149	149	149	128	148	145
MailPosted	Pearson Correlation	.196(*)	.417(**)	.449(**)	.479(**)	1	.127	.357(**)
	Sig. (2-tailed)	.027	.000	.000	.000		.155	.000
	N	128	128	128	128	128	128	126
DiscRead	Pearson Correlation	.186(*)	.488(**)	.338(**)	-.061	.127	1	.476(**)
	Sig. (2-tailed)	.023	.000	.000	.462	.155		.000
	N	148	148	148	148	128	148	144
DiscPosted	Pearson Correlation	.387(**)	.692(**)	.651(**)	-.195(*)	.357(**)	.476(**)	1
	Sig. (2-tailed)	.000	.000	.000	.019	.000	.000	
	N	145	145	145	145	126	144	145

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

\* Correlation is significant at the 0.05 level (2-tailed).

There seemed to be an even lower positive correlation between final scores and the number of discussion postings (.387) and the number of emails read (.336). There was little if any correlation between final scores and emails sent and number of discussion postings read.

In summary, while there appears to be no correlation between final scores and the number of emails sent or discussion postings read, there is a low positive correlation between final scores and number of discussion postings (.472), number of online sessions (.495) and the amount of time spent online (.458). The difference between the Pearson's *r* values for the correlations between final scores and the number of discussion postings shows the biggest



difference in terms of interactions between blended and online students. There seems to be a nearly high correlation between final scores and discussion postings in the online classes (.658), whereas the same correlation in the blended classes is low (.387).

Research Question (4): Is there a significant difference between blended and online students in terms of their online interactions (number of emails, discussion postings, Learning Management System sessions, hours spent in the Learning Management System)?

Null Hypothesis (4): There is no difference between online and blended classes in terms of online interactions (the number of online sessions, number of discussion postings, number of emails, and the amount of time spent online).

The Independent Samples *t*-test was used to examine if there is a significant difference between blended and online students in terms of their online interactions and their academic performance. The two class formats were compared based on the following variables:

- Number of postings (measure of student-student, student-teacher interactions);
- Number of emails (measure of student-student, student-teacher interactions);
- Number of online sessions (measure of student-interface interactions);
- Time spent online (in hours) (measure of student-interface interactions).

The group statistics information (Table 10), where 1 indicates blended and 2 indicates online class interactions, shows that the mean of final scores is higher in the blended sections (mean=73.6) than in the online sections (mean=66.5). However, the means for all measures of online interactions (number of online sessions, hours spent online, number of emails read

and sent, and the number of discussion posts read and posted) are lower for the blended sections. The Independent *t*-test was used to find out if these differences between the online and blended sections were statistically significant in the population. The *t* scores in Table 11 show that while there is a significant difference between blended and online sections in terms of final scores, there seems to be no significant difference between online and blended students in terms of their online interactions.

Table 10

*Group Statistics for Final Scores in Online and Blended Sections*

	ClassFormat	N	Mean	Std. Deviation	Std. Error Mean
GradeScore	1	149	73.6028	21.06826	1.72598
	2	154	66.5053	23.16200	1.86645
NoSessions	1	149	92.3356	60.81881	4.98247
	2	154	99.7987	80.40538	6.47925
Hours	1	149	29.44	16.305	1.336
	2	154	39.65	33.421	2.693
MailRead	1	149	41.7315	20.59901	1.68754
	2	152	49.0789	31.63210	2.56570
MailPosted	1	128	6.6641	7.33268	.64812
	2	121	9.7355	14.61436	1.32858
DiscRead	1	148	2271.74 32	3857.07020	317.049 22
	2	152	5283.34 87	14694.4037 0	1191.87 353
DiscPosted	1	145	18.8552	15.60670	1.29607
	2	151	30.7483	23.03569	1.87462

Research Question (5): Is there a significant difference between blended and online students in terms of their academic performance (final scores)?

Null Hypothesis (5): There is no difference between online and blended students in terms of their academic performance.

The Independent Samples *t*-test was used to examine if there is a significant difference between blended and online students in terms of their academic performance based on their final scores in the class. Since the *t* value (2.788) exceeded the critical value (1.96 for when *df* = 301), the null hypothesis was rejected. Only 0.6% of the time could we expect to see a sample difference of 7.09 or larger. If the null hypothesis was true, the observed results were unusual. The Independent *t*-test results (Table 11) reveal that while there is no difference between blended and online sections in the number of online interactions, there is a significant difference between the final scores of online and blended students with the blended students achieving a mean that was 7.09 points greater than their online only counterparts.

Table 11

*Independent t-Test Results for Final Scores and Online Interactions (Online and Blended)*

		Levene's Test for Equality of Variances		t-Test for Equality of Means					95% Confidence Interval of the Difference	
		<i>F</i>	Sig.	<i>T</i>	<i>Df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Grade Score	Equal variances assumed	2.087	.150	2.788	301	.006	7.09749	2.54615	2.08699	12.10800
	Equal variances not assumed			2.792	299.867	.006	7.09749	2.54217	2.09474	12.10025
No. of Sessions	Equal variances assumed	6.881	.009	-.909	301	.364	-7.46313	8.21039	-23.62016	8.69389
	Equal variances not assumed			-.913	284.578	.362	-7.46313	8.17348	-23.55127	8.62501
Hours	Equal variances assumed	16.045	.000	3.363	301	.001	-10.213	3.037	-16.189	-4.237
	Equal variances not assumed			3.397	223.552	.001	-10.213	3.006	-16.137	-4.289

(table continues)

Table 11 (continued).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
MailRead	Equal variances assumed	19.957	.000	2.383	299	.018	-7.34740	3.08337	-13.41527	-1.27954
	Equal variances not assumed			2.393	260.220	.017	-7.34740	3.07093	-13.39444	-1.30037
MailPosted	Equal variances assumed	18.256	.000	2.113	247	.036	-3.07147	1.45350	-5.93431	-.20864
	Equal variances not assumed			2.078	174.570	.039	-3.07147	1.47824	-5.98899	-.15396
DiscRead	Equal variances assumed	14.219	.000	2.414	298	.016	3011.60544	1247.77842	5467.17910	556.03178
	Equal variances not assumed			2.442	172.240	.016	3011.60544	1233.32182	5445.97636	577.23452
DiscPosted	Equal variances assumed	14.263	.000	5.179	294	.000	-11.89317	2.29628	-16.41241	-7.37394
	Equal variances not assumed			5.219	264.678	.000	-11.89317	2.27903	-16.38051	-7.40584

Research Question (6): Is there a relationship between students' perceived interactions and their level of satisfaction with their overall learning experience?

Null Hypothesis (6): There is no relationship between perceived interactions and the level of satisfaction with the learning experience.

Perceived interactions were measured by using a modified version of Picciano's (2002) Perceptions of Interactions instrument as part of the end-of-semester course evaluation

survey (Appendix B). Blended and online students were asked to evaluate their interactions with their peers, instructors, and the course content in comparison to traditional classroom instruction on a scale from 1 (*increased*) to 5 (*decreased*). Satisfaction with the learning experience was measured on a scale from 1 (*poor*) to 5 (*excellent*). Based on the results of the Chi Square Test of Independence (Tables 12.1 and 12.2), the null hypothesis was rejected. Perceived interactions and the level of satisfaction with the overall educational experience do not seem to be independent. It appears that those who rated their overall educational experience *excellent* perceived their interactions increased as compared to traditional classroom instruction, whereas those who rated their educational experience as *poor* perceived that their interactions decreased as compared to traditional classroom instruction.

Table 12.1

*Chi Square Test of Independence Crosstabulations for Students' Perceived Interactions vs. Their Overall Satisfaction with the Learning Experience: Perceived Amount of Student-Student Interactions vs. Student Satisfaction*

		Course Evaluation					Total	
		1	2	3	4	5		
Amount Of Student - Student Interaction	1	Count	0	8	18	21	19	66
		Expected Count	10.5	14.3	20.7	15.0	5.6	66.0
		% within Amount of Interaction	.0%	12.1%	27.3%	31.8%	28.8%	100.0%
		Std. Residual	-3.2	-1.7	-.6	1.6	5.6	
2	Count	13	25	36	49	12	135	
	Expected Count	21.4	29.2	42.3	30.6	11.5	135.0	
	% within Amount of Interaction	9.6%	18.5%	26.7%	36.3%	8.9%	100.0%	
	Std. Residual	-1.8	-.8	-1.0	3.3	.1		

(table continues)

Table 12.1 (continued).

		Course Evaluation					Total	
		1	2	3	4	5		
Amount Of Student Interaction	3	Count	25	35	56	23	10	149
		Expected Count	23.6	32.2	46.7	33.8	12.7	149.0
		% within Amount of Interaction	16.8%	23.5%	37.6%	15.4%	6.7%	100.0%
		Std. Residual	.3	.5	1.4	-1.9	-.8	
4		Count	11	28	39	26	4	108
		Expected Count	17.1	23.4	33.9	24.5	9.2	108.0
		% within Amount of Interaction	10.2%	25.9%	36.1%	24.1%	3.7%	100.0%
		Std. Residual	-1.5	1.0	.9	.3	-1.7	
5		Count	44	31	35	14	5	129
		Expected Count	20.4	27.9	40.4	29.2	11.0	129.0
		% within Amount of Interaction	34.1%	24.0%	27.1%	10.9%	3.9%	100.0%
		Std. Residual	5.2	.6	-.9	-2.8	-1.8	
Total		Count	93	127	184	133	50	587
		Expected Count	93.0	127.0	184.0	133.0	50.0	587.0
		% within Amount of Interaction	15.8%	21.6%	31.3%	22.7%	8.5%	100.0%

Table 12.2

*Chi Square Test of Independence Crosstabulations for Students' Perceived Interactions vs. Their Overall Satisfaction with the Learning Experience: Perceived Amount of Student-Instructor Interactions vs. Student Satisfaction*

		Course Evaluation					Total	
		1	2	3	4	5		
Amount Of Student - Instructor Interaction	1	Count	0	6	13	12	18	49
		Expected Count	7.8	10.6	15.4	11.1	4.1	49.0
		% within Amount of Interaction	.0%	12.2%	26.5%	24.5%	36.7%	100.0%
		Std. Residual	-2.8	-1.4	-.6	.3	6.9	
2	Count	5	9	29	38	10	91	
	Expected Count	14.5	19.8	28.6	20.5	7.6	91.0	
	% within Amount of Interaction	5.5%	9.9%	31.9%	41.8%	11.0%	100.0%	
	Std. Residual	-2.5	-2.4	.1	3.9	.9		
3	Count	11	39	64	38	12	164	
	Expected Count	26.1	35.6	51.6	37.0	13.7	164.0	
	% within Amount of Interaction	6.7%	23.8%	39.0%	23.2%	7.3%	100.0%	
	Std. Residual	-3.0	.6	1.7	.2	-.5		
4	Count	21	41	50	28	7	147	
	Expected Count	23.4	31.9	46.2	33.2	12.3	147.0	
	% within Amount of Interaction	14.3%	27.9%	34.0%	19.0%	4.8%	100.0%	
	Std. Residual	-.5	1.6	.6	-.9	-1.5		
5	Count	56	32	28	16	2	134	
	Expected Count	21.3	29.1	42.1	30.2	11.2	134.0	
	% within Amount of Interaction	41.8%	23.9%	20.9%	11.9%	1.5%	100.0%	
	Std. Residual	7.5	.5	-2.2	-2.6	-2.8		
Total	Count	93	127	184	132	49	585	
	Expected Count	93.0	127.0	184.0	132.0	49.0	585.0	
	% within Amount of Int	15.9%	21.7%	31.5%	22.6%	8.4%	100.0%	

Research Question (7): Is there a relationship between class format and perceived interactions?

Null Hypothesis (7): There is no relationship between class format and perceived interactions.

The Chi Square Test of Independence was used to test for the existence of a relationship between class format (blended and online) and students' perception of the quality and quantity of their interactions (Tables 13.1-2). Although the descriptive statistics indicated that blended and online students rated their perceptions of interactions very similarly, the null hypothesis was rejected based on the results of the Chi Square Test of Independence. The class format (blended or online) and the perceived interactions (including the amount and quality of interactions with peers and instructor, as well as motivation and quality of learning experience) do not seem to be independent. The only exception is the perceived amount of knowledge gained in the class, which seems to be independent of the class format.

Table 13.1

*Chi Square Test of Independence Crosstabulations for Students' Perceived Interactions vs. Class Format (Blended and Online): Perceived Amount of Student-Student Interactions vs. Class Format*

		Course Format		Total	
		1 Blended	2 Online		
Amount	1	Count	37	33	70
Of Student -		Expected Count	33.1	36.9	7.0
Student		% within	52.9%	47.1%	100.0%
Interaction		Amount of Int			
		Std. Residual	.7	-.6	

*(table continues)*



Table 13.1 (continued).

		Course Format		Total	
		1 Blended	2 Online		
Amount	2	Count	79	59	138
Of Student - Student		Expected Count	65.3	72.7	138.0
Interaction		% within Amount of Int	57.2%	42.8%	100.0%
		Std. Residual	1.7	-1.6	
	3	Count	72	83	155
		Expected Count	73.4	81.6	155.0
		% within Amount of Int	46.5%	53.5%	100.0%
		Std. Residual	-.2	.2	
	4	Count	49	60	109
		Expected Count	51.6	57.4	109.0
		% within Amount of Int	6.7%	23.8%	100.0%
		Std. Residual	-.4	.3	
	5	Count	48	82	130
		Expected Count	61.5	68.5	130.0
		% within Amount of Int	36.9%	63.1%	100.0%
		Std. Residual	-1.7	1.6	
Total		Count	285	317	602
		Expected Count	93.0	127.0	602.0
		% within Amount of Int	47.3%	52.7%	100.0%

Table 13.2

*Chi Square Test of Independence Crosstabulations for Students' Perceived Interactions vs. Class Format (Blended and Online): Perceived Amount of Student-Instructor Interactions vs. Class Format*

		Course Format		Total	
		1 Blended	2 Online		
Amount Of Student - Instructor Interaction	1	Count	34	16	50
		Expected Count	23.6	12.4	50.0
		% within Amount of Int	68.0%	32.0%	100.0%
		Std. Residual	2.1	-2.0	
2	Count	48	47	95	
	Expected Count	44.8	50.2	95.0	
	% within Amount of Int	50.5%	49.5%	100.0%	
	Std. Residual	.5	-.5		
3	Count	81	90	171	
	Expected Count	80.7	90.3	171.0	
	% within Amount of Int	47.4%	52.6%	100.0%	
	Std. Residual	.0	.0		
4	Count	68	80	148	
	Expected Count	69.8	78.2	148.0	
	% within Amount of Int	45.9%	54.1%	100.0%	
	Std. Residual	-.2	.2		
5	Count	52	84	136	
	Expected Count	64.1	71.9	136.0	
	% within Amount of Int	38.2%	61.8%	100.0%	
	Std. Residual	-1.5	1.4		
Total	Count	283	317	600	
	Expected Count	283.0	317.0	600.0	
	% within Amount of Int	47.2%	52.8%	100.0%	

## Qualitative Data Analysis and Results

During the fall 2005 semester, a short mid semester survey was administered in the blended courses. The survey (Appendix C) included questions on how students perceived their learning experience. The survey was posted within the learning management system and the instructors encouraged their students to fill them out. 146 students responded to the survey and their overall rating of the blended course was *good* (on a scale of *poor*, *satisfactory*, *good*, *very good*, and *excellent*). Based on the student responses to open-ended questions on what they found the most and the least helpful in the blended course, the researcher developed a set of codes (Patton, 2002) which were applied to the open-ended responses of the end-of-semester survey (Appendix B).

### Student Experiences

At the end of the end-of-semester survey, in addition to rating their learning experience on a five-point scale (from *poor* to *excellent*), students were asked if they considered their educational experience *successful* or *unsuccessful* and had the opportunity to point out the best parts of the course. 741 students (276 blended, 311 online, and 154 face-to-face students) answered at least one of the open-ended questions. The students' comments on the best course features as well as their suggestions for further improvements were analyzed using qualitative research methods (Patton, 2002).

#### *Preference for Class Format*

When asked in an open-ended question, which aspect of the course most contributed to its success, the majority of the blended students mentioned the class format, usually emphasizing either the online or the face-to-face component. Only a small percentage of them

stated explicitly that they found the blended format (i.e., the combination of online and face-to-face components) to be the major contributor to the successful learning experience.

The blended experience was found successful primarily because of three factors: fewer in-class meetings than in a traditional course, meetings in small groups, and online content. The combination of online content and in-class small group discussions was often noted as the key to the success of the course. Students felt that having access to the content online and being able to discuss it face-to-face with their peers and instructors reinforced the information.

[The best thing about the blended course was] not having to go to class everyday and being able to do lessons online instead! That actually made me want to go to class when the time came.

[What made the course successful was] the flexibility of the online lessons combined with the intimacy of the small discussion groups.

I think that what made the aspect of this course successful was that it was blended. Having online lessons and in-class participations it was good for my schedule completing the assignments.

The reasons for finding the blended format unsuccessful seemed to vary. The blended students who found the blended experience unsuccessful (29.73%) primarily mentioned course management, workload, and technology issues, as contributing factors. One of the most common complaints was that the online content put too much responsibility on the student in terms of their learning process and required independent learning. Some students criticized the non-linear nature of the online component, and felt overwhelmed by the fact that information was supposed to be gathered from various sources.

[It is] easy to forget things, [I] felt overwhelmed by all of the different places to go for class needs.

The fact that the class was online made it easy to forget about and easy to avoid. I didn't like how everything was on the student to learn. The teacher is there to teach and I would not have taken this course if I would have known what "blended" meant.

Some of the blended students also complained that the class did not meet often enough or that the workload was too high.

There were a lot of online assignments and I felt like I couldn't keep up with them.

**TOO MUCH WORK!!**

There were only a few negative comments on technology. Some of the criticism was directed at the learning management system because of the relatively frequent system downtimes. Some students mentioned their lack of computer experience that made the online component difficult to use.

While some students thought that the combination of online and face-to-face components made the class successful, some students indicated that they found the course unsuccessful for the same reason. They felt that the course had been successful if had been either entirely online or entirely face-to-face.

I did not like the blended aspect of the class. I would have much rather had a traditional class or a class that was entirely online. I felt like not enough time was spent in the classroom to meet classmates and get a good sense of community and develop a relationship with the teacher. I also felt since there was not enough time spent online either, that that made me not concentrate as much on it as I would have if it was a class that was entirely online.

A few students criticized in-class lectures for being pointless and indicated that they would have rather had the entire class online. Students who found the online component more useful than the face-to-face part commented on the effectiveness of the presentation of the

material, the use of interactive tools, and the small online discussion groups. The most often mentioned positive feature of online classes was its flexibility in time and space. Students appreciated that they were allowed to work at their own pace, felt that they had a more efficient use of time, and that they were able to return to the lessons at any time for clarification on concepts, assignments, schedules, and other course information. Online lessons were mentioned as providing extra help, being more convenient in terms of students' schedules, and for providing a variety of learning tools including various listening exercises, visual aids, videos, and self tests.

I really enjoy having lessons online because it gives me the chance to learn when it is convenient for me. If I am not in the mood to learn I don't have to and when I am I can focus a lot more clearly on all of the details. Also online lessons tend to cut down on the useless information and focus on all of the important details. You don't have to worry about being sidetracked because it is all right there in front of you and you know it is important if the instructor took the time to actually write it all out.

Interestingly, while the presentation of the online course content seemed overwhelming to some, those who expressed preference toward online learning praised the online format for its "easy access to materials online."

Students who preferred the face-to-face component of the blended course said that they simply "did not like the online interaction as much." They found the face-to-face meetings more useful because of the small discussion groups.

While online and blended students seemed to focus on the online features or the small face-to-face discussion groups as the main factors that contributed to the successful learning experience, a relatively large percentage (40.37%) of face-to-face students attributed the success of the course entirely to the instructor. They generally commented on the instructor's knowledge of the subject matter, enthusiasm, personality, or presentation style.

## Faculty Experiences

The researcher conducted two interviews with the blended faculty members during each semester. The semi-structured interviews were conducted over the phone and via email communication mid-semester and at the end of the semester (Appendix D). The researcher also participated in the monthly blended faculty meetings where faculty challenges and experiences were discussed.

### *Challenges for Faculty*

During the first monthly faculty meeting and the mid-semester interviews, the faculty reported mostly technical challenges. Since this was the first semester when the blended faculty members used WebCT Vista, most of these were the result of their unfamiliarity with the learning software. This problem was solved in the first couple of weeks of the semester as the faculty became familiar with the system. The other source of technical challenges was the occasional server downtime, which proved to be a problem for the instructors especially on the weekends when they were grading most of the assignments. Although the instances of system unavailability or slow response time were usually resolved in a reasonable time period, those periods generated more email s for the instructors and resulted in the need for more one-on-one time between faculty and student.

At the beginning of the semester, class management challenges involved misunderstandings about the format of some of the class sections. The first time that the courses were offered in a blended format, there was no separate category for blended sections in the course schedules; thus the blended sections were listed as either online or face-to-face sections. Many students in the nutrition class, for example, believed that they would attend a weekly face-to-face lecture and were surprised to find out about the online component. The opposite occurred in a communications course. The students believed that they enrolled in an

entirely online class and were disappointed to learn that they would be required to go to campus a few times during the semester to attend classes. While many students dropped the communications class after the first meeting, the nutrition faculty tried to accommodate the blended students by allowing them to attend lectures of the face-to-face section. Although this misalignment of expectations turned out to be a major issue for the involved faculty at the beginning of the semester, it provided the researcher with an unexpected insight into students' expectations of the course format and how it affected their perceptions of the learning experience.

Another example of a course design problem had to do with submitting assignments. In one class students were initially allowed to submit assignments via email or paper-trail (dropping assignments off at the office). As the instructor explained in retrospect,

I think e-mail is the way to go. Everything can be recreated in text format, filled in by the student, saved, and e-mailed to me. I have found several reasons for this to be beneficial. First, this method is beneficial to me because I can easily and quickly type in my response, any questions I have, and a few general comments, save the document, and reply instantaneously. For the students, this means, they don't need to come by the office to drop-off assignments, then wait for me to grade, and then later come back to the office to pick up their graded assignments. When it's all done via e-mail, everybody saves time and energy. Specifically, for both of us, I find myself being asked to e-mail comments to assignments when the student is unable to make it back to the office to pick up comments.

Throughout the semesters, some of the faculty faced challenges related to students' misunderstandings about upcoming assignments or meeting times. These challenges were resolved by increased communication primarily through the use of announcements and message boards designated to logistical questions. Instructors found these message boards especially helpful, because allowing students to help each other with commonly asked questions resulted in a shorter response time and a smaller number of emails to the instructor. The instructors indicated that overall they had a very positive teaching experience, and the few problems presented mostly learning opportunities.



### *Faculty Perception of Student Challenges*

From the faculty's perspective, the primary concerns for the students were related to technical problems (as result of system outages) and misunderstandings about upcoming assignments and events. Many students were confused about where and when they were supposed to be in class and online. The faculty solved this problem as it occurred by directing the students to the correct location. The students who reported problems with the learning management system were provided with troubleshooting tips. For more serious problems, they were referred to the university Helpdesk.

Another challenge was related to online content organization. The faculty noticed that a few students had trouble navigating the website and finding the necessary information on assignments or locating reading assignments. As a rule, emails and discussion forum postings helped to overcome these problems in the short term. However, in the long term, the online content presentation should be revised to make it more intuitive for the students.

Some of the faculty reported that many student frustrations resulted from misunderstandings and realized that some students needed repeated communication through various channels. These students were inclined to miss important information related to the course management and the content of the course. While emails, announcements, and discussion postings helped clarify logistical issues, self help quizzes also seemed to work well in helping students focus on the content of the course.

In the Communication courses, for example, some students faced a new challenge when it came time to present their speeches. Those enrolled in the online sections were required to submit their videotaped speeches, while those in the blended sections had to perform in front of their peers during the in-class meetings. Several of the blended students mentioned that they found it more difficult to make their presentations because they did have

the same level of familiarity that they might have enjoyed in a traditional classroom setting. They indicated that even though they interacted with each other online, the bonds they formed as classmates were not the same as it would have been in a face-to-face class.

### *Academic Performance*

In general, the faculty was satisfied throughout the semesters with the academic performance of the blended students. In fact, most of the faculty noted that while the blended students' performance was comparable to those in the online sections, the quality of both was significantly higher than those in the face-to-face sections. The blended and online students were prepared adequately and followed the assignments fairly well, which apparently did not always occur in the face-to-face sections.

While it is almost impossible to generate quality discussions in large face-to-face classes, the faculty noted that the number and quality of discussion postings in the online and blended sections were relatively high and that the students seemed to be engaged in the discussions. The majority of students posted quality discussions and most posted more than the required number of postings. The instructors made a conscious effort to increase the quality of discussions by asking questions from those students whose postings were lacking in quality. They found that the students who did not post quality comments were also the ones who only posted the required number of times, which suggests that these students did not check back for responses or comments to their own postings to see if they needed additional participation.

A couple of instructors whose blended and online sections students scored lower on the exams than their students in the face-to-face class wondered whether the amount and quality of the discussion postings indicated deep learning or true engagement in the course material.

Without a doubt, they are engaging in discussion forums well, but I can't ascertain whether some of them are really cognitively engaging or if they are sitting with their books in hand writing what I think the best answer would be.

In the online sections, faculty also noted a difference in the quality of discussion postings between group and individual postings. The quality of group discussion postings seemed much better than the individuals' postings. They were longer and included more thoughts.

Small group in-class discussions proved to be effective for blended students. The faculty noted that during these sessions the blended classes seemed particularly engaged, because they were allowed and encouraged to ask questions of one another and to inquire about the topics from the instructor.

The thing that I find myself most encouraged by is that fact that several of the students in both the online and blended environments chose persuasive speech topics that were somewhat more controversial than most of those did in the face-to-face environment.

Students in the online communications classes also seemed more comfortable with more sensitive or provocative topics, probably because they did not have to present in front of an "unknown" audience.

I really enjoyed this aspect of the course because I felt that the students, even if only those presenting, were able to reach beyond their own knowledge and find someone new and intriguing.

In general, the faculty noted that students in most online and blended sections performed better on the quizzes than did the students in face-to-face classes. These instructors agreed that the students seemed more engaged with the material and seemed to understand some of the more complex concepts better (or at least more quickly) because of the online lessons.

### *Workload Issues*

Overall the faculty agreed that the student workload was manageable or even relatively light in the blended courses. They concluded this based on students' comments and the student tracking information of the learning software. They also assumed that since the blended students had the flexibility of completing the assessments online and did not have to submit assignments or prepare for random quizzes during class meetings, the students "had it pretty easy" in terms of workload.

My perception is that the workload for students is really light. They don't have to come to class with prepared assignments, and they know in advance what those assignments (DFs [Discussion Forums] and others) are and can complete (DFs specifically) them on their own time, even early if they so desire. I guess from my perspective, the blended students have it pretty easy by way of workload.

Some of the faculty members recognized the possibility that blended students might perceive that they carried a heavier workload (relative to in-class students) because they were required to participate in both online and in-class discussions.

I do not think that the student workload is too much. They might perceive it as being higher, though, because they are not used to reading their textbooks in preparation for class.

As for their own workload, all faculty members felt it was somewhat higher than teaching a face-to-face class. This was partly because they were still working on parts of the online and blended courses, and partly because the online component meant increased communication between students and instructor. However, all faculty indicated that they found email and discussion postings to be the most efficient ways to communicate with their students.

A few faculty members reported that the workload occasionally felt overwhelming (primarily as a result of the high volume of emails), but they also realized that adapting the course structure would alleviate this problem. Interestingly, even though faculty members tried to keep the assignments comparable to those in their face-to-face classes, they reported more time spent on grading in the blended and online sections. This might have been due to the additional technical processes, such as downloading and opening files, changing file formats or printing documents if necessary, typing answers, returning graded assignments as attachments, etc.

### *Student-Student Interactions, Community Building*

The faculty believed that the blended sections were the most conducive to community building among the students. They noticed that the students felt more connected to both the instructors and each other after each in-class meeting.

It had been interesting to observe the students in the Small Discussion Groups. They are not used to talking in class, and it took them a few minutes to start speaking up. Once they began talking, though, they seemed comfortable and excited to share their ideas. There were definitely a couple of quiet students in each group.

Online discussions also contributed the students' sense of community. In the online discussion topics, many of the questions were answered by peers even before the instructor had a chance to respond. This mode of communication as well as the collaborative group projects helped students to bond and build a community of trust and hard work.

Students also discovered that they could use the discussion topics as tools for initiating study groups or course related events.

One exciting thing happened just this week. The students are required to attend two music concerts outside of class, and some of them are nervous about this prospect. In the past, they have tended to attend concerts by themselves, but because of the online discussion postings, they have begun to make plans to attend concerts as a group. I think that they are feeling more connected to each other, even though they are not in

class together as much. The timing of this particular discussion posting happens to coincide with the first rotation of Small Discussion Groups, which suggests to me that the combination of in-class meetings (especially the smaller groups) and the online community is effective.

In general, the faculty did not report signs indicating that students were having difficulties working with one another. The students appeared to be supportive of each other. They responded to each other's questions, made suggestions or positive comments and seemed to have quality online conversations. Typically, the communities were positive and complementary, requiring little faculty intervention.

### *Student-Instructor Interactions*

In the face-to-face sections, the instructors did not notice a student preference for any specific form of communication. Many students chatted with the instructor before or after class briefly, but also many found that email was a sufficient method of communication. These chats and emails were primarily course related, but very rarely were they content specific.

The majority of the online and blended students, however, chose email as the primary means of communication with their instructor and that resulted in a significantly increased number of emails. One instructor reported as much as five times as many emails in the online section as in the blended section. In the end of the semesters, a few instructors realized that they received many questions via e-mail that were plainly answered in the assignments, but they responded to them nonetheless. As rule, instructors went beyond just answering emails if at least two or more students contacted them about the same issue. They would check the problem and rephrase or reiterate directions and post them to the discussion forums.

In the blended sections, instructors noted that the increased email communication noticeably reduced the in-class questions, even though they very rarely were content-related.

Very often, the emails were about technical difficulties and from the same few students. One instructor noted that she found it very strange when a blended student asked for extra credit in an email, because in her practice that never happened before in a face-to-face class. She attributed this to some form of e-courage since they only rarely met in person.

Some of the blended and online students would drop by or schedule an appointment during the instructor's face-to-face office hours as well, but that mostly occurred in advance of assignment due dates. The conversations during these usually very brief meetings were often not even class related. Only one instructor mentioned a couple of instances when she was contacted by students during her online office hours via chat.

Even if it was not explicitly stated, students accommodated themselves to the instructor's pattern of communication early in the semester. Most instructors do not check discussion postings on a daily basis but rather about three times a week just to make sure that they are not missing anything. On the other hand, they tend to log in at set times for grading and responding to email.

### Summary

This chapter presented the various data analysis techniques used in the current study as well as the results of both quantitative and qualitative data analysis. The next chapter focuses on the research findings by synthesizing the results of the quantitative and qualitative methods. Chapter 5 addresses the implications of the study in terms of blended course design and it includes suggestions on how universities can help students find the course format that best fits their life styles and learning styles.

## CHAPTER 5

### CONCLUSIONS

#### Introduction

This chapter is a report on the findings and implications of a study regarding the relationship between interactions and the effectiveness of face-to-face, blended, and online learning environments. The first section of the chapter provides a brief overview of the study including the original research problem and the data collection procedures. The second section presents a synthesis of the research findings. The third section is a discussion of the conclusions. The fourth section addresses the implications of the research results, and the last section recommends additional research ideas in order to further our understanding of the relationship between interactions and the effectiveness of blended learning.

#### Summary of the Study

Interaction has long been a defining and critical component of the education process (Anderson, 2004) as well as an important factor in distance education. The present study was designed to examine two related research problems. The first focused on the comparison of the effectiveness of blended, online, and face-to-face instruction in terms of students' attitude changes toward the subject matter and students' perceptions of the effectiveness of the learning experience. The second research problem investigated the relationship between students' perceived and actual interactions and their effects on student satisfaction with the overall learning experience.



The literature on blended learning has been dominated by detailed descriptions of its introduction in campus-based courses (Stacey & Gerbic, 2008) and by summaries of factors that seem to promote successful blends of online and face-to-face learning. Blended learning research has focused on specific aspects of blended learning, primarily the technology. Recently, more and more researchers argue for a more holistic approach to blended learning that will facilitate a better understanding of the complexity of its settings and its processes as a whole system (Bliuc, Goodyear, Ellis, 2007; Chen & Jones, 2007) as well as the complex relationships between blended learning, student behavior, attendance, and attainment (Barrett, Rainer, Marczyk, 2007).

Investigating the quality and quantity of interactions is one way to get to a more holistic inquiry of the learning process. Interaction research has identified student-teacher, student-student, and student-content interactions as the three most common types of interaction in the distance learning process (Moore, 1989). In the distance learning literature, the increased quality and quantity of interactions have been linked to more positive student outcomes (Keefe, 2003), a higher degree of sense of community (Rovai, 2002), and higher order learning (Harasim, 1989; Garrison & Cleveland-Innes, 2004). Learning theories (such as the theory of conditions of learning, engagement theory, or the theory of situated learning) as well as communication theories (such as the theories of immediacy and social presence) suggest that promoting interaction will lead to a positive communication process and learning experience and will promote higher order learning. Blended learning – by its very nature – expands the opportunities for quality interaction.

As a comparative study examining the differences between various types of instruction, the current study focused on a population of predominantly undergraduate students enrolled in five blended undergraduate courses and their face-to-face and online equivalents offered at the University of North Texas between fall 2005 and summer 2006.

The purpose of the study was to examine the effectiveness of the newly developed blended courses compared to their traditional face-to-face and fully online sections. The researcher participated as an observer in both the planning and implementation phases of the project. During fall 2005 and spring and summer of 2006, the researcher collected quantitative and qualitative data from students via online and paper surveys, and qualitative data from the blended faculty via interviews and observations during the monthly blended faculty meetings.

## Findings

### *Student Profiles*

The population of the study was composed of undergraduate students at the University of North Texas. The sample seemed rather homogenous throughout all sections in terms of gender, geographic location, and computer expertise. They were predominantly female students living within 10 miles of the UNT Denton campus with reported intermediate computer skills. The demographic comparison of blended, online, and face-to-face students showed significant difference only in terms of age among the sections. While the majority (57.9%) of online students was between 21 and 30 years old, most students in the blended (64.5%) and the face-to-face (60.71%) sections were under 20.

### *Student Satisfaction and Perceived Success of the Learning Experience*

Overall, students in all sections were satisfied with their learning experience. At the end of the semesters, students were asked to rate their overall learning experience on a scale from *poor* (1) to *excellent* (5). The Bonferroni test of multiple comparisons revealed that there was a significant difference between the face-to-face and the other two (online and blended) courses. While the mean scores for the overall course ratings were similar in the online (mean=2.91) and blended (mean=2.81) sections, the mean for the face-to-face sections

was significantly higher (mean=3.59) indicating an overall higher satisfaction with the learning experience in a traditional lecture-based learning environment.

The learning experience was considered successful by the majority of students in all sections. One surprising finding was that while the perceived success rate was around 70% in the online and blended sections, the face-to-face sections were considered “successful” by almost 95% of the students. The success of face-to-face courses was primarily attributed to the teacher. The teacher’s style, enthusiasm, knowledge, and presentation style were mentioned specifically. Only a small percentage of students mentioned the subject matter, certain parts of the course material, in-class discussions, or audio-visual presentations (e.g., videos) as factors that contributed to the success of the course. Interestingly, in the online and blended courses, the teacher’s role was negligible in making the course successful. Blended students attributed the success of the course to three main factors: fewer in-class meetings than in a traditional course, meetings in small groups, and additional online content. The combination of online content and in-class small group discussions was often noted as the key to the success of the course. Students felt that having access to the course material online and being able to discuss it face-to-face with their peers and instructors reinforced the information.

### *Student Attitude Toward Subject*

Changes in students’ attitude toward the subject matter can also indicate the effectiveness of teaching methods. While the pre-test results of the Attitude Toward Subject survey showed no significant difference among the three teaching formats in terms of average attitude scores (AS), the post-test multiple comparison results revealed that at the end of the semester those taking face-to-face classes had significantly higher attitude score (AS mean=112.76) than those enrolled in online (AS mean=97.36) or blended (AS mean=98.12)

sections. It should also be mentioned that while the attitude of online students did not change by the end of the semester, blended students' attitude toward the subject dropped significantly and face-to-face students' attitude increased significantly. This was an unexpected finding, especially since the qualitative data collected from both faculty and students suggested that the blended students did enjoy the blended format and seemed more enthusiastic about the class than the face-to-face students. Faculty perceptions of student academic performance also indicated that the blended students also performed better than students in online and face-to-face sections. It is possible that the attitude toward the subject in the blended classes was negatively affected by the lack of time management and independent learning skills that were required by these classes but not possessed by all of the students.

#### *Online Interactions and Academic Performance*

One of the main research questions in the study asked if there is a relationship between students' actual online interactions and academic performance in the blended and online sections. Since the final scores for the students were only available in the blended and online sections of the Principles of Language Study (LING3060) class, the researcher examined the relationship between the final scores (the measure of academic performance on a scale of 1-100) and the variables measuring actual online interactions (such as time spent in the online course, the number of online sessions, discussion postings, and emails) in these two sections. While there seemed to be no correlation between final scores and the number of emails sent or the number of discussion postings read, the Pearson's  $r$  indicated a low positive correlation between final scores and number of discussion postings (.472), number of online sessions (.495) and the amount of time spent online (.458).

Comparing the interactions between blended and online students, there was a moderate to high correlation between final scores and discussion postings in the online

classes (.658), whereas the same correlation in the blended classes was low (.387). This seems to support the theory that learning is indeed a social process and in the entirely online learning environment those who interact more often with their peers and instructor(s) during online discussions engage more in the course material and achieve higher grades. In blended classes, the need to engage in the material via online discussions is somewhat reduced by the face-to-face interactions, especially the small group discussions. This may also suggest that the most valuable feature of online classes is the peer discussions where students engage in critical thinking and problem solving.

The finding that there is no correlation between final scores and email (i.e., online one-on-one communication) is also supported by the qualitative results of the study. Instructors and students both reported that they used email communication primarily about course or assignment related logistical issues and not course content. In fact, the study showed that the volume of logistical emails was actually reduced in well-designed courses that had clear instructions and straightforward assignment descriptions.

Blended and online students were compared in terms of their online interactions and academic performance. The average final score (using a 1-100 point scale) was almost 7 points (almost a letter grade) higher for the blended students than for the online students. Although, this result was based on a relatively small sample (149 blended and 154 online students), university records showed similar results indicating on average almost a letter grade difference between the blended and online sections.

Faculty perceptions of student performance did not reveal significant differences between online and blended students in terms of their academic performance. Most of the faculty noted that the blended students' performance was comparable to those in the online sections. However, they also noted that the quality of both online and blended students' performance was significantly higher than those in the face-to-face sections. The blended and

online students were prepared adequately and followed the assignments fairly well, which apparently did not always occur in the face-to-face sections. Students in most online and blended sections performed better on the quizzes than did the students in face-to-face classes. The instructors agreed that online and blended students seemed more engaged with the material and seemed to understand some of the more complex concepts more easily than face-to-face students. They attributed this to the availability of online content and the online discussions.

Interestingly, the faculty perceived the student workload lighter in the blended courses than in the face-to-face sections. They assumed that since the blended students had the flexibility of completing the assessments online and did not have to prepare for random quizzes during class meetings, the students “had it pretty easy” in terms of workload and stress. On the other hand, student perceptions indicated that the workload in the blended courses seemed much higher than in face-to-face courses. This supports the findings reported by Chen and Jones (2007) who argue that online discussions force blended students to be more prepared and generally more involved in the learning process, whereas students in a traditional classroom setting stay more passive and tend to rely on mere classroom attendance, which does not necessarily mean engagement in the course material. The qualitative results regarding students’ perceptions of the workload in the traditional lecture-based classes are also in line with the NSSE 2008 results (NSSE, 2008) that about one-fifth of the first-year students report frequently attending class without completing readings or assignments. This supports the argument that the possibility of random in-class quizzes is very often not enough of a motivation for students to engage in the course material. Courses delivered primarily online, on the other hand, seem to stimulate students’ level of intellectual challenge (NSSE, 2008) and engagement in the learning process.

Although the initial descriptive statistics indicated that blended students spent less time online, sent fewer emails and posted to the discussion topics fewer times than online students, the Independent Samples *t*-tests revealed no significant difference between online and blended students in terms of the volume of their online interactions. The difference between blended and online sections in terms of final scores can be attributed to the additional face-to-face meetings.

### *Perceptions*

Perhaps the most puzzling finding of the present study was the contradiction between some of the quantitative results and the student and faculty perceptions of the learning experience. Most students and faculty considered the blended approach a successful form of instruction. Students appreciated the online content and the increased interaction with the instructor via online discussions and through assignment feedback. The blended faculty anecdotally reported higher academic performance in the blended classes than in the face-to-face and online sections. However, when students were asked to rate their learning experience and respond to the Attitude Toward Subject survey, the traditional face-to-face lecture-based sections were rated more positively than the other two forms of instruction and they showed an increase in students' attitude toward the subject. One possible explanation is that this study was based on the very first blended project at the University of North Texas and each blended course was designed separately without following any of the course models. Students were not used to the new format, which eventually affected their perceptions of the learning experience and their attitude toward the subject.

### Conclusions

Students enter college with a variety of backgrounds and experiences. Some students become highly engaged in the learning and extracurricular activities of their high schools, while others are less engaged. Some students set high academic expectations for their first year based on stories of family, friends, and teachers, while others do not (NSSE, 2008). Students also enter college with varying levels of academic preparation. Some students are underprepared while others are highly prepared for college. Underprepared students are usually less engaged than highly prepared students in both academically challenging activities and collaborative learning (NSSE, 2008).

### *Previous Experience*

One possible explanation of the relatively higher perceived success rate of the face-to-face lecture courses as compared to the blended sections is students' lack of familiarity with blended learning as well as their different expectations of the college experience. The study was done during the first semesters of the introduction of blended courses at UNT and for most of the students, this was their first college experience. Previous research support the idea that familiarity with technology (Song, Singleton, Hill, & Koh, 2004) and previous expectations of the learning experience (Osborne, 2000) affect student satisfaction with the course. After conducting a longitudinal study on the perception of online courses, Arbaugh (2004) also found that student perception of online learning became more positive as students took subsequent courses, and that the most notable change came between the first and second course.

### *Traditional View of Higher Education*

Recent developments in brain research and learning theories offer another possible explanation for the discrepancies between the various blended results of this study. Zull



(2002) claims that the traditional view of learning is still prevalent in our education system. The learner is viewed as the receiver of information, and the transformation of the learner from a receiver into the producer of knowledge very often remains unsupported in many courses. Teachers feel the constant pressure to increase the amount of information in their classes and students expect control and authority from the teachers. It is not surprising then that the perception of the success of the learning experience and even the attitude toward subject matter seem to be affected by the perceptions of interactions. The central role of the instructor in making a course a successful learning experience suggests that first-year students tend to believe that school is about authority and control. As one researcher has concluded, “it is about knowledge being located somewhere outside us: in books, the teacher’s brain, on educational television, or on the Internet” (Zull, 2002, p. 45).

While in a face-to-face lecture class, the success of the course depends on the instructor’s personality and how the instructor is perceived by the students, in the computer mediated environment, there is more emphasis on collaborative learning and less emphasis on variations of content presentation dependent on the instructor. In collaborative learning, the perception of a community and peer interactions gain importance. However, students’ initial expectations of the student and teacher roles seem to affect their perception of the utility of both student-instructor and student-student interactions. Blended learning can combine the discovery approach while still keeping the traditional teaching method, where the teacher is the main source of information.

### *Models of Student Development*

Models of student development, such as Kegan’s (1994) personal developmental framework provide another possible explanation of the unexpected results of this study. In Kegan’s framework, individuals move from the first to the fifth order of consciousness over

their lifetimes while developing foundations that help them make sense of the world. College students are typically at the level of second or third order of consciousness and the goal for them is to achieve the fourth order by the end of their four-year higher education. The Student as Scholar Model developed by Hodge, LePore, Pasquesi, and Hirsh (2008) focuses on “students progressing from their reliance on external authority in the third order of consciousness to an internal authority in the fourth order” (p. 4). In this study, the majority of students enrolled in the face-to-face and blended sections were new college students at the beginning of their undergraduate education and probably in their second or third level of consciousness of development. The decrease in attitude toward subject and the lower ratings of the learning experience in the blended sections as compared to the face-to-face sections might have been the results of the students’ need for external authority.

The challenge for higher education is to consciously build an evolutionary bridge that fosters this developmental transformation. Blended courses seem to be especially suitable for providing these intermediate-level learning experiences of the model and helping students across Kegan’s (1994) evolutionary bridge. The intermediate-level experiences take the students beyond the book (and professor) and challenge them to continue their personal development as scholars. Students who successfully progress to this intermediate level will have the skills and confidence that will allow them to perform at a much higher level immediately after graduation and will be more likely to become lifelong learners.

### Implications

While research has not provided a complete description of what exactly makes a successful learning experience (Stacey & Gerbic, 2008), blended learning has been gaining popularity in academia as an alternative to traditional face-to-face and entirely online education. Although some of the quantitative results of this study indicate that lecture-based

face-to-face learning is still favored by many undergraduate students and it is perceived as a more effective way of learning, the qualitative results show that most students quickly adjust to blended learning and recognize the advantages of adding online content and activities to face-to-face lecture-based classes. The two key success factors in the blended learning environment, as identified by Stacey and Gerbic (2008) and as supported by the qualitative results of this study, are the strong integration between the online and face-to-face environment (Garrison, Kanuka, & Hawes, 2004; Garrison & Vaughan, 2007) and the careful consideration of the roles of teachers (Gerbic, 2006) and students.

### *Teacher Roles*

One of the main implications of the study is that the integration of online components into large-enrollment lecture-based face-to-face undergraduate classes is changing the way both students and instructors work, and universities should be prepared to accommodate and anticipate these changes. In their research, Cuthrell and Lyons (2007) concluded that online instructors must employ a variety of instructional strategies to appear to a wide range of students. Gerbic (2006) found that encouragement, reminders from the teacher and discussion of the rationale for addition of online discussions was not especially effective in connecting online discussions to the classroom. In the present study, however, it was discovered that undergraduate students in their first college year very often do not have the time management skills that are required for successful online learning. They need and appreciate reminders and consider them as contributing factors to the perceived effectiveness of the course. Ideally, the teacher can follow the students' progress and can intervene when learning is stalled as students go through the entire learning cycle.

Also, in addition to small group discussions or other face-to-face activities, undergraduate students seem to have a need for the presence of a teacher as a source of

content-related information and not just as a person providing feedback on assignments. The teacher's role as discussion leader in a small group setting is also considered important, while peer comments are generally not found very useful. Students also expressed the need for occasional summary lectures during the face-to-face sessions. The least favored blended classes had scheduled meetings only for student presentations and exams. The most favorably viewed blended classes had a variety of interactions (discussions in small groups, lectures, presentations, and other face-to-face activities) reflecting the model developed by Garrison and Vaughn (2007).

### *Student Roles*

Although learning environments should respond to local and organizational needs, course developers and designers should consider the learners' needs first (Mason & Rennie, 2006) ahead of the context or the biases of the teacher in making such choices. This study revealed that undergraduate students often do not have realistic expectations of the workload in blended classes. They assume that reduced classroom time means smaller workload in terms of fewer interactions with the instructor as well as the content and it may come as a surprise to many of them that the online component of the course entails a higher level of engagement with the course material and an increased interaction with both their instructor and peers. In general, new college students need time to understand the blended learning process and blended instructors need to provide a consistent and transparent communication around the new expectations to facilitate this process (Sharpe, Benfield, Robert, & Francis, 2006).

At university level, students should be advised about what to expect from blended courses in terms of workload and class attendance as well as what kind of learning and communications styles are required for success. The National Survey of Student Engagement

(NSSE) (2008) also recommends a careful analysis of students entering college to identify those who may need special intervention to ensure engagement and success. They recommend using the Beginning College Survey of Student Engagement (NSSE, 2008) to assess students' propensity for engagement in college.

### *When to Employ Blended vs. Online Methods?*

An important implication of the study is that entirely online courses should be designed and evaluated differently than lecture-based face-to-face or blended courses. Online courses seem to serve a very different population: older students who work full-time and live further away from campus. Their highest priority in completing courses is flexibility in time and space. If these online courses are suddenly combined with face-to-face meetings, they lose their convenience and attraction as a way of earning a course credit or degree. This flexibility also requires a very different approach to the course design process. While blended courses should be designed around face-to-face activities, online courses should be designed around online activities. In this study, the blended courses that received the most positive feedback from students showed resemblance to the four phase blended model developed by Garrison and Vaughan (2007). In their model, the central role of the face-to-face environment provides the comfort of a traditional learning environment for both students and instructors, and it also includes a sequence of activities before, during, after, and in preparation for the next face-to-face session. Face-to-face activities, such as small group discussions or small group activities cannot simply be replaced by online discussions, because online students will instinctively feel the need for face-to-face interactions with their instructor and peers and this will affect their perception of the success of the learning experience.

### *Learning Styles*

There are indications in the blended learning literature that blended learning might be especially suitable to accommodate different learning styles by providing learners the opportunity to choose the appropriate strategy to meet their learning needs. While independent learners can take advantage of the freedom an online learning environment provides, dependent learners, who are less self-regulated and need more frequent directions and reinforcement from a visible professor, can benefit from the periodic opportunities for face-to-face interactions of blended courses. This study supports previous findings that blended learning environment can help students understand and experience the right balance of independence and interaction or reflection and collaboration (Garrison & Cleveland-Innes, 2004).

Kinesthetic, visual, and auditory learners (Fleming, 2009) can all be accommodated in the blended environment. Providing visual clues together with auditory information and kinesthetic exercises might help students to make connections, take them through the entire learning cycle (Zull, 2002), and eventually deepen their learning. Different learning styles could be accommodated not only through content delivery, but also by allowing a choice of assessment tasks.

### *Blended Course Design*

Colleges should consider using the Student as Scholar model (Hodge et al., 2008) of student development to create developmentally appropriate curricula that build student capability progressively throughout the college years. Hodge et al. (2008) recommend applying their Student as Scholar Model to the entire undergraduate experience and taking into account the development of the students. As students complete undergraduate courses during their college years, they move across a “developmental bridge” (Hodge et al., 2008) that takes them from foundational courses to advanced level courses. Undergraduate courses

in general and blended courses in particular should be designed following this model and should focus on students progressing from their reliance on external authority to internal authority.

### Future Research

The more we learn about the learning process, the more we realize that it is more complex than expected. The medium, the course design, the applied pedagogical strategies, the subject matter, learners' preference for dependent or independent learning, or their personalities are just a few factors that contribute to the complexity of the process. The results of the present study suggest several areas that would benefit from further research.

#### *Interaction Research*

The concept of interaction should be further investigated, but primarily within the online and blended classes. Interaction in traditional lecture-based instruction does not seem to be comparable to the other two forms of instruction. The main difference is that in a face-to-face large-enrollment lecture class, most students seem to interact only passively with their instructors and the course material; whereas in a small-group face-to-face setting or in the interactive online learning environment, students actively interact with their instructors, peers, and the course content. Considering the active involvement in the learning process via student-initiated interaction, both blended and online learning seem to “represent a fundamental redesign that transforms the structure of, and approach to, teaching and learning” (Garrison & Vaughan, 2007, p. 5).

As new patterns of online interaction are identified and as new theories of learning and communication emerge in the online environment, there will be a need for new comparative studies of learning outcomes, course effectiveness, and the types of interactions

involved in the process. Interactions in graduate and doctoral level courses should be examined in order to find out how student maturity and familiarity with the subject matter affects the quality and quantity of online and face-to-face interactions.

In a smaller scale study, deep and surface learning should also be measured to provide a more complete picture of the effect of the class format on the learning experience. A next step toward this could be an analysis of cognitive (content) postings using the SOLO Taxonomy (Biggs & Collis, 1982) to detect what types of learning occurs during the learning process.

### *Role of Previous Online Experience*

The findings of the attitude toward subject survey suggest that while online instruction did not affect students' total attitude scores, blended instruction decreased the scores, and face-to-face instruction increased them. Longitudinal studies are needed to find out if undergraduate students' previous exposure to online and blended learning will result in different attitude changes toward the subject matter of the blended classes. Measuring undergraduate students' learning maturity and readiness for blended or online learning would be another possible approach to investigate the contradiction between the results of this attitude survey and the blended students' high academic performance.

### *Cognitive Development*

Kegan's (1994) personal development model seems to be especially applicable to blended learning. The model was designed to support students in learning to construct knowledge and it also challenges them to achieve self-authorship during college (Hodge, et al., 2008). A longitudinal study should examine the same group of college students from a developmental perspective to determine if students' perceptions of the learning experience as



well as their attitude toward the subject would change as they grow their personal identities and academic capabilities during the college years. Initial measurements of cognitive development could also be investigated as possible predictors of students' preference for teaching format.

### Summary

It is an exciting time to be involved in education. Over the past few years, blended learning has received considerable attention in both academia and the corporate world and has quickly become the new wave of e-learning. Although some of the definitions of blended learning are fairly simple, the implementation of an effective course and the understanding of the importance of face-to-face interaction are much more complex than we thought.

This study supported the argument that blended learning can combine the strengths of face-to-face and online learning and can provide a more effective learning experience. The present comparison of interactions in the various learning environments also confirms that interaction is indeed one of the key variables in the learning process. The finding that the quantity of online interactions in the blended and online courses were not significantly different suggest that blended classes take advantage of the face-to-face interactions as well as enhance students' interaction with the content and their peers. The potential for immediate individualized feedback and the availability of self test quizzes enhanced students' understanding of course concept and their retention of the course material.

Blended learning has the potential to improve learning and to engage students in the course material. Although the perceived success rates and students attitude towards the subject were the highest in the traditional lecture classes, both blended and online courses were perceived as successful learning experiences by a large majority of the participants. The blended courses received very positive reviews reflecting a deeper engagement in the subject

and a new-found excitement for learning. Most blended students also agreed that they would take blended courses again in the future.

These findings support the argument that there is no single recipe for designing a successful blended course. The optimal blend of face-to-face and online learning events may vary in every discipline and in every course. Different learning goals may require different solutions as well. While case studies and white papers will remain important resources for designers of blended learning programs, course development will remain an iterative process in which instructors and instructional designers will have to periodically re-evaluate the effectiveness of their courses with students' learning maturity and readiness for independent learning in mind.

APPENDIX A  
ATTITUDE TOWARD SUBJECT SURVEY

Dear Student:

This is the second part of our Attitude Toward Subject survey. The questions below are designed to identify your attitudes toward the subject of the course you are finishing this semester. The item scale has 7 possible responses; the responses range from 1 (strongly disagree) through 4 (neither disagree nor agree) to 7 (strongly agree). Please read each question. From the 7-point scale, carefully mark the one response that most clearly represents your agreement with that statement. Use the entire 7-point scale to indicate your degree of agreement or disagreement with our items.

Please remember that the survey information will be kept confidential. Your instructor will only see a summary of responses. The data you provide will only be used to see what relationships exist between student attitudes toward subject and the effectiveness of the course delivery format.

If you have any questions about this survey, please feel free to call or e-mail me. Thank you for your assistance.

Agnes Pearcy

## End-of-Course Questionnaire

[Adapted from Schau, C., Stevens, J., Dauphinee, T. L., & Del Vecchio, A. (1995). The development and validation of the Survey of Attitudes toward Statistics. *Educational and Psychological Measurement*, 55(5), 868-875.]

Your Name: \_\_\_\_\_ Date: \_\_\_\_\_

Name of Course: \_\_\_\_\_

Your Gender: \_\_\_\_\_

Your Age: \_\_\_\_\_

Degree you are currently seeking:

1. Bachelors   2. Masters   3. Doctorate   4. Certification   5. Other

To what extent do you agree or disagree with the following statements about this course?

**Strongly Disagree (1) / Somewhat Disagree (2) / Disagree (3) / No Opinion (4) / Agree (5) / Somewhat Agree (6) / Strongly Agree (7)**

- |     |  |
|-----|--|
| 1.  | I did well in this course.   |
| 2.  | The knowledge and skills I gained in this course will make me more employable. |
| 3.  | I liked this course.   |
| 4.  | This is a subject quickly learned by most people.                              |
| 5.  | This course should be a required part of my professional training.             |
| 6.  | I was under stress during these classes.                                       |
| 7.  | I felt insecure when I had to do the assignments for this course.              |
| 8.  | Learning this subject requires a great deal of discipline.                     |
| 9.  | This subject makes me feel anxious or uncomfortable.                           |
| 10. | This course does not fit into my overall educational needs.                    |

11. thinking to do well in this course. Most people have to learn a new way of
12. concepts of this subject. I found it difficult to understand the
13. interesting. I find the topic of this course very
14. This is a complicated subject.
15. I enjoyed class discussions.
16. This subject is irrelevant in my life.
17. course. I am knowledgeable about the topic of this
18. course will be useful in my everyday life. The knowledge and skills I gained in this
19. my profession. I will have no application of this subject in
20. I am scared by this subject.
21. because of how I think. I had trouble understanding this subject
22. I can learn this subject.

APPENDIX B

END-OF-SEMESTER COURSE EVALUATION SURVEY

Dear Student:

We are conducting a research study comparing the effectiveness of face-to-face, online, and blended learning. Using this survey, we would like to assess how well this course met your learning needs, and whether the format of the course delivery affected the extent to which these needs were met. The following questionnaire was designed to get feedback on your overall satisfaction with your learning experience, with an emphasis on your perceived learning, your sense of community, and your perception of the quantity and quality of interactions with your instructor and your peers.

The majority of the questions below are multiple choice questions. Please read each question and carefully mark the one response that most clearly represents your agreement with that statement. Please always use the entire (5- or 7-point) scale to indicate your degree of agreement or disagreement with our items. In the last four questions, please give us your overall evaluation of the course and your suggestions for improvement.

Please note that even though this survey is not anonymous, your information will be kept confidential. Upon receipt, coded labels will be affixed to the survey forms, which will be kept separate from the informed consent forms. Your instructor will only see a summary of responses. The data you provide will be used to compare the effectiveness and to improve the quality of the three types of course delivery format.

If you have any questions or concerns about this survey, please feel free to call or e-mail me. Thank you for your assistance.

Agnes Pearcy



## QUESTIONNAIRE

Name:

Date:

Course Title and Section Number:

Number of credits for this course:

Age: Under 20      20 - 29      30 - 39      40 - 49      Over 50

Gender: Male / Female

How far do you live from the main campus of UNT?

0-10 miles    11-30 miles    31-50 miles    51-100 miles    More than 100 miles

Level of computer expertise: Novice / Intermediate / Expert

Why did you decide to take this course? (Mark all that apply.)

- to fulfill a general education requirement
- to fulfill a requirement for my major
- the subject matter looked interesting
- the instructor has a good reputation
- it was offered this semester
- it was offered in a traditional lecture format
- it was offered as a web-based course
- it was offered as a blended course

### Perception of Interactions

[Adapted from Picciano, A. G. (2002). Beyond student perceptions: Issues of interaction, presence, and performance in an online course. *Journal of Asynchronous Learning Networks*, 6(1), 21-40. Retrieved May 24, 2008, from [http://www.aln.org/publications/jaln/v6n1/pdf/v6n1\\_picciano.pdf](http://www.aln.org/publications/jaln/v6n1/pdf/v6n1_picciano.pdf)]

*In comparison to traditional classroom instruction, in this course,*

The amount of interaction with other students  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The quality of interaction with other students  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The amount you learnt about the other students  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The amount of interaction with instructor  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The quality of interaction with instructor  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The amount you learnt about the instructor  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The amount of knowledge you have gained  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The quality of your learning experience  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

The motivation to participate in class activities  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

### Technology

How easy was it for you to use technology (WebCT) to participate in this course?  
Easy / Somewhat easy / Somewhat difficult / Difficult

Your familiarity with computer technology  
Increased / Somewhat Increased / No Change / Somewhat Decreased / Decreased

On average, how many hours per week have you spent working on this course? (Include time spent reading, completing projects and assignments, studying for quizzes, or discussing the course content with the instructor or classmates.)

1 -5 hours    6 - 10 hours    11 - 15 hours    16 - 20 hours    21 - 40 hours    More than 40 hours

On average, regardless of whether you posted a message or not, how often did you access the course web site each week?

- a. once a week
- b. twice a week
- c. three times a week
- d. four times a week
- e. five or more times a week

On average, how often did you post a message to the Discussion Board each week?

- a. once a week
- b. twice a week
- c. three times a week
- d. four times a week
- e. five or more times a week

### Overall Evaluation of the Learning Experience

How would you rate your overall educational experience in taking this course?  
Poor / Satisfactory / Good / Very Good / Excellent

Would you rate your experiences with this course as: Successful / Not successful

If successful, what aspect of the course most contributed to its success?

If not successful, what aspect of the course was most problematic?

The best thing about this course was:

This course can be improved by:

APPENDIX C

MID-SEMESTER EVALUATION OF BLENDED COURSES

1. How would you rate your overall educational experience in taking this course?

Poor / Satisfactory / Good / Very Good / Excellent

2. How would you compare the value of the online vs. the face-to-face part of the class to date?

The online part is more successful / About the Same / The face-to-face part is more successful

3. Compared to “traditional” face-to-face course, how effective is this blended class?

- 1 Much less
- 2
- 3
- 4 About the same
- 5
- 6
- 7 Much more

4. Compared to an entirely online course, how effective is this blended class?

- 1 Much less
- 2
- 3
- 4 About the same
- 5
- 6
- 7 Much more

5. What helped you learn the most in this course so far?

6. What is the least helpful to your learning in this course?

7. I have the following suggestions for improving this course:

APPENDIX D  
FACULTY INTERVIEW QUESTIONS

## A: MIDSEMESTER ASSESSMENT QUESTIONS FOR THE FACULTY

1. Over the past few weeks, what challenges (pedagogical, technical, etc.) have you faced? Were these challenges resolved? If so, how? If not, when and how do you anticipate resolution?
2. What challenges have your students faced? Were these challenges resolved? How?
3. What positive experiences have occurred in the past few weeks? When did the students seem particularly engaged? What worked well from your perspective? Why?
4. Have you had any negative experiences? What didn't work well for you? Why? What areas need improvement? How could these improvements be made (consider long-term vs. short-term possibilities)?
5. How would you evaluate your students' academic performance for the last few weeks? Did the students meet the primary learning objectives?
6. How do you perceive the quality and quantity of student-student and student-teacher interactions (discussion postings, emails, in-class questions, etc.) in the different class formats?
7. How would you assess student collaboration in the last few weeks? Have you encountered any issues (technical, social, etc.) that can make it difficult for some students to work with other students?
8. What is your perception of the workload for you and for the students?

B: END-OF-SEMESTER ASSESSMENT OF THE BLENDED EXPERIENCE:  
QUESTIONS FOR THE FACULTY

1. What challenges (pedagogical, technical, etc.) did you face during the semester? Were these challenges resolved? If so, how? If not, when and how do you anticipate resolution?
2. What challenges did your students have to face during the semester? Were these challenges resolved? How?
3. What positive experiences occurred during the semester? When did the students seem particularly engaged? What worked well from your perspective? Why?
4. Did you have any negative experiences? What didn't work well for you? Why?
5. Is your face-to-face class different from the online and blended courses in terms of exams, assignments, readings? **Please include a copy of the syllabus of your face-to-face section.**
6. How would you evaluate your students' academic performance during the semester in the different sections? Did the students meet the primary learning objectives?
  - 7.1. How did you perceive the quality and quantity of student-teacher interactions (discussion postings, e-mails, in-class questions, etc.) in the various class formats?
  - 7.2. How did the students in your face-to-face section contact you about course content and other (technical, social, logistical, etc.) issues? (during class, before/after class in person, e-mail, phone, fax, etc.) Did they seem to have a preference for any of these communication tools?
  - 7.3. How did the students in your online section contact you about course content and other (technical, social, logistical, etc.) issues? (e-mail within WebCT, e-mail outside WebCT, WebCT discussion board, phone, fax, etc.) Did they seem to have a preference for any of these communication tools?
  - 7.4. How did the students in your blended section contact you about course content and other (technical, social, logistical, etc.) issues? (during class, before/after class, e-mail within



WebCT, e-mail outside WebCT, WebCT discussion board, phone, fax, etc.) Did they seem to have a preference for any of these communication tools?

8.1. How would you assess student collaboration in the different class formats? Did you encounter any issues (technical, social, etc.) that made it difficult for some students to work with other students?

8.2. Did you perceive the existence of a learning community among the students in any of the sections?

9. What was your perception of the workload for you and for the students in the different class formats?

10. What areas of your blended section need improvement? How could these improvements be made (consider long-term vs. short-term possibilities)?

APPENDIX F  
ATTITUDE TOWARD SUBJECT SUBSCALES

**Affect -- positive and negative feelings concerning the subject matter:**

I will like this course.

I will feel insecure when I have to do the assignments for this course.

This subject makes me feel anxious or uncomfortable.

I will be under stress during these classes.

I will enjoy class discussions.

I am scared by this subject.

I find the topic of this course very interesting.

**Cognitive Competence -- attitudes about intellectual knowledge and skills when applied to the subject matter:**

I will have trouble understanding this subject because of how I think.

I will find it difficult to understand the concepts of this subject.

I can learn this subject.

I am knowledgeable about the topic of this course.

I am confident that I will do well in this course.

**Value -- attitudes about the usefulness, relevance, and worth of the subject matter in personal and professional life:**

This course should be a required part of my professional training.

The knowledge and skills I will gain in this course will make me more employable.

This course does not fit into my overall educational needs.

The knowledge and skills I will gain in this course will be useful in my everyday life.

I will have no application of this subject in my profession.

This subject is irrelevant in my life.

**Difficulty -- attitudes about the difficulty of the subject:**

This is a complicated subject.

This is a subject quickly learned by most people.

Learning this subject requires a great deal of discipline.

Most people have to learn a new way of thinking to do well in this course.

I will find it difficult to understand the concepts of this subject.

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